

# Veer Narmad South Gujarat University Exchange Program. Achievements and results



María Mestre Martí (Coord.)

**Veer Narmad South Gujarat  
University Exchange Program.  
Achievements and results**

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# PRESENTATION

Internationalization is more than ever a valuable strategic goal in institutions of higher education. According to the strategy of internationalization of Spanish Universities 2015-2020 MECED, internationalization is defined as “the process of integrating an international, intercultural and / or global goals, functions (teaching / learning, research, university extension services) and development of higher education.” This broad definition encompasses various aspects and activities such as all forms of academic mobility, collaborative research, international project development, curriculum design, offer programs and courses with an international dimension, or changes in the curricula of certain areas.

But that definition highlights a fundamental and less frequent in our universities aspect: the internal dimension of internationalization that involves a cultural change in the institution.

Internationalization outward aims (international) projection of supply and capacity of the university. This means to expand the visibility, recognition and scope and influence of the university. At the same time, this outward projection contributes to the opening of the corporate culture, facilitating the understanding of the phenomena and global trends, relativizing localism, appreciating multiculturalism and consolidating values such as tolerance and solidarity.

I would like to thank specially to Mahendra Mistry, from India Partnership and Market Development Lead, for making possible our joint venture with Indian universities, and our close relation with the Veer Narmad South Gujarat University (VNSGU), Surat, where UPCT would like to increase our physical projection. I would like to thank the VNSGU Architecture School and the 15 excellent students that were involved in the program. I would like to thank the Architecture School at UPCT, and I would like to mention Antonio Garrido and Maria Mestre for being pioneers in this international adventure and for the enthusiastic work they have been developed. And finally to all the International Relations Office at UPCT for giving all the support for this encouraging initiative.

**José Manuel Fernández Vicente**  
Vice-Rector for Internationalization and Development Cooperation  
Universidad Politécnica de Cartagena (Spain)

India and China are priority markets for many academic institutions around the world. Globally, India is the second largest exporter of international students after China.

Historically, the preferred destinations for Indian students have been the UK, USA, Canada, Australia, New Zealand; these destinations continue to attract a large number of students from India. In recent years a number of new countries have emerged as destination for Indian students wanting to get quality international education. In this respect, Spain is increasingly creating traction. Recognising this opportunity, Universidad Politécnica de Cartagena, (UPCT), has successfully established a number of Institution-to-Institution partnership and is actively recruiting students from the open market for a number of its courses.

Our first MoU was signed with the Veer Narmad South Gujarat University (VNSGU), Surat, Gujarat in 2013. Our first project was to offer a 6 months program for 4th year students from VNSGU Architecture School. The program content and structure was designed with input from both the Faculty at UPCT and VNSGU. We received 15 enthusiastic students – competitively selected by the sending institution on merit.

An opportunity of a lifetime was presented to these deserving students. In the six months they stayed at UPCT participating in the program, they not only gained valuable academic learning experience, but were also given an opportunity to work in real Architecture practices in Cartagena, Murcia, Alicante and Barcelona. This provided the students with unique work experience and knowledge, which otherwise they would have not received.

It is encouraging and heartening to know that following the success of this first program, VNSGU has decided to send a second batch in 2016.

I would like to take this opportunity to thank every one involved in making this project successful both at UPCT and VNSGU and in particular the International Relations Office at UPCT.

We look forward to continuing and further developing this partnership and receiving new batches of students each year in the future.

**Mahendra Mistry**  
India Partnership and Market Development Lead  
Universidad Politécnica de Cartagena (Spain)

Our school was set in 2008. A short time to big a big achievement. We have had all kind of experiences but no one like the day you, young Indian people, came to our ceremony room. Maybe we should have opened champagne bottle to celebrate our first international experience. People coming from 7000 kilometers far were expecting all of us from our capacity of teaching architecture. Nerves, smiles and wide open eyes. A few speeches in our best English to welcome you were said. I wish we had known more from your country. But no difficulty was enough strong. Five minutes after the scene had been suffering a sweeping change. Young professors had found young student one together and then everything became perfect amid the room. Architecture was present and everybody forgot all difficult. Thank you young future architects from Shri Gijubhai Chhaganbhai Patel Institute of Architecture. Welcome (we said) and goodbye forever (we say).

**Antonio Garrido Hernández**  
Headdirector ETSAE  
Universidad Politécnica de Cartagena (Spain)

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## Insertion of modern Architecture into High Value Historic Areas

María Mestre Martí  
Khandwala Zeal Niravbhai  
Bhanvadiya Nisarg Renishkumar

### ABSTRACT

Spain has the second best World Heritage cultural properties in the world after Italy. It has evolved over centuries, and now it has become an attractive mix of the old and the new architecture, leaving its mark for future generations. This is a positive process that we can celebrate by paying heed to these precious cultural assets which will make us feel proud that it is managed to unite past and present styles and tastes.

In this research work, it is focused on how a new building can be constructed in the historic context in the cities of Murcia, Alicante, Valencia, Cartagena and Elche, analyzing buildings from the eyes of an architecture student. All of these lies on Mediterranean stretch having same type of climate and many historic buildings. Icomos General Assembly in Budapest (1972) at the conference (Art. 12 and 13) of the Venice Charter declared that the present architectural language should be contemporary while the new buildings should “integrate harmoniously” into the old surroundings not breaking “the balance of the composition” and it should be used even in the scale of settlements. VIENNA MEMORANDUM on *World Heritage and Contemporary Architecture – Managing the Historic Urban Landscape* also states that “contemporary architecture in the given context is understood to refer to all significant planned and designed interventions in the built historic environment, including open spaces, new constructions, additions to or extensions of historic buildings and sites, and conversions” which means respecting historic context before building a new one is important. The purpose of this research work is to see how contemporary building can be designed in historic settings.

### Introduction

Earlier in 18th and 19th century this theme did not exist but at end of 20th century, there was a critical issue which decision makers and conservation professionals faced regarding how to accommodate change to heritage places and add new layers to the historic urban environment in ways that recognize, interpret, and sustain their heritage values.

Over the last decade, a vigorous debate has ensued regarding the appropriateness of contemporary architectural insertions into historic urban areas. This debate has polarized sectors of the architectural community, pitting conservationists against planners and developers. It has positioned conservationists as antidevelopment and antiprogress, responsible for stifling the creativity of a new generation of architects and their right to contemporary architectural expression.

So, creative solutions which are compatible with the established character of a historic neighborhood are strongly encouraged. Designs that seek to contrast with the existing context, simply for the sake of being different, however, are unlikely to be compatible and are discouraged.

### Design Criterias

New development in a conservation area, heritage precinct or adjacent to the heritage buildings, aims to maintain and enhance the area’s distinctive features and sense of place.

Design in a historic context or infill design aims to preserve the special qualities that give a



place character in a way that respects the old while reflecting the new and meeting the amenity needs of its users. Conservation requires the retention of an appropriate visual setting and other relationships that contribute to the cultural significance of the place. New construction, demolition, intrusions or other changes which would adversely affect the setting or relationships are not appropriate. Designing in context does not mean imitation or following inflexible design rules. A wide range of solutions may emerge for any design problem after careful analysis of surrounding buildings and sympathetic interpretation of their design elements, as mentioned in the research paper 'Design in Context - guidelines for infill development in the historic environment.

To achieve a successful infill design new development must be appropriate under the following design criteria:

01. CHARACTER
02. SCALE
03. FORM
04. SITING
05. MATERIALS AND COLOUR
06. DETAILING

### **Design Strategies**

An important issue for preservation has been defining how new construction appropriately support and enhance, rather than detract from, historic buildings and districts under regulatory protection. So as long as new additions or infill buildings were likely to be designed in the same styles as their historic neighbors, "fitting in" was rarely an issue. But since the ascendancy of contemporary architecture style which defined itself in terms of opposition to traditional styles and assumptions about design— an important part of the preservationist's mission has been to tame the ambitions of new architects and their penchant for setting off historic structures with contrasting new ones.

Many preservationists either acquiesced in or actively embraced contemporary aesthetics for new buildings, especially as a means of distinguishing new and old construction, which has been a preservation goal. However, much attention has been focused on the question of how we ought to manage the relationships between historic buildings and contrasting new additions in the context of contemporary architectural debates about style.

A designer or preservationist contemplating new construction in a historic setting may adopt one of four strategies based on four possible attitudes toward the existing setting or resource:

- 1) Literal replication
- 2) Invention within the same or a related style
- 3) Abstract reference
- 4) Intentional opposition

These options represent a range of responses to the call for "differentiated" yet "compatible" designs for additions or infill construction in historic settings. The above strategies are mentioned in the research paper named "Sense of place: Design guidelines for new construction in historic districts", 2007 which we have used to analyze the buildings in this paper.

### **Literal Replication**

The strategy of replication prioritizes compatibility and minimizes differentiation. This strategy will likely sustain the character of an existing setting so long as the historic elements to be replicated are well understood, the technical means to effect replication are available and until the scale of the replication is modest relative to the original building. Architects have often chosen to add to existing buildings by reproducing a previous architect's work, sometimes even

centuries afterward, usually for the sake of completing an intended but unrealized symmetry or extending a pattern already established. In such cases, the resource is defined as the design concept as a whole rather than any isolated part of it as it appears at a given time.

Many great European monuments visible today were completed not by the original designers but by a series of successive architects willing to realize their colleagues' designs. Filippo Brunelleschi completed his Ospedale degli Innocenti in Florence (1425) on the southeast side of the Piazza Annunziata. Over the course of the next two centuries the disparate buildings around the square were unified by a series matching arcades that appear to be the work of a single hand. In mid-17th century Paris, Jacques Lemercier replicated Pierre Lescot's century-old facade on the Cour Carré of the Louvre to maintain the symmetry of the expanded elevation. The other examples we analysed are Nuevo Centro Servef de Empleo de Torrent, and various others of the considered region in Valencia, Spain.

## Design Strategies

### Invention within a style

This strategy means not to replicate the original design, but to add new elements in either the same or a closely related style, sustaining a sense of continuity in architectural language. The intention is to achieve a balance between differentiation and compatibility. It also has a long history as most architects have always done it.

Leon Battista Alberti, in his 15th-century treatise, urged architects adding to a pre-existing building to work in the same style as the original builder and complete the work in the same spirit. He followed this principle to complete the facade of Santa Maria Novella in Florence, adding to its medieval first story in kind, then subtly transforming the style into a Renaissance flourish at the top. Back at the Louvre, two hundred years after Lemercier, Louis Visconti and Hector Lefuel designed the monumental facades on the Cour Napoléon in conscious imitation of his work. Other than these, projects like the Alicante Museum of Contemporary Art; Edificio de viviendas para realojo en el Barrio del Carme, Valencia; Office building PIMESA and the Museu d'Historia i Arqueologic (MAHE) environment, Elche, Alicante; Dwellings on Viana Street, Valencia; Archena School of Music, Murcia; Edificio de oficinas Diputación de Alicante, Alicante; Peris House, Alicante; House in Cullera, Valencia, and many more are designed on the principle strategy of invention within a same or related style.

Invention within a style—so long as it is an informed and fluent exercise—leads naturally both differentiated and compatible with respect to its pre-existing context. Unfortunately, some preservation authorities continue to resist the very approach most likely to yield the results called for by the characters and standards.

### Abstract References

The third strategy seeks to make reference to the historic setting while consciously avoiding literal resemblance or working in a historic style. This approach seeks to balance differentiation and compatibility, but with the balance tipped toward the former. It is a difficult strategy to execute because it requires an artistry and skill that are not often available.

The abstract referencing of historic architecture is a modernist innovation in which the compatibility of the new and old is suggested by the reduction of composite form to abstract shape. An early example, Adolf Loos's 1910 Goldman & Salatsch Building on the Michaelerplatz in Vienna makes reference to its setting through massing, size, materials, and very restricted articulation, allowing it to be both "modern" (in the sense of using a minimum of historical detail) and "contextual" (in the sense of "fitting in"

Physically with the scale, materials, and massing of the surrounding buildings). The analyzed examples of this strategy are Adecuación edificio para Local Social en Nules, Castellón; Pantheon Nube, Murcia; Town hall, Murcia; Museo de Monteagudo, Murcia, etc.

This strategy is limited by the fact that a formal language—classicism, for example—

cannot be reduced to abstract shape and still retain its distinctive “composite” quality-its ability to subdivide into coherent sub-parts or to join with other parts to become a larger whole. Furthermore, many modernist architects resist compromising for the sake of “fitting in,” which is undoubtedly why the contextualism of the 1980s has been abandoned in favor of a newly aggressive oppositional posture toward historical architecture in the recent works of Frank Gehry, Rem Koolhaas, Steven Holl and others. The strategy of abstract reference sees the historic urban setting as a resource to be conserved by means of deferential massing, but is typically unwilling to engage traditional formal language at the scale of the building or its constituent elements.

#### Intentional Opposition:

The fourth strategy is one of conscious opposition to the context and the determination to change its character through conspicuous contrast, prioritizing differentiation at the expense of compatibility.

Modern architects did not invent this idea. Andrea Palladio, who famously loathed gothic architecture, wrapped the medieval town hall of Vicenza with elegant arcades to conceal the geometric irregularities of the older building. Palladio’s arcades became a model of urban amenity and there is no question that the center of Vicenza is the richer for this facelift.

Sometimes contrast is the appropriate response to a context that is weak or otherwise unsatisfactory, but we must be careful making such judgments. The examples associated with strategy are Nueva Sede del Ilustre Colegio de Abogados de Valencia; Museo de la Muralla Árabe de Santa Eulalia, Murcia; Market of Villajoyosa, Alicante; Centro Cultural El Musical, Valencia; Ampliación del Ayuntamiento/City Hall Extension, Alicante; Auditorio of the Provincial de Alicante, Alicante; Vila Joiosa Auditorium Theatre, Alicante and various others. The most suitable use of this strategy is to repair damage to the historic setting brought about by previous insensitive or oppositional interventions. The use of this strategy intentionally to diminish a valued historic context is usually inappropriate.

The resource is seen as an artifact from a vanished world, something to be isolated in a museum setting or set off by contrast with a radically different modernist expression. Such designs are inherently incompatible with adjacent traditional buildings and inevitably lead to the erosion of historic character as increasing numbers of intrusive and alien forms challenge the qualities that made our protected settings valuable in the first place.

These were the four strategies on which designing can be done for a new building in a historic context; along with these there is also one strategy called as small scale interventions. In this strategy some small design principles, guidelines, elements, scale, proportions, etc. are used and the new building is designed.

Design principles at a smaller scale like maintaining the main axis, the scales of height, creating spaces, etc. which is intervened from other buildings but is used and implemented at a smaller scale; that is the design strategy called as small scale interventions.

Each strategy has its own method and principles of designing, the strategies discussed above are explained by taking references from the research papers of UNESCO, AAA, AIA, ETC. and the base of this topic of design strategy is mentioned from the research work presented in the article “Sense of place”.

## **CONCLUSIONS**

The aim of this research was to establish guidelines in dealing with new architectural intervention in urban historical setting to achieve aesthetic fitness. It was inspired by several relevant issues that are still critical in the development of such urban environment. It concerns with aesthetic fitness of new building in historical context. Significance aspects of formal aesthetic were clarified to be compatibility, meanings and visual harmony, and also several design tools of proportion, shape and scale.

The case studies demonstrate a number of ways in which good architecture can be

achieved on sensitive sites. Equally importantly, they show that most of the excuses offered for failing to achieve high design standards in such places are not valid. The general, most important lesson from all the studies

is that all successful design solutions depend on allowing time for a thorough site analysis and careful character appraisal of the context. This lesson is of universal application. For example, what is appropriate in an area made up of buildings of varied types and scales will be different from what can be permitted in the context of formally laid out streets and squares or an area with a strong unified character.

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***An opportunity of lifetime  
which will be cherished  
for the rest of my life***



KHANDWALA ZEAL NIRAVBHAI

*It is difficult to express my experience in words as it is really beyond words... Let's say it is something that has impacted me in the best possible ways of living life and has given memories which will always stay with me very close to my heart.*

*Thinking of staying away from my family always used to scare me, but after coming to Spain it became wonderful. Though Cartagena is a small town but is very beautiful and well equipped with all things that one dreams for living best life. Being here and experiencing different culture, different lifestyle, different language, different food and different people have changed my perspective towards life. It has helped me to overcome my fears and to explore myself as I could have ever done before. It has also helped me to come out of my shell (saying that I used to be shy, scared to talk in public, to new people i.e. I was very introvert), but now I have become more independent, more confident and learned to take up things as and when they come.*

*Talking about my progress in my work, starting with my research work for first 3 months was very interesting under the guidance of one of the best mentor, a friend, Prof. Maria Mestre Marti on the topic: "Insertion of Contemporary Architecture into high value Historic areas". I came across work of many Spanish architects and learnt about many new buildings from the case studies done of the new buildings built in historic context. I even learned how the uniqueness of the place and the historical continuity can be achieved through the settlements, despite of the ceaseless change in the building technologies and life culture. Second part of my stay was an internship under an architect, Martin Lejarraga, one of the best architects of Cartagena. Working under him is what I am going to miss when I go back to India. He has always been very kind, polite and encouraged me to make best out of my work and my stay.*

*I even got an opportunity to travel within and outside Spain, to places like Barcelona, Madrid, Valencia, Paris, Geneva, Rome, Florence, Venice, Pisa, Milan, etc. This gave me exposure to various different kinds of architectural works, buildings, culture, lifestyle, which is practiced in different parts of Europe.*

*Now, while listing down about my experience, my learning's, is making me sad, I feel like crying as there is feeling of losing something, something very special. But now, I proudly say that Cartagena is my SECOND HOME. As it is rightly said that all things come to an end some day, may be good or bad. So I have to accept it with heavy heart.*

*However, there is still an excitement to share my experience with my juniors and will be surely recommending them to come to Spain and be part of this program. I also wish and hope to come back to Spain very soon.*

*Finally, I would like to thank my college G.C. PATEL INSTITUTE OF ARCHITECTURE, VN S G U, SURAT and UPCT, Cartagena, Spain for giving me such an opportunity to bloom myself. The faculties and architects in Spain as well as in India without whose involvement the program would have been a failure. I also would like to thank our coordinator Mr. Mahendra Mistry and special thanks to my parents who have always supported me.*



BHANVADIYA NISARG RENISHKUMAR

*The most important thing which I found interesting was to get the idea of how the contemporary buildings can be designed and built if the surrounding context is so strong in the historical as well as in the historic architectural aspects. The other interesting thing was to know about various places and how they function; of the Spain where we selected our buildings for the research work; places like Alicante, Valencia, Murcia, etc. . The other interesting thing was to seek the design strategies and criteria from the examples of buildings which studied in various aspects; like form, function, material, character, siting and scale.*

*The aim was to know how the contemporary building can be inserted in the context having high historic values. It was an interesting process which we have gone through; firstly we read various articles suggested by my guide prof. Maria Mestre. Then I got the idea what is research all about. Then I started searching the criteria on whose bases the buildings required for understanding the research were needed. After that I started searching the buildings in the Mediterranean region of Spain like Murcia, Valencia, Alicante, etc. After finding the buildings the next step was to analyse those buildings and to come up with the result that how and on what basic strategy they might have been designed. Later the work of compilation was done in which I have tried to put the explanation of each part logically explained the composition part of the buildings and then deriving the strategies and criteria from it.*

*The experience was like; coming to heaven and working on the topic which I wanted to do and to know about it more was completely amazing. Learning and working in such a beautiful, pleasant, people friendly atmosphere was a great experience and specially dealing with the people who try to help you out; even though there was a barrier of the language was a pleasure. Working in Spain was like; each day I wake up, I feel like I have found myself. So I would like to thank Maria ma'am , all the faculties, friends and also Martin Lejarraga sir for allowing us to work under him . And thank you Spain for giving me such a wonderful experience and giving me my best 6 months of my life; which I will never forget.*

## The Palace of Charles V in Granada. Survey of the ring vault in the courtyard

Macarena Salcedo Galera  
José Calvo López  
Mustafa Mudreka Attarwala

### Abstract

This paper describes a survey of the ring vault located in the courtyard of the Palace of Charles V in Granada carried out using convergent multi-image photogrammetry, in order to study its geometry and define its construction processes. Photogrammetry is increasingly becoming a widely used architectural heritage surveying method. This technique is specifically suitable for geometric and stereotomic analysis of masonry pieces.

### 1. Introduction

Although Renaissance architecture was originated in Italy, in Spain it was executed using different construction methods. While Italian vaults are usually built in brick, during the Spanish Renaissance the use of ashlar masonry was widely extended. As a result, there are in Spain many vaults and interesting pieces that were built using this construction technique from the 16th century onwards. Some of the most relevant examples of these vaults were built in Granada, where this new artistic trend was gladly welcome and applied to representative buildings like the Cathedral, or the iconic Palace of the Emperor Charles V beside the Alhambra. It is mainly in this Palace where we can find a wide range of masonry pieces, like the big annular vault in the courtyard, the small arches in the doorways, or the pointed lunettes in the crypt vault.

At this point, architectural surveying plays an essential role, as it is the only way of getting the real geometry, that is, the real shape and measures of the object under study. Architectural surveying can be carried out by different methods, as 3D scanning, topographic techniques, or photogrammetry, choosing the one that best fits the work depending on the purpose of the survey. In this paper we have obtained the surveying of the thorax vault of the courtyard in the Palace of Charles V in Granada thanks to photogrammetric methods in order to analyse its geometry and define the execution processes that were carried out during its construction (Alonso and Calvo 2010).

In addition, this geometric and constructive study based on photogrammetric surveying, may help to identify the historical facts and artistic influences that might have been involved in the construction of the mentioned vault. And, what is more, it may help to compare the results obtained from the solutions explained in the studies and stereotomic manuscripts.

### 2. The Palace of Charles V in Granada and its ring vault

The palace of Charles V is situated inside the fortification of Alhambra in Granada. This palace was the first High Renaissance building outside Italy. Its architect was Pedro Machuca, who also was a painter trained in Italy from where he returned to Spain in 1520. The design of the Palace begun in 1527, and construction started in May 1533. According to Rosenthal, the construction of the new palace must have started by May 1533, and in the twenty-four years in which Machuca led the works, these advanced considerably. When he died in 1550



Fig. 1. Palace of Charles V in Granada.

he was succeeded by his son Luis, who finished the circular courtyard and its ring vault (Fig.1) (Rosenthal 1985).

In 1568 the work was suspended because of the rebellion of the moors and four years later Luis died with no successor. The round courtyard had long served for the storage of stone and marble, as well as tools and equipment for the works, and stonecutters and carvers did the final work on individual pieces there. The building, cut-stone-made, has a square shape and it is 63 meters long with an inscribed circular courtyard in its interior, which resulted in a different, strange and unique floor plan, of very difficult use. The round courtyard is one of the most beautiful constructions of the Renaissance. It is a circle which occupies the center of the building and it is surrounded by a wide portico that has 32 stone-made Doric columns (Fig.2).

### 3. Methodology

There are two main features of this photogrammetric system, the monoscopic identification of points and using convergent photos (Fig.3). The images used are conventional photos taken with digital cameras that have been calibrated to meet the internal guidance and target deformations introduced into the theoretical conical projection of the photographic image. This



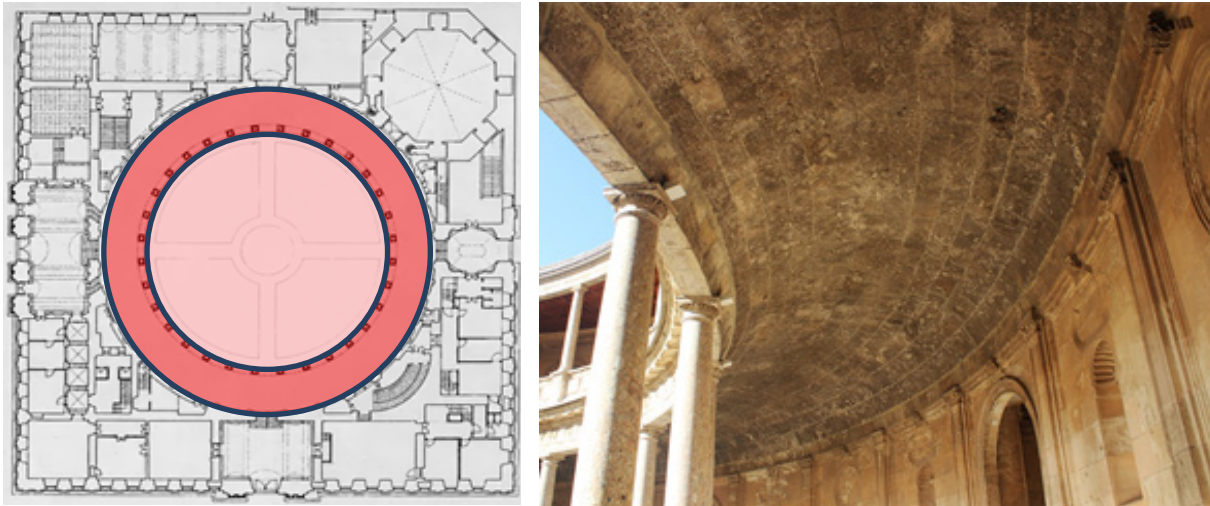


Fig. 2. Location and picture of the ring vault in the courtyard of The Palace.

calibration is now very simple and away from the complex systems used in the past. It is performed using a simple computer program, and involves taking a series of photos of a given plane geometric pattern, usually based on a grid of black and white, and identify its vertices thereon, so that the program compares the actual position on the image with which theoretically should have, he knows and is stored in memory, and this data calculates the equation of radial distortion with two or three parameters and internal guidance.

The process begins directing two photographs, identifying at least five common points. With two oriented photos we will have the coordinates of those points and the identification of homologous points will be aided by the oriented rays, which is that, when a point is identified in an image, on the other appear drawn on the corresponding ray. The error in determining the point of intersection of two lines which depends on the angle cut and is higher the smaller the angle, and decreases as it approaches the right angle. Then this new photogrammetric system, by using cross pictures, can surround the object and cover it entirely with ease and also define the points from more data and therefore more accurately apart from the advantage, already mentioned, of employing cross regarding the crossing angle of homologous ray pictures (Cabezos and Cisneros 2012).

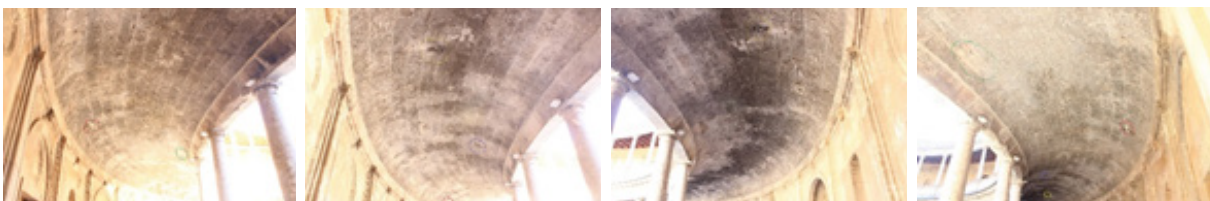


Fig. 3. Convergent images used for the survey.

The precision can contrast reaches easily, just use it to measure a building whose geometry is known or easy to guess. It's very good, with this objective, measure a curtain wall, which it will normally be flat and is strongly modulated and that, given the diversity of shapes, sizes and locations to be found, you can perform from pictures taken at higher or lesser distance and get points that are closer or farther away, which are key variables in relation to the accuracy and we will do according to a procedure that conforms to the usual conditions in which it is employed in the practice of architectural survey.

The software which has been used is PhotoModeler Scanner (Fig.4). The result of the measurement made by the photogrammetric system is a cloud of points that we can export to common drawing programs. This collection of points in principle has no guidance or to give them scale and, in the case of an architectural object, the easier it is to identify a vertical edge and experience a measure taken at the time of taking pictures. These operations guide

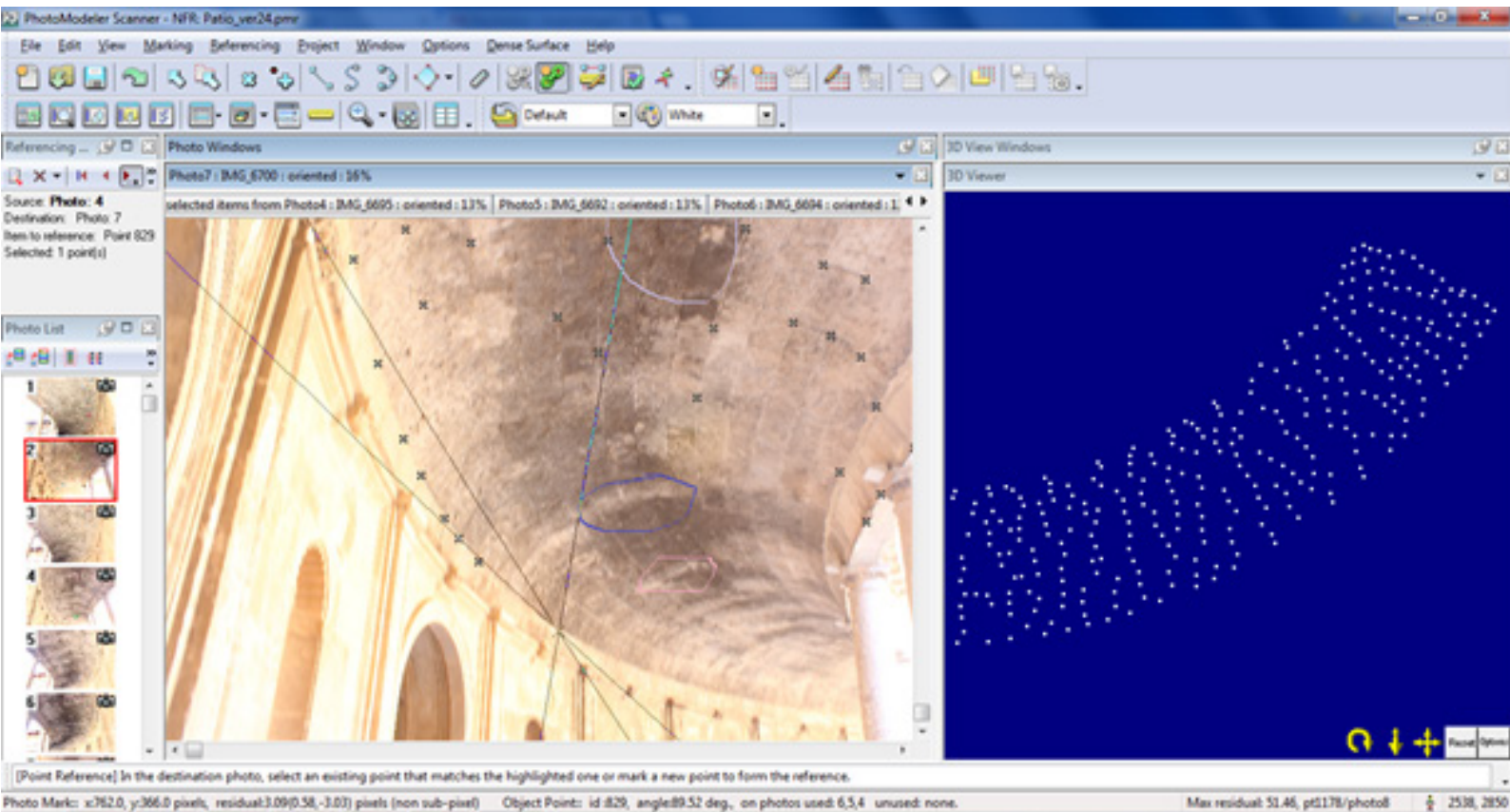


Fig. 4. Photogrammetric process.

and scale the model orders are found in PhotoModeler Scanner but we can also perform once exported to a drawing program, as Autocad or Rhinoceros, and the same applies if one wants to measure a distance. This photogrammetric system is easy to use and does not require special training. Moreover all the instrumentation required is a camera and a computer. Compared to other means of lifting, multi-image photogrammetry offers not only saves time and transport costs considerably but also the possibility of data jacks for occasional travel, and in points to which it is not possible to transport a total station, much less a laser scanner. Just bring a standard photo camera, preferably a digital SLR, and take a series of images to measure a constructive element, provided their morphology allows to define it points; taking a measurement of length you can determine the scale of the studied object (Natividad 2012).

#### 4. Results

The result of the photogrammetric process is a cloud of approximately 246 points (Fig.5). After the appropriate treatment with the software mentioned before, the final result consist on plans and sections that represents the shape and the quartering of intrados surface (Fig.6). This graphic documentation could be used in the future for constructive and geometric analysis.



Fig. 5. Clouth of points obtained with Photomodeler Scanner

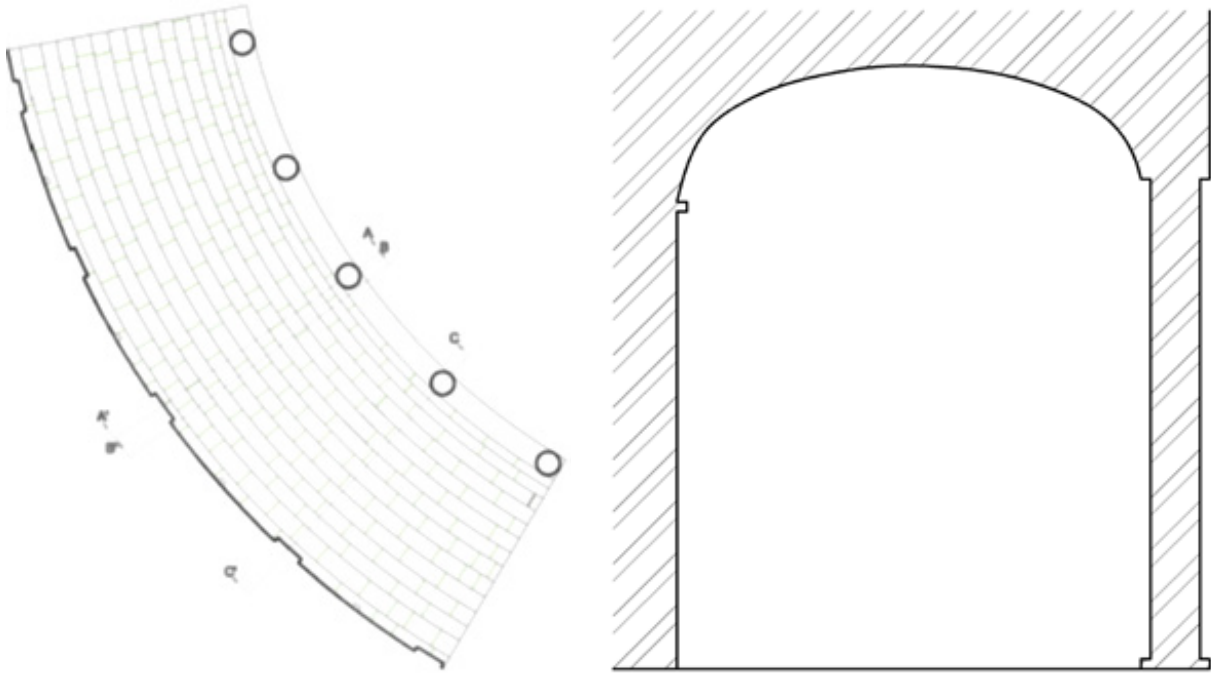


Fig. 6. Plan and section of the surveyed sector of the ring vault

## 5. Conclusions

Photogrammetry does not just help in architectural survey but it also helps in the research of ancient monuments. We can get to know the construction methods of the elements made in the past and the real shape of the element we are analyzing. The stonecutting method explains the type of process used in the construction for constructing the element, whereas the photogrammetry shows the type of construction and the shape of element. This method is more useful to unveil the historical construction methods and the geometry and shapes of the elements.

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ATTARWALA MUSTAFA MUDREKA

*This was the first experience of any research work done in my life. So it was very interesting for me to do a different kind of work. This opportunity we got in a different country having a different approach towards architecture and having different methods. The people, the culture, the atmosphere was different. It was a new feeling in a new place doing a completely different work which we hadn't done before.*

*The research work needed us to learn some new software which we weren't aware of before, it gave us some new techniques and technology for the work and methods that we take with us. It gave us exposure to new how to work fast with these new software. My tutor, Macarena Salcedo Galera, helped us in as many ways as possible to make the research a good research by using different software and techniques. By completing the research work I knew that the important thing about the research is detailing. The more you concentrate on the details of the research work the better it gets. The research work is not done single handedly we need some help from others in one way or the other. So from my point of view I see research as a group work but done individually.*

*The tutors were very good in teaching, they were very friendly and helpful not only in academics but they helped us in planning the trips to travel to different places. From the very first day I had an experience that the people of Spain are very helpful. Most of the people here are very friendly, kind and helpful. It was great working with the Spanish people in my life. It was a lifetime experience. I am very happy to have worked UPCT which is a very good institute in a very good city. I hope to work with some Spanish people again in my life, if I get a chance. Thank you for all the things you taught us and all the help and support you gave us in our stay in Cartagena.*

*Thank you*

## The Palace of Charles V in Granada. Survey of the pointed lunettes in the crypt

Macarena Salcedo Galera  
José Calvo López  
Chandni Bhailalbhai Daxaben Patel

### Abstract

This paper describes a survey of the pointed lunettes located in the crypt of the Palace of Charles V in Granada carried out using convergent multi-image photogrammetry, in order to study its geometry and define its construction processes. Photogrammetry is increasingly becoming a widely used architectural heritage surveying method. This technique is specifically suitable for geometric and stereotomic analysis of masonry pieces.

### 1. Introduction

Although Renaissance architecture was originated in Italy, in Spain it was executed using different construction methods. While Italian vaults are usually built in brick, during the Spanish Renaissance the use of ashlar masonry was widely extended. As a result, there are in Spain many vaults and interesting pieces that were built using this construction technique from the 16th century onwards. Some of the most relevant examples of these vaults were built in Granada, where this new artistic trend was gladly welcome and applied to representative buildings like the Cathedral, or the iconic Palace of the Emperor Charles V beside the Alhambra. It is mainly in this Palace where we can find a wide range of masonry pieces, like the big annular vault in the courtyard, the small arches in the doorways, or the pointed lunettes in the crypt vault.

At this point, architectural surveying plays an essential role, as it is the only way of getting the real geometry, that is, the real shape and measures of the object under study. Architectural surveying can be carried out by different methods, as 3D scanning, topographic techniques, or photogrammetry, choosing the one that best fits the work depending on the purpose of the survey. In this paper we have obtained the surveying of the pointed lunettes of the crypt in the Palace of Charles V in Granada thanks to photogrammetric methods in order to analyse its geometry and define the execution processes that were carried out during its construction.

In addition, this geometric and constructive study based on photogrammetric surveying, may help to identify the historical facts and artistic influences that might have been involved in the construction of the mentioned vault. And, what is more, it may help to compare the results obtained from the solutions explained in the studies and stereotomic manuscripts.

### 2. The Palace of Charles V in Granada and its pointed lunettes

The palace of Charles V is situated inside the Nasrid fortification of Alhambra, Granada, Spain (Fig.1). This palace was the first High Renaissance building outside Italy. Its architect was Pedro Machuca, was a painter, trained in Italy from where he returned to Spain in 1520. The Palace's design begun in 1527, and construction started in May 1533. Its square exterior encloses a two storied circular courtyard with superimposed Doric and Ionic orders. The

conception of the round court and the quadrangle is typical of Italian houses. The first project approved for construction on the Alhambra was not the new palace itself, but the suite of six small rooms on the northern rim of the old palace. They were called “new rooms” in the large royal Palace plan. These rooms were built on the outer edge of the descending garden directly north of the hall of the two sisters. The plan of the palace is a 17 meter high, 63 meter square containing an inner circular patio.



Fig. 1. Picture of the Palace in the fortification of Alhambra.

The construction of the new palace must have started by May 1533, when funds from a new five-year budget became available. The work accomplished during the first four years of construction can be deduced from the state of the building in the late 1530s. The first bearing walls of the palace raised by Machuca were those of the south wing and its façade was the first faced in sandstone. Charles V Palace has Renaissance Architectural style which is based in roman architectural style. It was designed in 1527 and construction begun in 1533. It has a large number of stereotomic singular pieces, which demonstrate the mastery of masonry techniques in Spain. One of these particular pieces is the pointed lunettes in the crypt (Fig.2), built in 1538, during the period in which Pedro Machuca was in charge of the works (Rosenthal 1985).

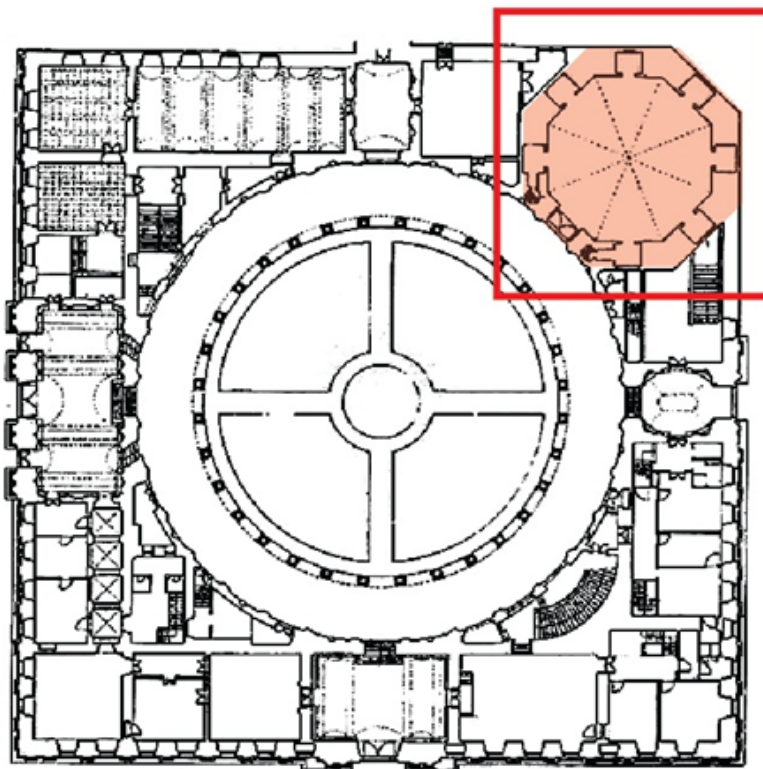


Fig. 2. Location of the the crypt in the Palace.

### 3. Methodology

The images used are conventional photos (Fig.3) taken with digital cameras that have been calibrated to meet the internal guidance and target deformations introduced into the theoretical conical projection of the photographic image. The process begins directing two photographs, identifying at least five common points. With two oriented photos we will have the coordinates of those points and the identification of homologous points will be aided by the oriented rays, which is that, when a point is identified in an image, on the other appear drawn on the corresponding ray. The error in determining the point of intersection of two lines which depends on the angle cut and is higher the smaller the angle, and decreases as it approaches the right angle. Then this new photogrammetric system, by using cross pictures, can surround the object and cover it entirely with ease and also define the points from more data and therefore more accurately apart from the advantage, already mentioned, of employing cross regarding the crossing angle of homologous ray pictures (Cabezos and Cisneros 2012).



Fig. 3. Picture of the pointed lunettes in the crypt.

The software which has been used is PhotoModeler Scanner (Fig.4). The result of the measurement made by the photogrammetric system is a cloud of points that we can export to common drawing programs. This collection of points in principle has no guidance or to give them scale and, in the case of an architectural object, the easier it is to identify a vertical edge and experience a measure taken at the time of taking pictures. These operations guide and scale the model orders are found in PhotoModeler Scanner but we can also perform once exported to a drawing program, as Autocad or Rhinoceros, and the same applies if one wants to measure a distance. This photogrammetric system is easy to use. Moreover all the instrumentation required is a camera and a computer. Compared to other means of lifting, multi-image photogrammetry offers not only saves time and transport costs considerably but also the possibility of data for occasional travel, and in points to which it is not possible to transport a total station, much less a laser scanner (Natividad 2012). Just bring a standard photo camera, preferably a digital SLR, and take a series of images to measure a constructive element, provided their morphology allows to define it points; taking a measurement of length you can determine the scale of the studied object.

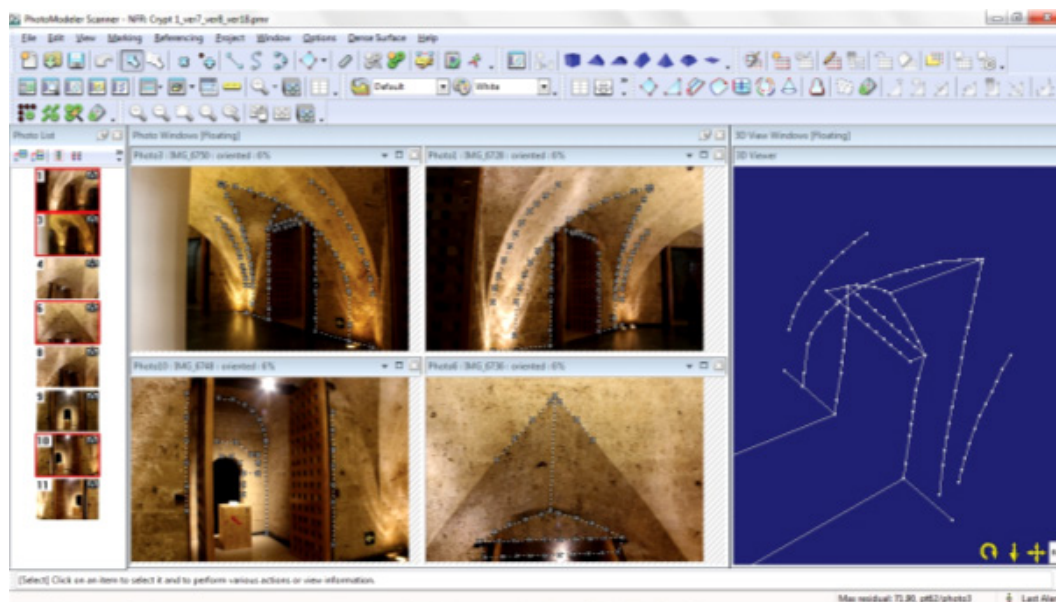


Fig. 4. Photogrammetric process.

#### 4. Results

The result of the work is a cloud of points (Fig.5) obtained with Photomodeler Scanner. This cloud of points has been managed with Cad software like Autocad or Rhinoceros, to obtain a 3D model (Fig.6). This is the first step to obtain a graphic documentation of the object and, in the future, continue the research studying its geometry and construction.

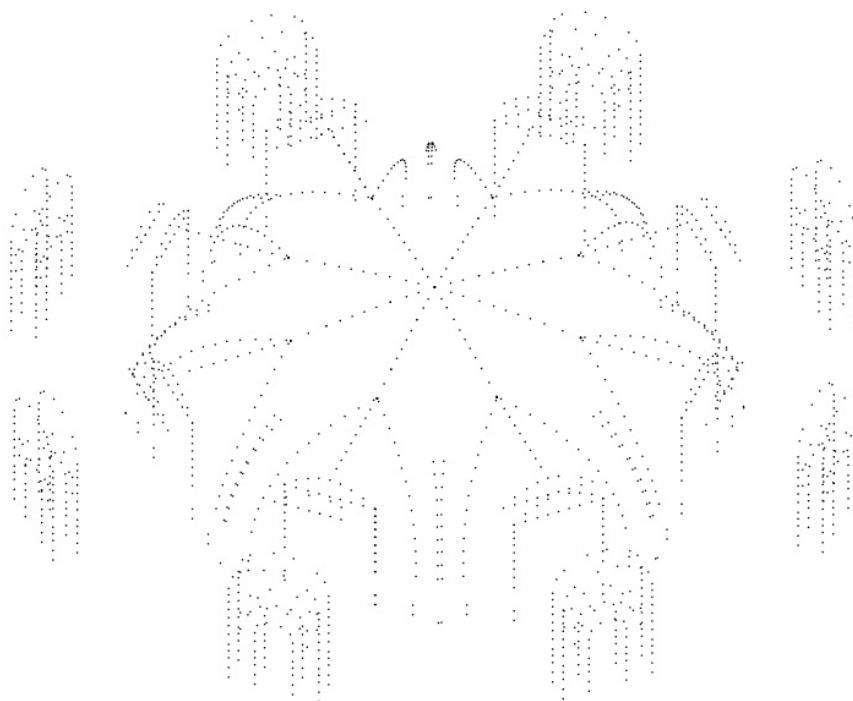


Fig. 5. Clouth of points obtained with Photomodeler Scanner



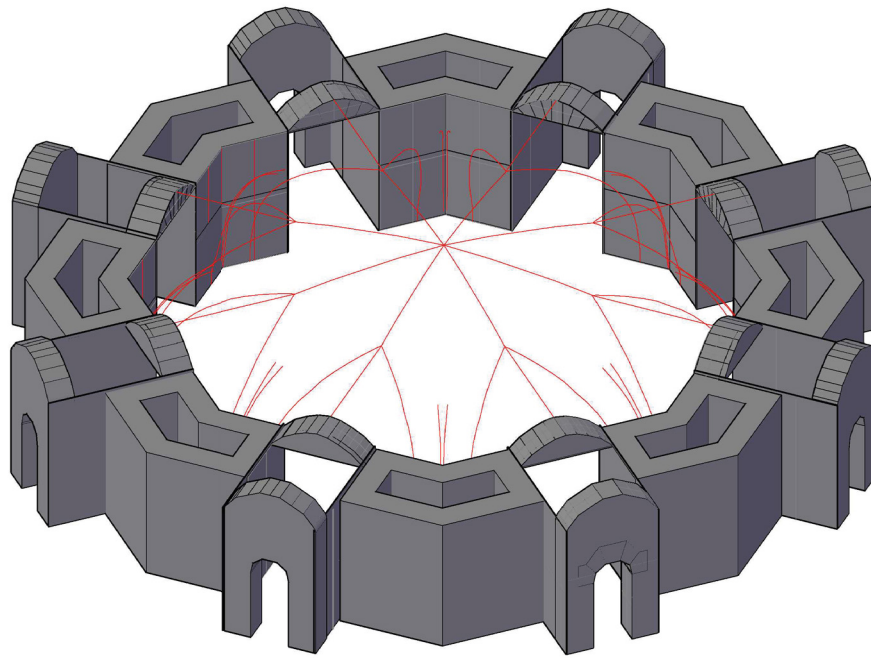


Fig. 6. 3D model of part of the crypt.

## 5. Conclusions

Photogrammetry is a helpful tool in the research of ancient monuments. We can figure out the methods of the constructions built in the past and the real shape of the element we are analyzing. The stonecutting method explains the type of process used in the construction for constructing the element, whereas the photogrammetry shows the type of construction and the shape of element. This method is more useful to unveil the historical construction methods and the geometry and shapes of the elements.

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Hello , Everyone..

- I would like to share my completely new experience about my research work which I haven't done before till now. I have heard many times that people do research about some topics and I have been always thinking that what they do in research. And now I have got chance to come to UPCT, Cartagena , Spain and to do research about Architectural topics.

- I have been working with Prof. Macarena Salcedo Galera and Prof. José Calvo López. They made me understand how research work should have done and how to do research step by steps. Research has been started with the lectures and presentation about my research topic which was given by them. I have been working on an Architectural Element 'Pointed Lunettes', which is located in Palace of Charles V, Alhambra, Granada, Andalucía, Spain. My tutors were always there at each and every step to lead me forward with proper knowledge. I have been taught about Construction methods of Spain, Stone cutting and Materials. After that I have been introduced to my topic of research And for that research I had to learn two software which are ' Photo modeller scanner ' and ' Rhinoceros '. Software were taught by the tutors and we started working upon Pointed Lunettes. I have been Researching upon Architectural Graphics Expression. Which includes, - Survey techniques and Representation of Architectural heritage , - Geometric analysis of masonry pieces , - Renaissance architecture in Granada Stone building in Renaissance .

- The research is based on the Pointed Lunettes in the Chapel Crypt of the Palace of Charles V. These lunettes are made up of stone. The geometry of the lunettes has been analyzed by the help of the software photo modeller scanner. This software makes analysis happen very easily. With help of just few pares of photographs we are able to make a 3D model. And this 3D model is being analyzed for the shape and geometry of the element we are analyzing. The photogrammetric not just helps in architectural survey but it also helps in the research of ancient monuments. We can get to know the construction methods of the elements made in the past and the real shape of the element we are analyzing. The stonecutting method explains the type of process used in the construction for constructing the element, whereas the photogrammetric shows the type of construction and the shape of element. This method is more useful to unveil the historical construction methods and the geometry and shapes of the elements.

- By doing this research it is found that the shape of the lunettes resembles to the shape creates with Circles & Ellipse. This shows the stability of the shape used in the lunettes in Crypt. The shape of the Chapel crypt is octagon. The Above chapel is supported by the lunettes & dome. The lunettes plays structural & aesthetical role at the same time.

- It's been wonderful journey till 6 months ( February 2015 to August 2015 ) in UPCT, Cartagena, Spain with Professors. Accept the Research, we have shared many thoughts and shared many cultural knowledge about Spain and India. This journey will be always stay fresh and amazing to remind it. I would like to come again to Spain and to work with new Architectural projects. And to meet UPCT and it's Professors. Thank you very much to always supporting and Encouraging me. Also I would like to invite to VNSGU, Surat , Gujarat, India. Thank you so much for you warm welcome in UPCT, Cartagena, Spain.



CHANDNI BHAILALBHAI DAXABEN PATEL

## The Palace of Charles V in Granada. Survey of the Vault in the East Hall

Macarena Salcedo Galera  
José Calvo López  
Anand Kalpeshbhai Shah

### Abstract

This Research paper focuses on the survey of the vault that covers the East Hall of the Palace of Charles V in the Alhambra of Granada, in order to study some aspects of its construction and geometry. Convergent multi-image photogrammetry is the tool that has been used to carry out the survey of the studied object, as this technique is specifically suitable for geometric and stereotomic analysis of masonry pieces.

### 1. Introduction

Although Renaissance architecture was originated in Italy, in Spain it was executed using different construction methods. While Italian vaults are usually built in brick, during the Spanish Renaissance the use of ashlar masonry was widely extended. As a result, there are in Spain many vaults and interesting pieces that were built using this construction technique from the 16th century onwards. Some of the most relevant examples of these vaults were built in Granada, where this new artistic trend was gladly welcome and applied to representative buildings like the Cathedral, or the iconic Palace of the Emperor Charles V beside the Alhambra. It is mainly in this Palace where we can find a wide range of masonry pieces, like the big annular vault in the courtyard, the small arches in the doorways, or the pointed lunettes in the crypt vault.

At this point, architectural surveying plays an essential role, as it is the only way of getting the real geometry, that is, the real shape and measures of the object under study. Architectural surveying can be carried out by different methods, as 3D scanning, topographic techniques, or photogrammetry, choosing the one that best fits the work depending on the purpose of the survey. In this paper we have obtained the surveying of the vault of the East hall of the Palace of Charles V in Granada thanks to photogrammetric methods in order to analyse its geometry and define the execution processes that were carried out during its construction.

In addition, this geometric and constructive study based on photogrammetric surveying, may help to identify the historical facts and artistic influences that might have been involved in the construction of the mentioned vault. And, what is more, it may help to compare the results obtained from the solutions explained in the studies and stereotomic manuscripts.

### 2. The Palace of Charles V in Granada and its oval vault

The palace of Charles V was built in a renaissance period in Alhambra, Granada, Spain (Fig. 1). It is of equal interest to historians of both Italian and Spanish renaissance architecture, as it is a monumental extension to the Alhambra in Granada. The Architectural style decided by Emperor Charles V was 'Roman style' as he was influenced by the Governor of the Alhambra and Captain General Luis Hurtado de Mendoza at that time. Originally the palace was designed by Architect Pedro Machuca (Rosenthal 1985). The palace includes blocked-design plan of residence with a portico round courtyard that belongs to the Renaissance style of architecture in Italy and organization of the courtyard which includes types of roman columns which belongs to the Roman Architectural style of roman empire period.

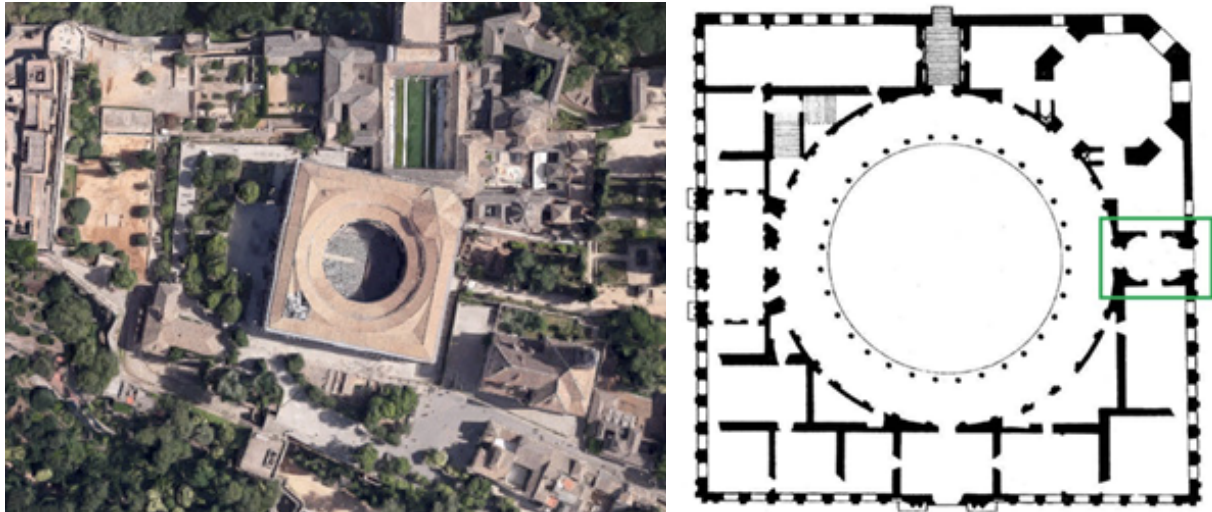


Fig. 1. Location of the Palace and the East Hall.

So, Charles V Palace has Renaissance Architectural style which is based in roman architectural style. The palace of Charles V designed in 1527 and Construction begun in 1533. It has a large number of stereotomic singular pieces, which demonstrate the mastery of masonry techniques in Spain. One of these particular pieces is the oval vault (Fig.2), which covers the East hall of the Palace. Although it was built in 20th century during the restoration of the palace, it apparently follows the model made in May 1621, and therefore, was built with renaissance masonry construction techniques. It is not a big piece, but has some value when talking about stereotomy, mainly because of its original geometry. Although it has been called “oval vault”, it does not seem to be so. The most probable option is that the vault has been configured by the combination of two kinds of vaults: a central barrel vault topped by two half-domes in the extremes. It becomes especially interesting if we take in consideration the fact that this complete solution is not discussed in the treatises and manuscripts of the period. Anyway, the aim of this study is to solve this discussion by proving its actual geometry.



Fig. 2. Oval vault in the East Hall.

### 3. Methodology

The architectural survey can be defined as the set of tasks performed for obtain graphic documents and study that represent an architectural object, based on the data, and the method used to carry out the survey is multi-image photogrammetry, or convergent images photogrammetry. Photogrammetry is a useful tool to analyze and study stonework in construction. In this research paper, surveys have been conducted aimed primarily determine the formal, constructive and dimensional arrangement of elements in a particular form of the vaults which is the main aim of this study (Natividad 2012).

Photogrammetry is a professional tool for generating accurate measurements and models of the real world from pictures (Fig.3), and could be defined as the science of obtaining reliable information about the properties of surfaces and objects without physical contact with the objects, and of measuring and interpreting this information. The software which has been used is Photo-Modeler scanner, which is a software for measuring and modeling real world objects and scenes through the use of photographs. This working methodology is based on photo-modeler scanner software to obtain convergent photos of the studied object with conventional digital cameras and make photogrammetric methods available to any person interested in obtaining good accuracy metric data from photographs.



Fig. 3. Convergent pictures used for the survey.

The two main features of this photogrammetric system are the monoscopic identification of points and the use of convergent photos. The images used are conventional photos taken with digital cameras that have been calibrated to meet the internal guidance and target deformations introduced into the theoretical conical projection of the photographic image. This calibration is very simple, away from the complex systems used in the past. Once strategically made the pictures, using the focal length for which it has been calibrated two by two each other and all together will be targeted, for which enough to identify a number of common points (Fig.4), to stay away from define a plane, and the program automatically performs guidance using least squares fit so that the end of this process a single block is obtained with all oriented pictures (Cabezos and Cisneros 2012).

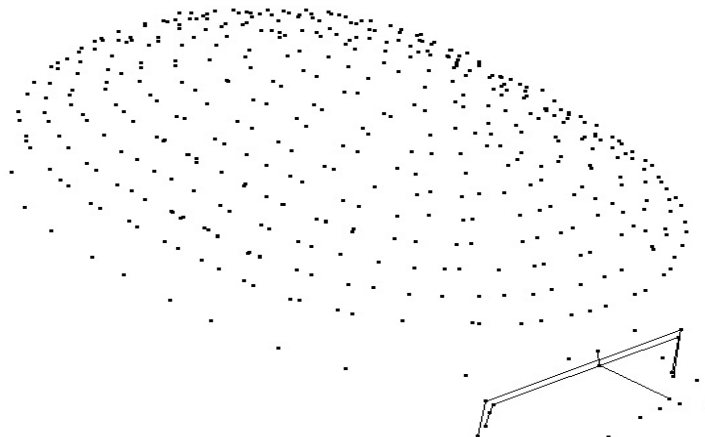


Fig. 4. Cloud of points obtained with Photomodeler Scanner.

#### 4. Results

The objective of the survey is to generate a graphical documentation (Fig.5) from which to address the formal and constructive study of the vault and seeks to define the cutting geometry of the vault (Fig.6). The result is a cloud with 500 points approximately. After proper treatment with the corresponding programs on computer, the final result is a model depicting the three-dimensional shape and perimeter. A three-dimensional survey greatly facilitates formal study and construction, and allows to generate all two-dimensional plans and other required drawings.

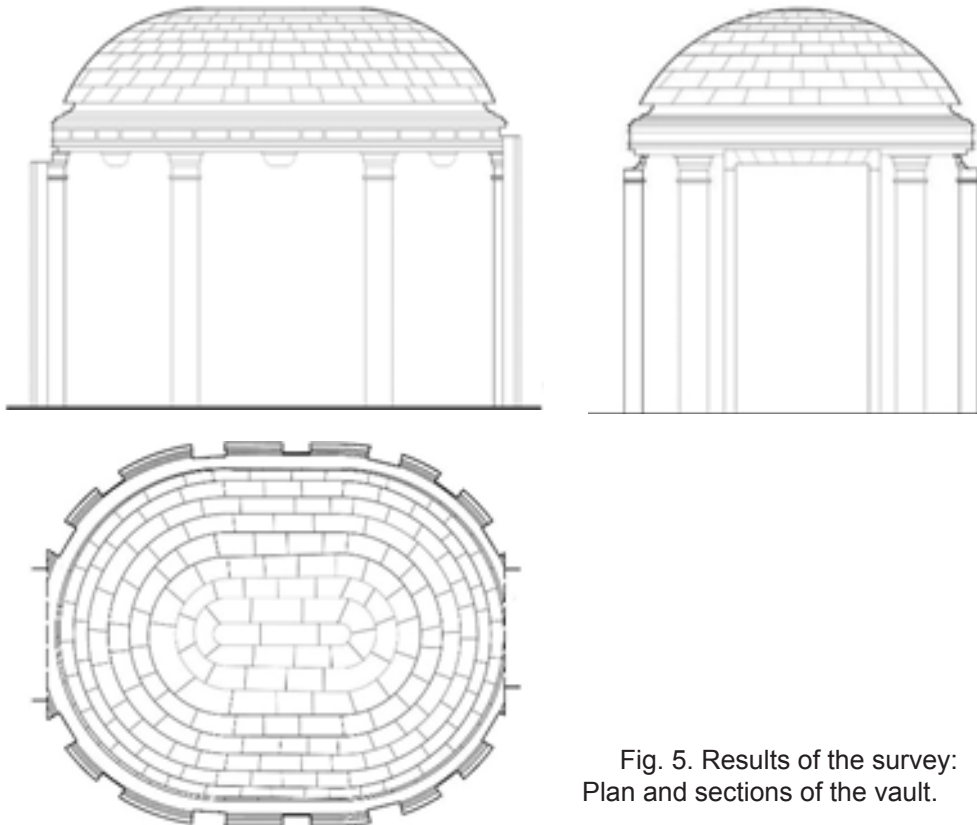


Fig. 5. Results of the survey:  
Plan and sections of the vault.

#### 5. Conclusions

This research helps not only for architectural issues, but also for historians researches, as it helps to know more about way of construction in the past. The construction process is as shown as in the diagram (Fig.7) that in a successive courses of stone the middle vault and both sides half semicircular domes are constructed with the mortar or binding material joint between all stones connected to each other. The diagram in figure shows the cutting and making of the each block with its complex shape and curves. Stonemason have to cut each stone in a manner that it suits to next stone and make this complex elliptical vault as the real scale drawings and templates. The construction process followed here is the local masons method in that time from Renaissance time of construction.

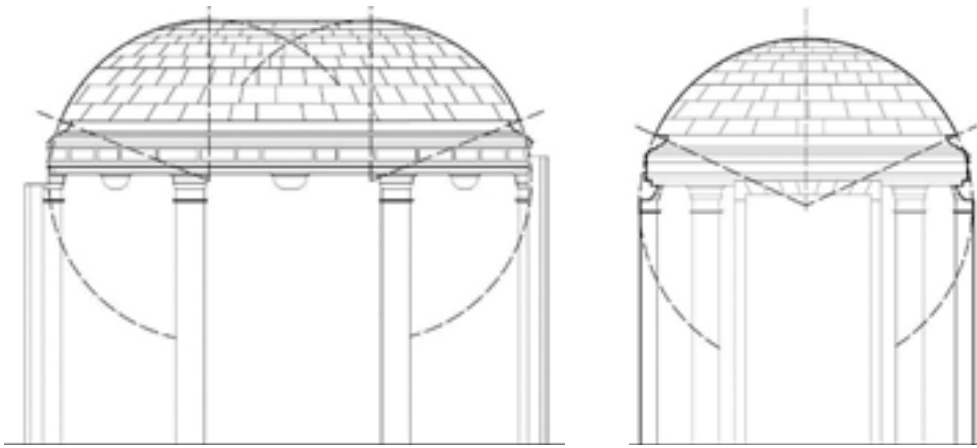


Fig. 6. Geometric analysis of the vault.

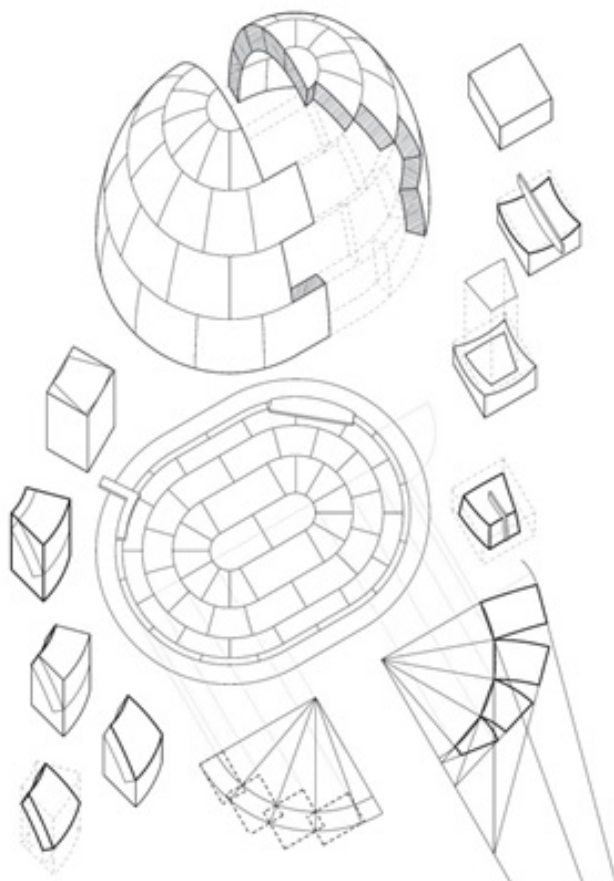
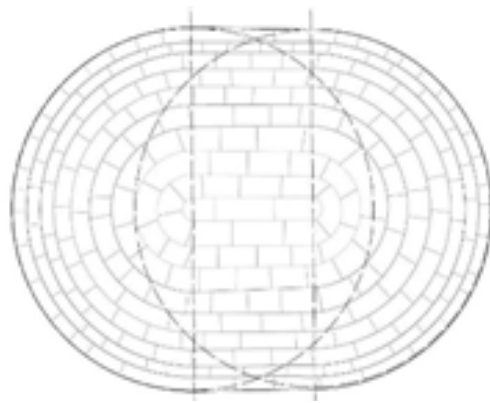


Fig. 7. Construction hypothesis of the vault (Calvo et al., 2005)

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### ***A experience - A journey***



ANAND KALPESHBHAI SHAH

*It is very grateful opportunity For me, an Architectural student from India, to learn about some aspects or expression of architecture and construction of Spain, in Spain. It is a perfect way of student exchange program to convey and exchange of knowledge between the countries- India and Spain, which are equally important and rich in their own architecture by of student exchange program.*

*My interests and achievements here are like, to learn Spanish language, architectural seminar and classes, exhibitions and presentations, working experience as an research intern at UPCT and architectural intern at architectural firm in Spain and gaining practical knowledge in architecture, to live independent and mature, to make more friends and grow contacts, visit different European cities and experiencing a different kind of culture and lifestyle and new approach to the architecture which are also turned into a lifetime memories.*

*My research at UPCT, Spain is on analysis of Renaissance Masonry in the Palace of the Emperor Charles V in the Alhambra of Granada-The Oval Vault in the East side. Probably, now i can say that in my research paper, the main emphasis is on a element-oval vault in the same palace and it's analysis techniques, software to develop accurate 3D model and it's architectural drawings, data about history and real construction and theoretic facts on the same which is positively conveyed by my director of our research at UPCT.*

*I found my research program not only interesting but also a step to learn other things like, software, construction techniques, documentation techniques, information collection techniques, also how to deal with professional camera. Here for me, The most interesting and effective part for a research is the part of gathering information for betterment of my study and documentation for proper drawings the element or building and it is also very informative to visit such marvelous structures on which the research topic is based. It was a great experience to explore Alhambra, Granada, Spain as a site of research and at a same time Granada as a European city with it's rich culture with it's other adjacent cities.*

## Implementation Urban Sustainability indicators for small and medium cities, on a 40's social housing neighborhood in Murcia, Spain

Patricia Reus  
Gangani, Hardik  
Dudhat, Shreya

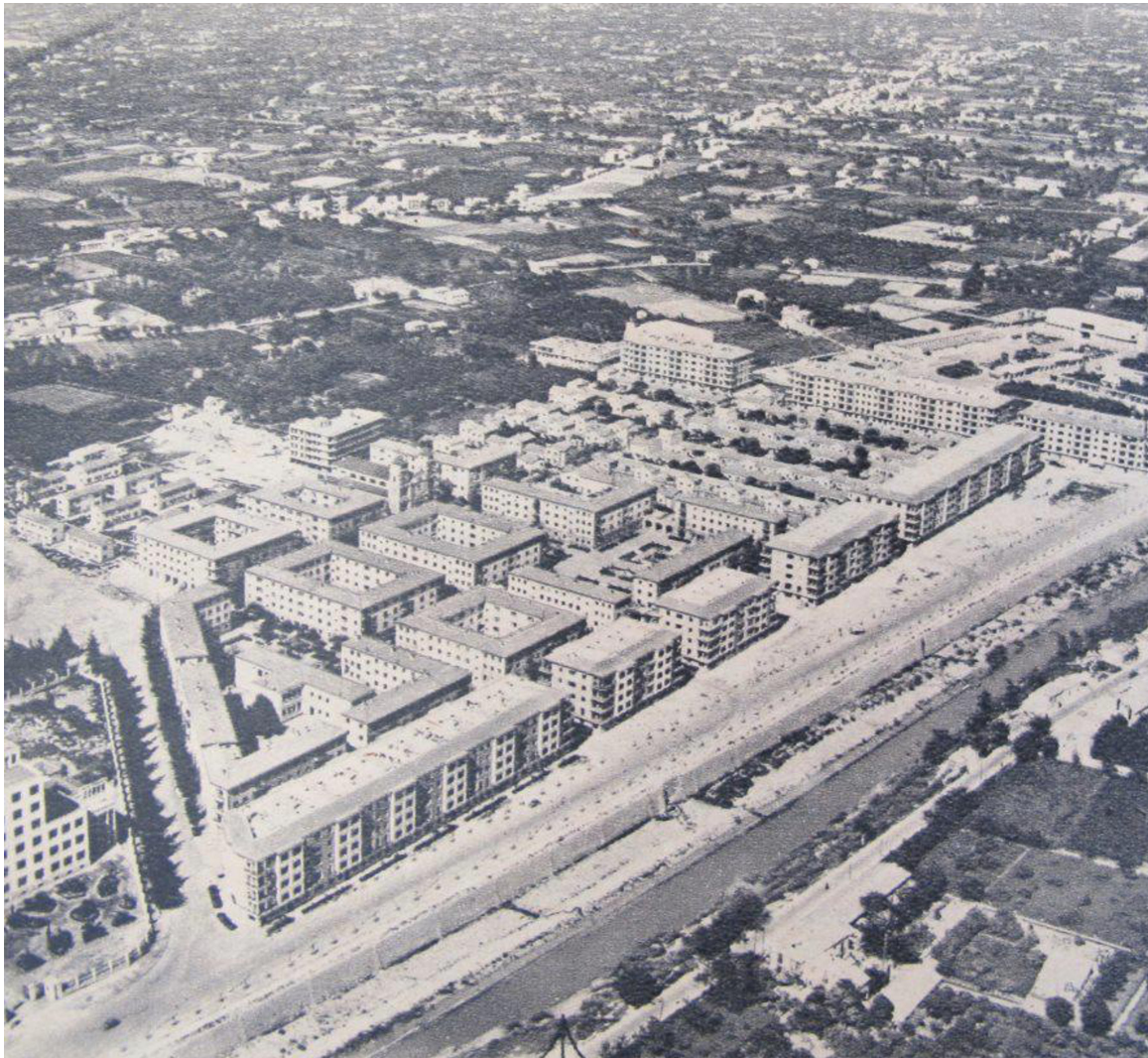


Fig.1. Vistabella, 1952. Regional flight

### 1. Introduction

The purpose of this research is the neighborhood of Vistabella in Murcia, Spain. This unique urban unit, located in the eastern part of the city was built between 1943 and 1957. Designed as a small village within the town, has proven to be, 60 year later, perfectly valid, with only minor modifications, in adapting to the need of very committed and particularly pleased with the quality of life in neighborhood society.

Developed in three phases: the first consists on terraced houses. Later, Daniel Carbonell, finished the set modifying the original planning.

The project has two peculiarities; on the one hand a beautiful landscaping and on the other, a populist decoration with details that recover the city center forms.



Fig.2. Federico Servet square, 2014. Pedro J. Pacheco

This urban unit was built after the Civil War as a symbol of the falangist utopia for a close to the government population.

Conceived as an autonomous urban organism in the outskirts of the city, 60 years after Vistabella has just undergone structural modifications to its inevitable physical renovation; While urban growth has enriched the response to daily activities and metropolitan character with new equipment and connections.

The theoretical framework of the research is the social critique of urbanism that did Lefebvre in his book "*La production de l'espace*"<sup>1</sup> (1974). Urban form, as container of everyday life, is an element of domination or enhancement of man in his constant quest for freedom.

The hypothesis of this research is that the urban morphology has some responsibility for the fact that over time Vistabella has gone from being a neighborhood inhabited by a social majority in close proximity to ultra catholic nationalism, to serve as the scene for a population particularly attached to their neighborhood environment , active and progressive. In fact, in its streets and squares it has gestated part of the constitutional process that has taken the concerns of the citizens' movement emerged 15M to the ballot boxes<sup>2</sup>.

*Vistabella will lead Murcia, a city that needs to reinvent*<sup>3</sup>

1 Lefevre, Henri (2013). *La production de l'espace*. Madrid: Capitán Swing.

2 The municipalist candidate ("*Ahora Murcia*") to the City Hall, in the elections of May 24, 2015, has been the president of the Neighborhood Association of Vistabella, the regional government candidate from "Podemos" and many of the people who accompanied them are Vistabella neighbors.

3 Speech by Professor Francisco Jarauta in the close of "*Ahora Murcia*" elections campaign May 22, 2015.

TUTOR: Patricia Reus Martínez; STUDENTS: Shreyaben Mavjibhai Dudhat; Gangani Hardik Mukesh

Faithful to the postwar political thought, the draft tried to build an appropriate scene for an idyllic ultraconservative community which was born in the privacy of home and was embodied in a radiant society, guarded by God and by the neighbors. In this framework, designed as a radical utopia, now social life is enriched with heterogeneities and contingencies which require the individual to an ongoing mediation and recognition of others, besides the context allows the daily emancipation and socialization.

Today Vistabella fulfills the Jane Jacobs's words:

*People smile in the street, and feels safe mainly because of the dense network of controls almost unconscious and reflections of voluntariness and willingness inscribed in the mind of people and constantly fed by themselves<sup>4</sup>.*



Fig.3. Federico Servet square, 1953. Antonio Gabarrón Archiv.



Fig.4. Federico Servet square, 2015. Ángel Ruiz

## 2. Methodology

The goal is to identify the distinctive features of urban form that have influenced the current success of the neighborhood understood the obvious success as the vitality, commitment and quality of life of the people who inhabit it.

To perform this identification we have applied of the *Indicators of urban sustainability for small and medium cities<sup>5</sup>* developed by the Network of Sustainable Local Development Networks, which have to do with the urban morphology.

These parameters have been complemented, in followings researches, with approaches such as those used by humanists and gender approximations putting particular emphasis on the everyday life.

<b>Bcn-ecology_</b>
Land Occupancy
Public Space And Habitability
Mobility And Services
Green Space And Biodiversity

Table 1. Parameters

<sup>4</sup> JACOBS, Jane. (2011) *Muerte y Vida De Las Grandes Ciudades*. primera ed. Madrid: Capitan Swing

<sup>5</sup> RUEDA, Salvador. & AGUADO, María Dolores. (2012) *Guía Metodológica para los sistemas de Auditoría, Certificación o Acreditación de la Calidad y Sostenibilidad en el Medio Urbano*. Madrid: Ministerio de Fomento

### 3. Results

The results obtained from the application of the evaluation system described are shown schematically.

These results demonstrate the high quality of life offered by the district in general terms while drawing attention to the lack of infrastructure for sustainable mobility, hence the lack of off-street parking and cycle paths.

INDICATORS AND CRITERIA IN EXISTING FABRICS (BCN ecology)			
LAND OCCUPANCY	A.01 Use Intensity	A.01.01 Residential Density	ok
		A.01.02 Absolute compactness	ok
		B.01.01 Corrected Compactness	ok
PUBLIC SPACE AND HABITABILITY	B.01 Public Space Structure	B.01.02 Staying space per Inhabitant	X
		B.02.01 Road Space For Pedestrian	ok
	B.02 Habitability of Public Space	B.02.02 Proportion of The Street	ok
		B.02.03 Visual Perception of Urban Green	X
		B.02.04 Road accesibility	ok
		B.02.05 Proximity to basic services	ok
		C.01.01 Proximity to alternative transportation networks	X
	C.02 Infrastructure	C.02.01 Proximity to Bicycle Parking	ok (no safety net to the parking point)
C.02.02 Off Road Car Parking Space		X	
C.02.03 Car Parking Space		X	
C.02.04 Bicycle Parking		ok (no safety net to the parking point)	
MOBILITY SERVICES AND	C.01 Network settings	C.01.01 Proximity to alternative transportation networks	X

GREEN SPACE AND BIODIVERSITY	D.01	D.01.01	
	Urban Green Structure	Green Space Per Inhabitant	ok
		D.01.02	
		Simultaneous Proximity to Green Space	ok
		D.01.03	
		Density Of Tree	ok

Table 2. Results

#### 4. Discussion

This research has tried to observe the neighborhood looking for morphological reasons that help us to explain the current Vistabella´s reality.

The application of the system of urban sustainability indicators has shown a number of issues.

The first has to do with the system itself, when we applied it, we can see that the reference values can't be putted into context, something clearly needed. In our case there are two of them, the one that measures *per capita* living space and perception of urban green that do not meet the minimum set. But in reality, for a local citizen, Vistabella is a garden city, as it is popularly known, because Murcia has an arab tradition where is better understood the content space than the large parks and squares from other areas. So it seems clear that the values set as optimal must be adjustable according to the size of the city, its location and even the culture to which it belongs.

On the other hand the study of the results does allow us to highlight the clear need to invest in alternative transportation networks, beginning from offering a safe and efficient network of cycle paths. In this district we see the paradox that there are sufficient parking spaces for bicycles but the use of them is dangerous and therefore its use is not encouraged, thus improving transport in terms of environmental impact but also given as the opportunity to save time in our day to day.

#### 5. Conclusions

There citywide formal features that encourage the exit of the current neighborhood :

- The proper disposal of relationship spaces.
- Allows mixed use.
- Have a sufficient density to ensure the critical mass that makes viable proximity services.
- The accessibility and convenience of the pedestrian routes.
- The proximity of supply activities and basic services.
- The good relation to the rest of the city.

The investment needs evidenced by these results are:

- The implementation of a safe bike network of path that connects the district with the rest of the city.
- The provision of parking off the road to free the public space from the presence of cars.



GANGANI HARDIK MUKESH

*Hola, I am Hardik Gangani. It was very exiting work for me because the site was 60 year old and a sustainable one. This was the first research I was doing on a live site. I have done some literature research in India.*

*My research on based on calculating sustainable indicators for small town or small cities. I worked on site for the analysis and documentation for the research work. I visiting Murcia to talk to people of “ Vistabella ” and it was pleasure going several time and each time it was a wonderful experience and specially people were very helpful. It was a different experience travelling in different country.*

*My tutor, Ar. Patricia Reus, was very helpful, friendly and very beautiful person. I learned a lot of things from her which shall be very useful in my future. With our tutor not only shared our architectural experience but also daily chores experience. It was fun working and interacting with Spanish people. The primary thing which I learned from this research work is to apply sustainability on an urban scale.*

*The people of Spain are very kind and helpful. Spain is a beautiful country with lots of beautiful places. It was very difficult to work with Spanish people due to language esue but we manage quite effectively.*

*Thank you “Universidad Politecnica de Cartagena” for giving us an opportunity to work in a different country, different culture, different lifestyle and different people. Thank you all he people for helping us in one way or the other and making our stay very fruitful.*



DUDHAT SHREYABEN MAVJIBHAI

*Talking about our experience in university was really really good. Specially the teachers are very helpfull and also they are so much positive i liked how they were mingled with us in every discussion. Also in the Residence, starting from the Receptionist, cook, every other staff were so welcoming and good with us. I've made lot of friends in Residence, and all are so so good. They all tried really good to show us their culture and it was really fun. And carnival fest, the other parties, we enjoyed a lot there. These were the things which we've nevee seen in India, and it was so nice. Everyone whom I met, were so good and friendly. And also I heartly appreciate your efforts for making us comfortable. Thank you.*



## Comparative Analysis between Gaudí's Buildings and Spanish Contemporary Architecture. A work developed by Kharwar Shivangi y Wadiwala, Puravbhai Bhupendrakumar

Jaume Blancafort  
Shivangi Kharwar  
Puravbhai Bhupendrakumar

### Introduction

What is described below is the work that the students Kharwar Shivangi y Wadiwala Puravbhai Bhupendrakumar from Veer Narmad South Gujarat University (VNSGU), Surat, India, did under my tutoring, meanwhile there were doing the exchange program with Escuela Técnica Superior de Arquitectura de Cartagena (ETSAE), UPCT, Spain.

When they began to work on the subject they had to do a research in the topic: Creative Process in Architectural Design.

From the point of view of architectural practice, and also from the teaching in architectural design subject, it is very interesting to study the processes that involve decision-making to achieve a particular architectural design. We wanted to focus on searching, referencing and analyzing architectural creative processes that have been described and / or studied before. At a first stage we would work on getting an exhaustive electronic literature search and at a second stage we would engaged on analyzing and describing the processes. So the research would seek to improve the architectural design tools focusing on the possibilities of the creative process, based on analysis of previous relevant architecture experience.

But after a couple of weeks of trying to make progress on the issue, we saw that that search represented an excessive difficulty for a non-graduated student, as it is not easy to find literature on the subject and they didn't know the way. So we decided to change the subject of study to focus on something that might be easier to track and also to bring some new knowledge that really motivate students.

The proposal came from the students themselves, and was considered a good idea: To study Spanish historical architecture and look to find traces of these in prestigious contemporary architecture.

Thus it is achieved that the research was focused on the country they were visiting and thus they also had a perfect excuse to know places and architectures of Spain, making their stay a true immersion in the Spanish architecture.

### Topic:

#### **Comparative Analysis Between Contemporary and Traditional Architecture in Spain.**

First they made two lists. One, with buildings considered essential in classical historiography of Spanish architecture, and another with contemporary buildings. The list of the contemporary ones was done by the collection of buildings between the finalists or winners in recent most prestigious awards of the country, ie the Spanish Architecture Biennial, the Spanish Architecture Award, FAD Awards and European Landscape Biennial Awards.

When it was observed the endless and inabastable list of buildings, it was decided to radically limit the boundaries of the research.

There was debate about what was the most interesting issue to study to attempt to do an acceptable work during their stage in Cartagena, by combining with the possibility of on-site viewing and analyzing the more buildings the better.

After new updates and justifications for lists of names of buildings and architects finally agreed that on the subject of "historical" architecture would focus only on one architect. Thus,

the options were largely reduced temporally and geographically.

On one hand, with the advantage that his works were mostly visitable and were mainly concentrated in Barcelona and on the other he was the architect that they knew more, it was decided to study some of the most representatives works of Gaudí, and try to find traces of their influence in contemporary architectures.

About contemporary works it was decided to choose from the list made, especially those that they might be visited on their trips in Spain (Barcelona, Madrid, Granada, etc.) and that their approaches they intuited could be compared with aspects of Gaudí's architecture.

## Methodology

To allow comparisons of value, it was decided to delimit in each of the selected works of Gaudí some partial and specific study fields that students felt as the most characteristic of him and his Mediterranean roots. Thus, in a focused vision it could describe the differences or similarities between the designs made by Gaudí and those of contemporary architects.

Finally they made 3 work lists and by crossing them they would try to find connections: Gaudí's works / Topics for study and comparison / Contemporary Buildings

- Gaudí's works: (Fig.1)
  - Sagrada Familia, Barcelona
  - Casa Milà (La pedrera), Barcelona
  - Casa Batlló, Barcelona
  - Park Guell, Barcelona



Fig.1 - Picture of some Gaudí's buildings datasheets done by Kharwar Shivangi y Wadiwala Puravbhai. Photograph: MuB foto

- Contemporary Buildings:
  - Mercat de Santa Catarina, Barcelona by Enric Miralles and Benedetta Tagliabue
  - Torre Agbar, Barcelona by Jean Nouvel
  - Jaume Fuster Library, Josep Llinàs i Carmona, Barcelona
  - Edificio 111, Ricardo Flores y Eva Prats, Barcelona
  - Between Silence and Light, Michaela Mezzavilla y Roberto Eleuteri, Barcelona
  - Adaptation of Roman Ruins, Montornés del Vallès, Barcelona, by Toni Gironès
  - Espacio Transmisor del Túmulo - Dolmen Megalítico de Seró, Lleida, Toni Gironès
  - Matadero de Arganzuela, Madrid by Iñiqui Carnicero, Ignacio Vila and Alejandro Virseda

TUTOR: Jaume Blancafort Sanso; STUDENTS: Shivangi Kharwar; Puravbhai Bhupendrakumar

- Medialab Prado, Madrid by Langarita-Navarro, Madrid
- Madrid Río, Madrid by Burgos & Garrido, Porras La Casta, Rubio & Álvarez-Sala and West 8
- Museo del Agua, Granada , by Juan Domingo Santos
- Muralla Nazarí en Alto Albaicín, Granada, by Antonio Jiménez Torrecillas
- Museo de la Memoria, Granada, by Alberto Campo Baeza
- Caja Granada, Granada, by Alberto Campo Baeza
- Board Walk Playa Poniente, Carlos Ferrater y Xavier Martí, Benidorm
- The Ring, Cáceres by José María Sánchez
- Spain Pavillion, Zaragoza by Francisco José Mangado Beloqui,
- Cross Walk, Constanze Sixt & Rafael Escobedo de La Riva Architects, Santa Cruz de Tenerife
- Themes and relationships (Fig.2)
  - Pattern: Casa Batlló → Torre Agbar, Santa Catarina
  - Light: Casa Batlló / Casa Milà → Museo de la Memoria, Caja Granada, Edificio 111
  - Remodeling of Existing Structure: Casa Batlló → Matadero Madrid, Medialab Prado, Museo del Agua
  - Response to Environment: Park Guell → The Ring
  - Borrowing From Nature: Sagrada Familia / Park Guell / Casa Milà / Casa Batlló → Museo del Agua, Spain Pavillion
  - Texture: Casa Batlló / Sagrada Familia / Park Guell → Seró, Muralla
  - Proportion: Casa Batlló / Sagrada Familia / Park Guell → Museo de la Memoria, Caja Granada, Seró, Muralla
  - Integrated Landscape: Park Guell → Adaptation of Roman Ruins

Students sought information on the internet and in the library of the University of all the buildings that had been chosen. Then they did some datasheet, in which repeating the methodology and format, they carried out an analysis of each building.

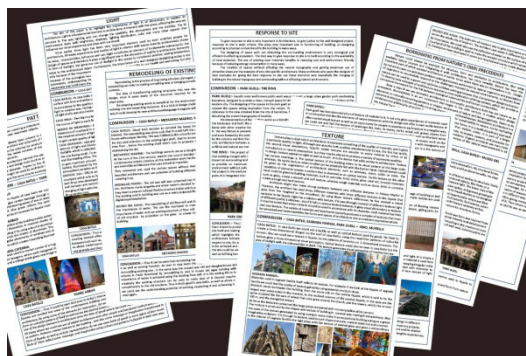


Fig.2 - Picture of some Themes and relationships datasheets done by Kharwar Shivangi y Wadiwala Puravbhai. Photograph: MuB foto

TUTOR: Jaume Blancafort Sanso; STUDENTS: Shivangi Kharwar; Puravbhai Bhupendrakumar

All building datasheets have a similar data structure. A graphical sector where they attached pictures and plans, sections, façades, location plan, etc. and a written sector where they described:

- Name of the building
- Name of the architect
- Location
- Brief memorandum
- Idea and philosophy
- Design features
- Construction and materials



Fig.3 - Picture of some Granada's buildings datasheets done by Kharwar Shivangi y Wadiwala Puravbhai. Photograph: MuB foto

Thus they studied from a descriptive and a theoretical conception the different buildings, from several angles and raised some hypothesis.

With their trips and visits to the buildings, were tested the certainties or the errors of the hypotheses that were made and then these were finally revised to adapt them to the experience of the visited architecture.

### To conclude

Once the students overcame the first stage of uncertainty and they found a way to do their research, they proved to be hard working and serious students.

They have managed to properly combine their research in the University with their architectural trips they have made through Spain. These trips have allowed them to visit and learn more deeply many of the architectural works studied in their research and to acquire certain culture of spatial experience through a broad spectrum of Spanish architecture.

They produced a correct research for an undergraduated architectural student.

They have discovered some not very known curiosities about some of the studied buildings.

His approach from outside the Spanish architecture culture was attractive and could evolve in interesting research projects.



WADIWALA PURAVBHAI BHUPENDRAKUMAR

*My research topic is 'comparative analysis of contrast architecture in Spain'. In my research we studied the Antonio Gaudí's historical buildings of Spain and compare it with some modern buildings of Spain. It is very interesting to learn in the research how the traditional buildings of Gaudí and today's modern buildings similar in some points. The main benefit of this research is to learn so many different buildings with different concepts. This research helps in reaching my imaginative power to another level. Our research professor Jaume Blancafort is very supportive and without him I can't be able to make research to this level. During the time of six months we also travel another European country like France and Italy, so this program also helps in explore the architecture of cities like Paris, Rome, Milan, Venice, Florence other than Spain. During this program we also travel the beautiful cities of Spain like Barcelona, Madrid, Murcia, Granada etc and also explore its architecture. This program is like a boon for me that allows me to be a part of it. In my research and being part of the UPCT, I learn so many things that I can't be able to learn in my whole life if I won't be the part of this program. The city of Cartagena is very beautiful and rich in heritage and this time period of six months is the best memory of my life time. All the professors of UPCT are very helpful. Professor María Mestre is also very helpful and responsive in the whole program.*

*THANK YOU.*

## From projects to architectural spaces

Manuel Ródenas López  
Hastiben Sanjivkumar Parikh

### INTRODUCTION

Project based on an object, that shows 'THE RELATION BETWEEN EVERYDAY SPACE'. The object lead one to create an architectural space, that defines the object. Deciding size of the object is the instinctive decision ; that fit in palm of your hand.

Parameters drawn to choose the objects are its texture, complexity, internal order, geometry or the development procedure. Some objects are organic and its growth series imprints its specificity; some are objects that are transform over time.

This research allows to define a self interesting object and using the parameters for analysis of particular elements that cause a habitable space through a striking change in its scale.

In this project we will try to explore the relationship between everyday life objects and new architectural space proposals. In order to deal with this aim, some methodological graphic procedures will be used such as iteration, transformation, symmetry, twist, taking photos from different phases or states, etc. Introducing the new graphics keys; colour' collage' model' plans' sections' symmetry' transformation, geometry.



### WORK PHASES

The project initials were to find a self interesting object. The object can be organic or inorganic. some objects found during this period were as below:



The objects were mostly inorganic dry seeds and the most interesting object decided to work on the project was the 'KURRAJONG SEED POD', a Mediterranean typical seed fruit.

#### STEP 1:

Documentation of the object is carried out in order to learn its internal structure. Rastering the pictures captured will help to refer the scale and understand the laws of the object followed by the object. Use the line drawing to graphically analyse the object's internal order in plan, section, elevation, ideogram, grids, proportion.

#### STEP 2:

Translate the line drawing that shows the each and every curved lines of the object and simplify the shape. This step simplifies the geometry of the object and the perfect shape is occupied by

## FROM OBJECTS TO ARCHITECTURAL SPACES

TUTOR: Manuel Ródenas López; STUDENT: Hastiben Sanjivkumar Parikh



Step 1. Documentation of the object

the geometry similar to the present shape. The object is studied from particular to general. The particular shape is studied and its geometry is decided approximately. The object in particular, line drawing is simplified by using circles for curves and line. By this the specific measurements are evolved and through which the parameter of phases *i.e.* the measurement is fulfilled. Finalising the particular of the object through the process of the front and rear view.



Step 2. The process of choosing the particular

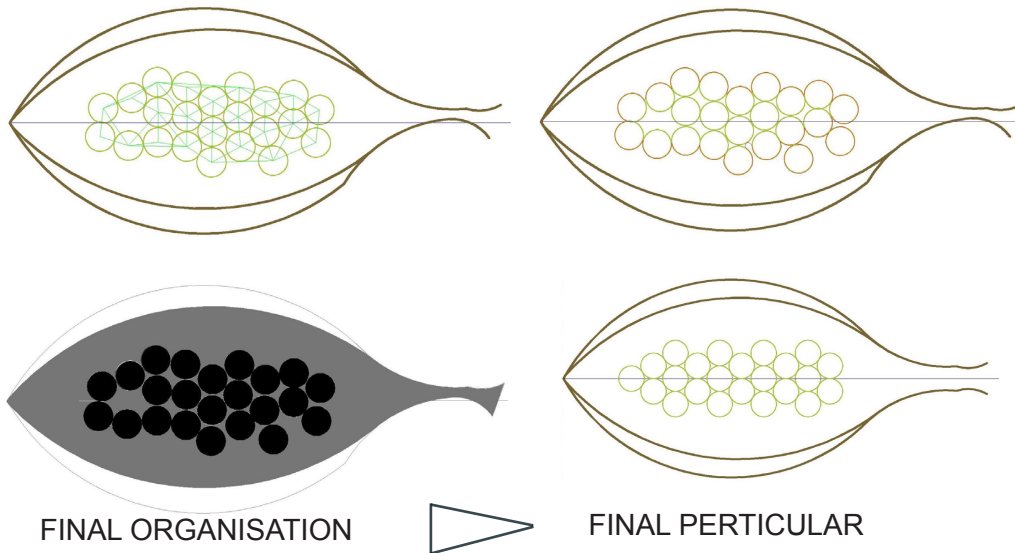
## STEP 3 :

General of the object from the particular is being decided and through using different laws to graphically analyse the object's internal order. The parameters that define the object can be symmetry, orientation, edges, geometry, mathematics of nature, axis, angles approximately studied from object etc.

Rear view of the object can be simplified easily as its symmetrical particulars can be created easily. Front view general is evolved by still studying further on the particular and the circular seeds in it as the circular seeds are not symmetrical. The further study for the circular seeds are based on the nature's rule.

Study the best organization of circle seeds, analyzing internal rules of geometry.

- 1.- To join the centers
- 2.- To draw the envelope shape (straight lines & curves)
- 3.- To make difference between front shapes (figures) and back shapes (backgrounds)
- 4.- Connections with each other



Step 3. The organisations of the circular seeds

The third organisation is decided by the process of negatives and positives, made the simplification of arrangement of the circular seeds with the specification of its number. The organisation contains three circles in a row adjoining each other. From the third organisation final symmetrical particular is found.

STEP 4:

Using the axis ,the symmetrical lines ,orientational angles, the basic unit is finalised from particular to general .The symmetrical lines guide the symmetry of the object from particular as well as general.

STEP 5:

After evolving the basic unit by graphically analysing the object through plans, the exploration of possibilities of plan form is found . Arranging plan form at different levels and rotating at a specific angle. Find different possibilities of arrangement of the plans with different floor levels. The possibilities are as follows:



Step 5.

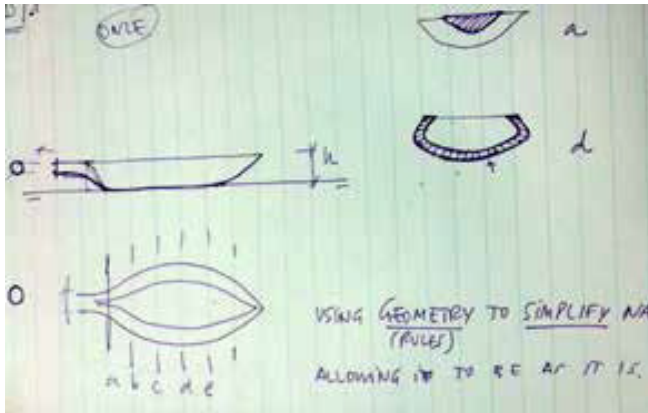


## FROM OBJECTS TO ARCHITECTURAL SPACES

TUTOR: Manuel Ródenas López; STUDENT: Hastiben Sanjivkumar Parikh

## STEP 6:

2D was a type of parameter choosed to evolve the graphics from the object. Next step to carry forward the object to instinct into a habitable space section and 3d are to be developed to perceive it as space.

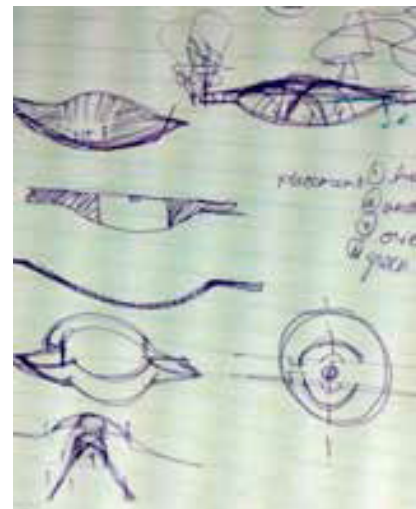
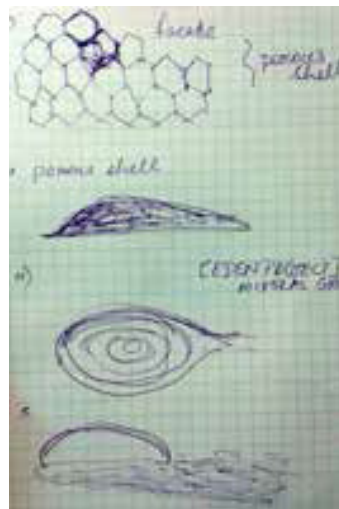
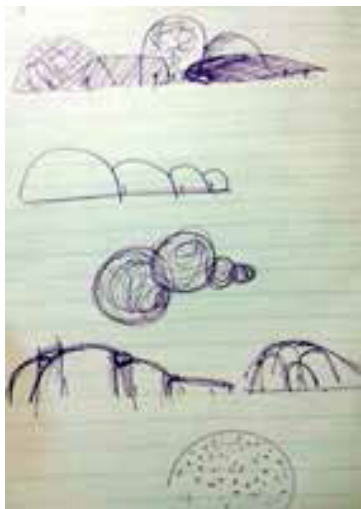


Step 6. 2D

## STEP 7:

To develop a perticular 3D of the object , the basic idea of the space is important to depict it by sketches. The space can be of any apartment, pavillion, airport area, museum, market place, a shade etc.

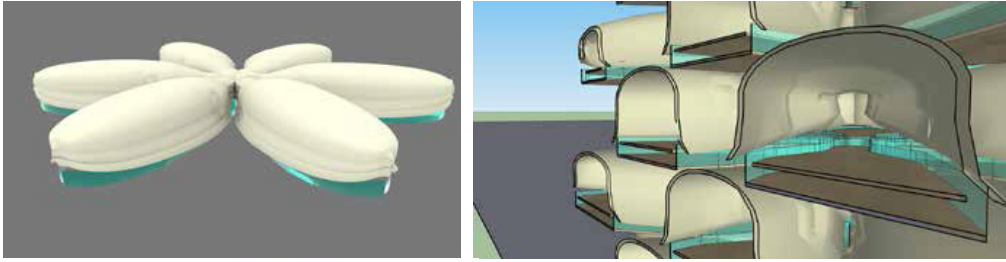
From sections and plans 3D is generated that gives the percievevness of space by the change in scale of the object.



Step 7. These sketches are of pavillions, market places, huge sky scrapper commercial complex, residence, mud architecture developed.

## FROM OBJECTS TO ARCHITECTURAL SPACES

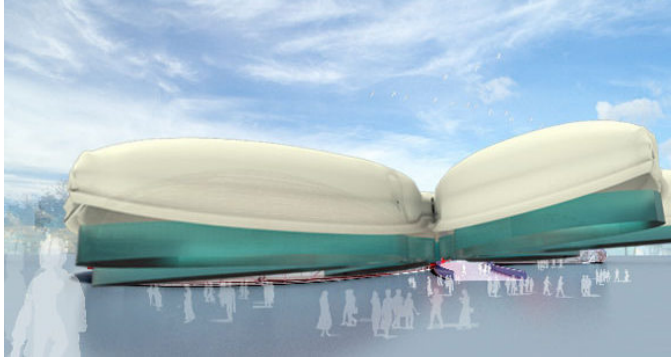
TUTOR: Manuel Ródenas López; STUDENT: Hastiben Sanjivkumar Parikh



Step 7. 3D

## STEP 8: URBAN INSERT

From 3d, the views are captured and transferred to a urban photograph and different spaces are developed.



Step 8. Urban Insert



PARIKH HASTIBEN SANJIVKUMAR

*The most interesting of my research work is the process to generate new ideas. I have learned in architecture in India is generating idea has its only way through concepts, but this was new method to generate an idea regarding the building form.*

*Design has its own parameters to grow in itself one is form follows function another is function follows form. In this research I came through many aspects of generating new ideas for designing through different process. The one I researched is function follows form.*

*This research is basically taking an inspiration from nature; How it grow, develop and finally get an identity. I studied the different objects from nature like seed pods, fruits etc.*

*This was the most amazing period of research. ' In search of weird, interesting, objects ' ; during this phase I almost rome around Cartagena in search of object that is weird and as well as interesting. Even when I travel with my friends to explore Cartagena I use to look around every where on the foot path if I get some interesting seed pods.*

*I found pine fruits, some Mediterranean typical wild fruits , seed pods and the one I and my tutor found most interesting is kurrajongs seed pod I found near roman theatre. Studying that object of nature was the second interesting thing I found. Till now I did analysis of many buildings but analysis of this natural object was sounding weird and fun at same time to me. This analysis gave me a rough idea about the building shape in plan form, I got through specification of the shape using geometric shapes. This result in a specific plan form of the object that I need to relate into a plan for a building.*

*This part i.e. 2D of the object seems to be simple and fun. The most important part and I think was tough of all is creating sections and then generating 3D mixing plans and sections. 3D generated was as similar as the object.*

*Then I need to convert this object into a architectural space by changing its scale, doing any urban insert, placing human figures. During this period I learned new techniques of presenting the building in photoshop. I learned new software . This was all and this resulted into four buildings a pavilion, housing project or an apartment building, kind of twin towers inspired from the object.*

## Morphology of tourist settlements in Mar Menor, Murcia.

Fernando M. García Martín  
Vaishali Gandhi  
Dewank Surendrakumar Agarwal

The tourism emerged in Spain in the 60's as a phenomenon which transformed completely the Mediterranean coast. Along the following fifty years, new urban forms have been developed to meet this new demand. Nowadays it is necessary to study the characteristics of these urban forms and the performance of its human activities. This study will help cities and their professionals to face the upcoming challenge of updating those neighborhoods to the new demands of quality and sustainability.

This research is focused into the understanding and classification of tourism urban typomorphologies in the specific area of Mar Menor seaside, in Murcia, at southeast of Spain. A second part of this research, which will be developed in the future, will analyze how the tourists activities are performed in each type.

### Settlements in Mar Menor area.

Mar Menor sealine is divided by four municipalities:

- Cartagena: Ranking second in the Region of Murcia, with 214,000 inhabitants, its large limits have 23 km of coastline on the south of Mar Menor and 16 km on the Mediterranean Sea.
- San Pedro del Pinatar: Despite being a relatively small town in the past, its strategic location on the north shore of Mar Menor, with a remarkable environmental qualities, has led to its rapid population growth. The population is over 24,000 inhabitants, however in the summer months can reach around 60,000. With only 22.32 km<sup>2</sup>, it has a population density of more than a thousand inhabitants per square kilometer.
- San Javier: Located on the north shore of Mar Menor, including the north part of La Manga. It has an extension of 74.2 km<sup>2</sup> and a population of 32,786 inhabitants, but it is highly increased in the summer due to its touristic activity in its 23 km of coastline on the Mar Menor and 16 km in the Mediterranean Sea.
- Los Alcázares: Located on the east shore of Mar Menor, surrounded by the municipalities of San Javier, Torre Pacheco and Cartagena, with a permanent population of around 15,000 inhabitants. It is the youngest municipality in the region of Murcia, with only 28 years of existence.

In a first approach to the morphological character of these four settlements, a comparison with the density of compactness of Murcia region cities was made with the base of previous works. As it can be seen in Figure 1, these settlements cluster together in the same area of 'Spacemate' diagram, exposing similarities in their morphology at urban scale.

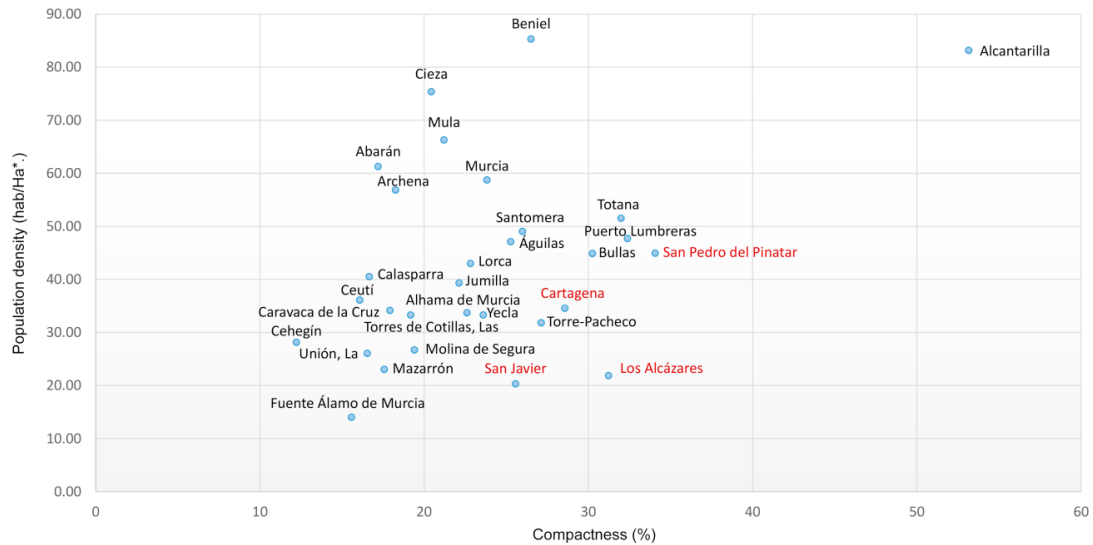


Figure 1. Municipalities of the Region of Murcia according to density (number of habitants) and compactness (SIOSE footprint areas) over Corine Land Cover 2006 (CLC06) artificial surfaces. Source: Authors from SIOSE and CLC2006 data.

### Methodology.

The transformation of settlements during twentieth century, with a big growth of population in urban environments, caused a great development of the study of urban morphology in the second half of this century to generate common tools that could describe the new neighborhoods but also the old historic places that had become desirable to preserve on this times. One of these research lines, which is followed here, try to define types or urban forms according to measurable parameters of density.

Density is the most common parameter to distinguish the urban form, defined as the ratio between a numerator that could relate to housing, inhabitants or built surface and a denominator that was always the global area. However, density is insufficient to define the urban form as Gropius (1930) or Martin and March (1972) indicated years ago. Recently, Berghauer in her thesis *Space, density and urban form* (2009) shows that combining density and occupation (percentage of ground area occupied respect to total available) can make accurate descriptions of urban form. This author, together with Haupt, suggests the use of intensity (FSI), compactness (GSI), height (L) and pressure of non-built space (OSR) to classify different urban forms. These four parameters are obtained from only two variables, the ground surface occupied and the surface built, distinguishing between basic and derived indicators. In order to capture these four variables simultaneously, these authors, develop a diagram called 'spacemate'.

In this work, density and compactness of urban areas of the four settlements are analysed in order to compare the differences into the region. The study started with the collection of information: maps and data from the Spanish cadaster ([www.sedecatastro.gob.es](http://www.sedecatastro.gob.es)), aerial images from regional cartographic institute (SITMURCIA, [www.sitmurcia.carm.es](http://www.sitmurcia.carm.es)) and data tables from the Population and Housing Census elaborated by the National Statistics Institute (INE, [www.ine.es](http://www.ine.es)).

The cadastral maps are the main source used, due to accuracy, homogeneity across municipalities and the updating of data. Open source software of Geographic Information System (GVSig) is used to manage this data in order to calculate footprint and built area. With this purpose, the original files are modified to obtain, for each built volume: footprint area, number of levels and floor area (footprint area \* number of levels).

Next step was to define a grid that fitted properly to study urban fabric forms. Part of the

## MORPHOLOGY OF TOURIST SETTLEMENTS IN MAR MENOR, MURCIA.

TUTOR: Fernando M. García Martín; STUDENTS: Vaishali Gandhi; Dewank Surendrakumar Agarwal

research was to evaluate the convenience of different grid sizes: 1km\*1km cells (used by Spanish National Statistics Institute) or 500m\*500m cells. It was also analyzed the exclusion or not of sea surfaces. Finally, 500m\*500m grid was selected because its extension, 25 Has., is more adjusted to the concept of neighborhood. Although decision about the convenience of include or exclude the sea from the cells was not clear, finally we step forward excluding it. For each one of these grids, values of FSI, GSI, OSR and L were calculated in GIS.

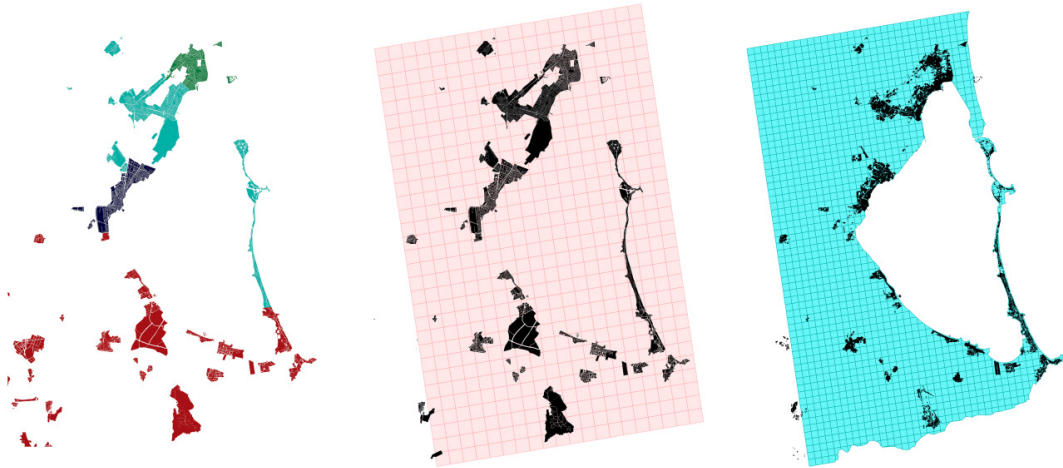


Figure 2. Urban areas of four municipalities by color (left), tested grid of 1km x 1km (center) and tested grid of 500m x 500m excluding sea area (right). Source: Authors.

### Density and compactness of urban forms in Mar Menor.

As result of the precedent methodology, a reading of urban forms in Mar Menor could be made from the values of density (FSI) and compactness (GSI) of the cells.

FSI values are exposed in Figure 3. The darker colored cells represent the higher FSI values while the lighter represent the lower. The more dense cells belong to traditional urban centers of San Javier, San Pedro and Los Alcázares. Meanwhile, La Manga with its high rise buildings have much lower FSI values, confirming that high buildings does not create the highest densities.

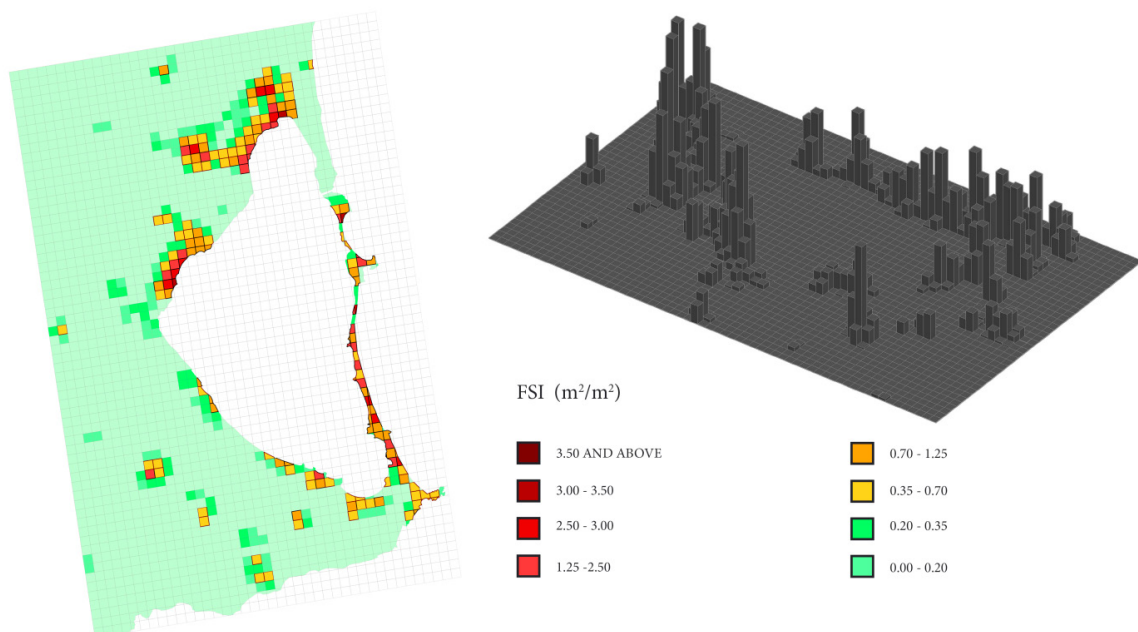


Figure 3. FSI values of cells in Mar Menor area. Source: Authors.

The representation of FSI in three dimensions shows how the built area is concentrated on opposite corners of Mar Menor: north-west (San Pedro, San Javier and Los Alcázares) and south-east (beginning of La Manga).

Figure 4 shows the GSI values of the region. High values of GSI means that there are less open spaces and more built area at ground level. The difference between the tourism models of north-west and south-east are more evident in this figure, as the form of La Manga includes a big amount of open spaces between the high buildings.

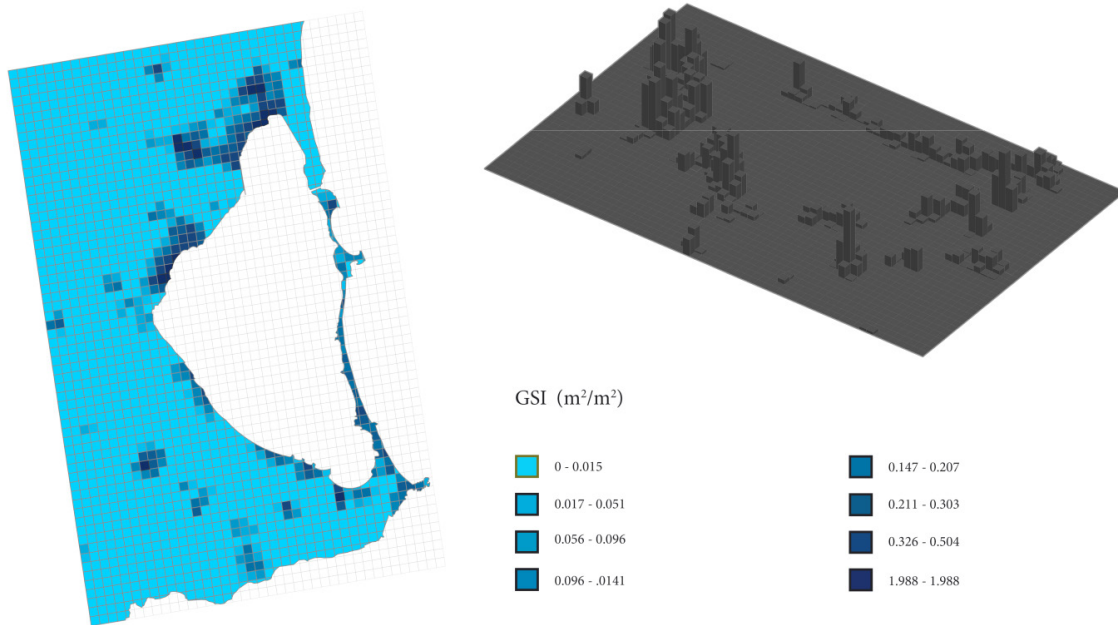


Figure 4. GSI values of cells in Mar Menor area. Source: Authors.

Due to the particularity of tourist settlements, where population changes highly between seasons, it is also interest to show, in Figure 5, the number of inhabitants that have their first address in each cell. The existence of a traditional center in the north-east municipalities, offering the whole set of urban services, helps to increase the number of people living permanently in the tourist areas of these towns. Contrary, the specialization of La Manga on tourist services causes the very low level of permanent residents.

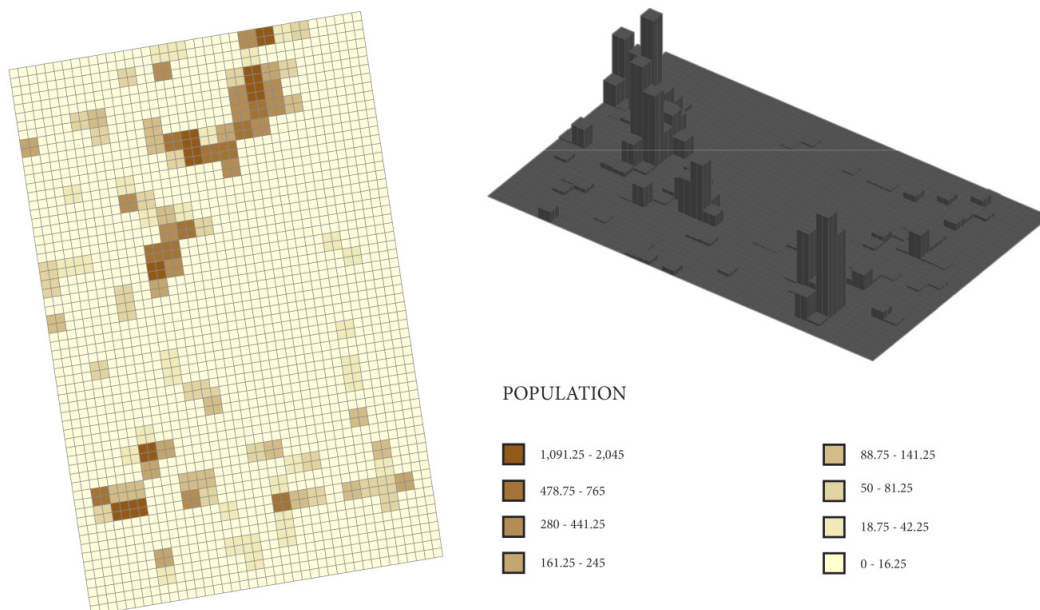


Figure 5. Population of cells in Mar Menor area. Source: Authors.

### Classification of urban morphologies in Mar Menor.

Combining density and compactness, a set of types of urban forms in this area have been defined. As can be seen in Figure 6, seven different types were created based in compactness and levels. The low rise forms (less than 3 levels) are more usual, so three types were settled according to high (more than 30%), medium (15-30%) and low occupancy (5-15%). Medium rise forms (average of 3-5 levels) were distinguished between medium (more than 15%) and low (5-15%) occupancy. Finally two types were created specifically to the high rise urban forms (more than 5 levels), which are only present in some parts of La Manga, and only in cells of very low occupancy, mainly because its position in the edge of the settlement.

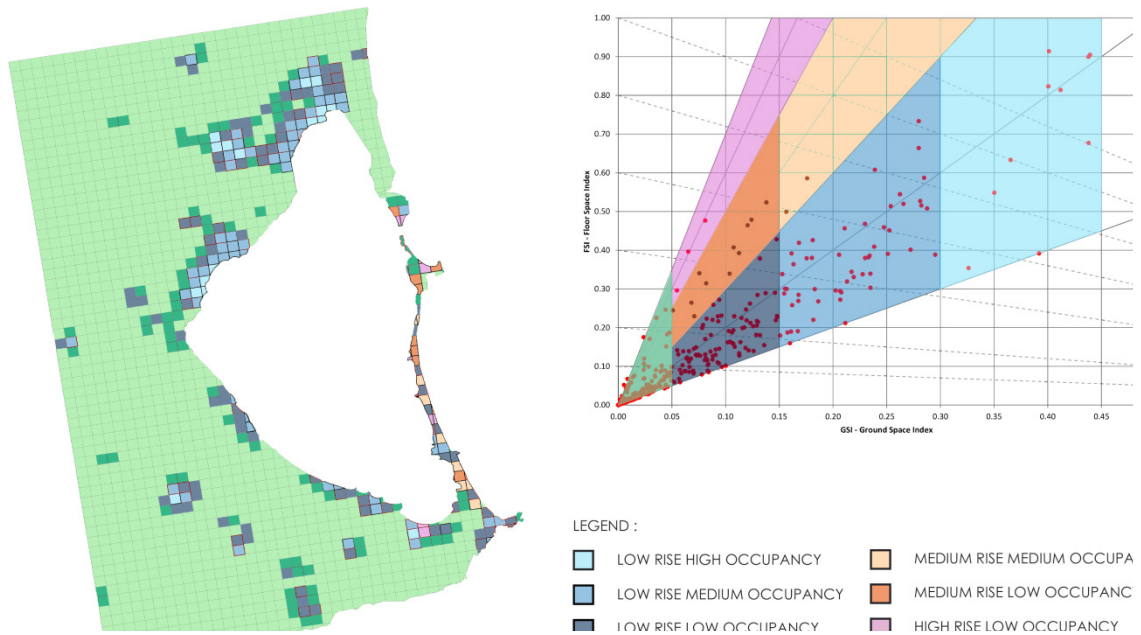


Figure 6. Types of urban forms on Mar Menor áreas.

This classification shows better the organization of urban forms in the area. Medium rise forms are only present in La Manga, where are alternated with low rise areas resembling the original Plan Bonet. On the inland shore, the most compact types (light blue) correspond with the traditional centers while the seaside present a medium occupancy. Finally the new developments of twentieth century are the less dense.

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VAISHALI GANDHI

*In the theatre called life, the chapter 'Cartagena' played a very important role in my life. It was all together a new experience and a new way of living. Being in field of architecture, Studying in Europe itself was a great opportunity to explore and learn new things.*

*Our research was focused on URBAN AND REGIONAL PLANNING in which we studied density and compactness of Marmenor region, with the help of software called GVSIG which was unknown to us. Doing the whole research using a unknown software in a short period of three months would not have been possible without our research professor FERNANDO MIGUEL GARCIA MARTIN. He was very helpful throughout are research from teaching this software to moving further with the research. He was always with us in solving our doubts, problems and spending his precious time on us. I would also like to thanks my research partner, Dewank Agarwal who was fully cooperative and made this research possible. Although the software is not in India but in future this could be very helpful in studying Indian cities.*

*After these amazing three months, i got another great opportunity to work under the guidance of Ar. MARTIN LEJARAGGA. A chance to go deep into the architecture of Spain, learn their way of designing, construction techniques. We are taking a lot of examples, knowledge and experience with us for the lifetime. These things would help us in our careers and every aspect of our lives.*

*Every experience and moment spent here has made me a better person day by day. I'll be taking back a better version of me to India.*

*A great thanks to each and every person who made the collaboration possible and was there with me in this amazing journey of six months.*



AGARWAL DEWANK SURENDRAKUMAR

*My Research falls under the category URBAN AND REGIONAL PLANNING and is based on understanding the Density and Compactness of the MAR MENOR region in south eastern part of SPAIN. The research involves use of a software namely GVSIG which was completely new to me.*

*My research head, Fernando sir was very helpful in making me learn this new software. Learning the software under his guidance and asking doubts through mails which sir named as 'online discussions' was something new. The software is an interesting part of the research. It helped to get rastered detailed maps of the cities in few steps rather than rastering the entire map in Autocad. It helped save lot of time which is very precious in this short period of 3 months of research.*

*Working on a new site with new software and new people was undoubtedly a good experience. Apart from the research work, visiting the architecture department of U.P.C.T also helped in getting familiar to the studio works done by the students of architecture in Spain. Their designing ideas, model making skills, use of 3-D software's and presentation skills was quite different and informative.*

*Interactive sessions with Fernando sir helped understand the Spanish culture and lifestyle. Sir also kept updated with various events/festivals that were going to take place from the Carnival in Cartagena to the Fellas in Valencia. I am very grateful to Fernando sir and his efforts without which this research would have not been possible. I would also like to mention about my research partner, Vaishali Gandhi who was very supportive and helped keep the research going on a good pace.*

*Coming to Spain and being associated to U.P.C.T was altogether a memorable experience. A special thanks to U.P.C.T for providing me this opportunity to be a part of this learning experience and visit a country like Spain and explore its beautiful landscapes and its architecture which has helped me improve my knowledge in architecture.*

*Their was time when we arrived in Cartagena completely unaware about the place, the culture and people, having no idea of how we would be managing in a country for 6 long months which is completely new to us, and here we are today, moving around Spain with no fear but just freedom. It feels like a second home.*

MUCHA GRACIAS U.P.C.T

## Analyze of the Huerta Surface, Urban Surface, Global Surface in Murcia, Spain

Marcos Ros Sempere  
Radhika Jagdishchandra Mehta  
Pavankumar Sureshkumar Patel

### Introduction

Spain, officially the Kingdom of Spain, is a sovereign state located on the Iberian Peninsula in southwestern Europe. It is well known for its agriculture in the past years the Crop areas were farmed in two highly diverse manners. Areas relying on non-irrigated cultivation, which made up 85% of the entire crop area, depended solely on rainfall as a source of water. They included the humid regions of the north and the northwest, as well as vast arid zones that had not been irrigated. The much more productive regions devoted to irrigated cultivation accounted for 3 million hectares in 1986.

Citrus fruits, vegetables, cereal grains, olive oil, and wine—Spain's traditional agricultural products—continued to be important in the 1980s. In 1983 because of the changed diet of an increasingly affluent population, there was a notable increase in the consumption of livestock, poultry, and dairy products. Meat production for domestic consumption became the single most important agricultural activity, accounting for 30% of all farm-related production in 1983. Increased attention to livestock was the reason that Spain became a net importer of grains. Ideal growing conditions, combined with proximity to important north European markets, made citrus fruits Spain's leading export. Fresh vegetables and fruits produced through intensive irrigation farming also became important export commodities, as did sunflower seed oil that was produced to compete with the more expensive olive oils in oversupply throughout the Mediterranean countries of the EC.

A huerta is a fertile area, or a field in a fertile area, common in Spain and Portugal, in which a variety of common vegetables and fruit trees are cultivated for family consumption and sale. Typically, huertas belonging to different people are in groups around rivers or other water source because of the amount of irrigation required. It is a kind of market garden.

This paper is focused on the transformation process, qualitative analysis and on the quantitative data of the Geography, Economy, Population, Huerta Surface, Urban Surface, Global Surface of Murcia and it's counties (Alcantarilla, Beniel, Santomera) over the period of time (1945, 1956, 1981, 2002).

### Analysis methodology, Orthophotographs.

For the analysis of patterns of urban growths and land use, we will do a double work with cartographic base and orthophotographic base, combining results and processing them by GIS computer software. This program allows us the data analysis and their processing to obtain growth patterns.

The available cartography is obtained by digital certificate of the cadaster electronic office. The orthophotographs are obtained from the Regional Administration, by its Spatial Data Infraestructure (SPI) server called "Cartamur". Therefore, we have an updated cartography, with indication and expression of the selected cities, as well as an indication of the current existing buildings.

Regarding orthophotographs, Cartomur has a series of 5 flights, taken in years 1945, 1956, 1981, 2002. This allows us to make a sufficient analysis of temporal relationship of building distribution, especially in the last decades, where photographic flights have been more frequent.

The previous work of base material elaboration has consisted in the unification of the

cartographic base with the orthophotographic one, in order to be able to overlap the cartographic base with the different historical orthophotographs, making reference both of them to U.T.M. coordinates.

Thus, orthophotography and plot overlap has been made five times, corresponding to the five available flights.

### **Analysis Variables**

For each one of the periods of which there is orthophotography, the following variables have been taken into account. They have been quantitatively analyzed, but some of them have been also analyzed in a graphic and in a qualitatively way:

- Global Surface area of the selected cities.
- Urban Surface (the city) area of the selected cities.
- Huerta Surface area of the selected cities.
- Murcia's County area.
- Population and Density of the selected cities.

Regardless of the variables analyzed, the following elements of the agrarian landscape have been also taken into account in each period. These elements appear in a constant way or with minimum variations and they will be used to relate the data obtained from variable analysis to the geographical situation and general preexistences:

- Layout of main and secondary roads in the performance area.
- Layout of Segura River bed and evolution with plans.
- Layout of urban cities over the years.
- Layout of Huerta area's over the years.

For the global study, the variable of average size of plots and the global number of analyzed plots have not been taken into account because, according to Garcia has exposed (2011), after making samples in different areas of Huerta, the global variation in the western area of plot number does not even reach a 5 per cent value in the 1956-2002 period. Similarly, the decrease of their average size, both in agrarian system and those which have an associated housing, does not reach a 5 per cent either. Therefore, we believe such value remains stable over time, without going into detail the different segregations and/or aggregations among plots that may have occurred, because a value has been compensated by its opposite.

### **Murcia**

Murcia is a city in south-eastern Spain, the capital and most populous city of the Autonomous Community of the Region of Murcia. It is the seventh largest city in the country, with a population of 442,573 inhabitants in 2009 (about one third of the total population of the Region). The population of the metropolitan area was 689,591 in 2010. It is located on the Segura River, in the Southeast of the Iberian Peninsula, noted by a mild climate with hot summers, mild winters, and relatively low precipitation.

Murcia nowadays is mainly a services city and an university town. It is famous for the Cathedral of Murcia and a number of baroque buildings. The city, as the capital of the comarca Huerta de Murcia is called Europe's orchard due to its long agricultural tradition and as a fruits, vegetables and flowers producer and exporter. Murcia is located near the center of a low-lying fertile plain known as the Huerta of Murcia.

### **Segura River**

The Segura River and its right-hand tributary, the Guadalentín, run through the area. The city has an elevation of 43 metres (141 ft) above sea level and covers approximately 882 square kilometres (341 sq mi).

The Segura River crosses an alluvial plain (Vega Media del Segura), part of a Mediterranean pluvial system. The river crosses the city from west to east. Its volumetric flow is mostly small but the river is known to produce occasional flooding, like those that inundated the capital in 1946, 1948, 1973 or 1989. The Segura was recognized as one of the most polluted rivers in Europe.

### **Mountains and hills**

The Segura river's Valley is surrounded by two mountain ranges, the hills of Guadalupe, Espinardo, Cabezo de Torres, Esparragal and Monteagudo in the north and the Cordillera Sur in the south. The municipality itself is divided into southern and northern zones by a series of mountain ranges, the aforementioned Cordillera Sur (Carrascoy, El Puerto, Villares, Columbares, Altaona, and Escalona). These two zones are known as Field of 'Murcia (in the south of Cordillera Sur) and Orchard of Murcia (the Segura Valley in the north of Cordillera Sur). Near the plain's center, the steep hill of Monteagudo protrudes dramatically.

### **Districts**

The 881.86-square-kilometre (340.49 sq mi) territory of Murcia's municipality is made up of 54 pedanías (suburban districts) and 28 barrios (city neighbourhood districts). The barrios make up the 12.86-square-kilometre (4.97 sq mi) the main urban portion of the city. The historic city center is approximately 3 square kilometres (1 sq mi) of the urbanized downtown portion of Murcia.

### **Climate**

Murcia has a hot subtropical semi-arid climate (Köppen climate classification BSh), with Mediterranean (Csa) influences. Given its proximity to the Mediterranean Sea, it has mild winters and hot summers.

It averages more than 300 days of sun per year. Occasionally, Murcia has heavy rains where the precipitation for the entire year will fall over the course of a few days.

In the coldest month, January, the average temperature range is a high of 16 °C (61 °F) during the day and a low of 4 °C (39 °F) at night. In the warmest month, August, the range goes from 33 °C (91 °F) during the day to 20 °C (68 °F) at night. Temperatures almost always reach or exceed 40 °C (104 °F) on at least one or two days per year. In fact, Murcia holds temperature records close to the highest recorded in southern Europe since reliable meteorological records commenced in 1950. The official record for Murcia stands at a stifling 46.1 °C (115.0 °F), at Alcantarilla airport in the western suburbs on July 4, 1994 with 45.7 °C (114.3 °F) being recorded at a station near the city centre on the same day.

### **Economy**

Economically, Murcia predominantly acts as a center for agriculture and tourism. Murcia is a producer of wines, with about 40,000 hectares (100,000 acres) devoted to grape vineyards. Most of the vineyards are located in Ricote and Jumilla. Jumilla is a plateau where the vineyards are surrounded by mountains.

During the 2000s, the economy of the region turned towards "residential tourism" in which people from northern European countries have a second home in the area. Europeans and Americans are able to learn Spanish in the academies in the town center.

The economy of Murcia is supported by fairs and congresses, museums, theatres, cinema, music, aquariums, bullfighting, restaurants, hotels, camping, sports, foreign students, and tourism.

## Huerta De Murcia

La Huerta de Murcia is a region of Murcia (Spain). As natural region comprises the lands irrigated with water from the River Segura (Vega Media del Segura river) and seepage from the dam called Contraparada to the limit of the Region of Murcia with Valencia. Its main city is Murcia.

As a region naturally la Huerta de Murcia includes land that is irrigated with water from the Segura River and leaks from Contraparada to the limit of the Region of Murcia with Valencia.

The region of Murcia is bounded north and south by two mountain ranges bordering parallel the river plain of the Segura and its tributary the Guadalentín, popularly known locally as The Reguerón.

The nearest sea is the littoral ridge that separates the Huerta de Murcia in the Campo de Cartagena and is constituted by Carrascoy saw and its extension in the hills of Puerto de la Cadena, the rooster, Miravete, Columbares and Altaona.

Thus defined, the natural region comprises all the municipalities of Sewer, Santomera and Beniel and most of the municipality of Murcia .

Some districts of Murcia is located on the southern slope of the littoral cordillera. This area includes the districts of Bath & Beggar , Carrascoy-La Murta, Corvera , Gea and Truyols, Jerónimo and Avilese, Lobosillo, Los Martínez del Puerto, Sucina and Villadolises and the Jury and constitute what is often referred Murcia Golf Murcia .

Geographically, the Campo de Murcia does not belong to the natural region of the garden of Murcia, but of the Campo de Cartagena , pouring their rainwater, not the Segura river, but the Mar Menor by many wadis . Moreover, unlike the territory that is part of the Huerta de Murcia, their lands were mostly rainfed rather than irrigated, but after the arrival of the Tajo-Segura , intensive irrigated farming has gradually moving to this region given its broader than the traditional smallholding Huerta de Murcia ownership structure.

## The Administrative Region

The division of the Region of Murcia in counties was under the Statute of Autonomy of the Region of Murcia, 1982. However, until now, the planned local division and its legal development has not yet been approved by the Regional Assembly of Murcia . Proposals comarcalizaciones there is often a region called Huerta de Murcia, although proposals include the territory of the natural region within a metropolitan region called Murcia metropolitan area or similar names. The proposed regionalization most used by the Regional Government and others provides a region called Huerta de Murcia which includes all the municipalities of Sewer, Murcia, Santomera and Beniel.

Sub- Regions:

- La Huerta-margin left
- La Huerta-margin right
- North Coast
- Southern Cordillera
- Field of Sangonera
- Golf Carrascoy
- City

Demographic Evolution, Huerta De Murcia ( 2008)

TOWN	POPULATION	EXTENTION	DENSITY	AREA
Alcantarilla	41,084	16.24	2529.8	16 km <sup>2</sup>
Beniel	10,933	10.06	1093.3	10.06 km <sup>2</sup>
Murcia	436,870	881.86	495.4	881.86 km <sup>2</sup>
Santomera	15,319	44.2	346.58	44 km <sup>2</sup>
Total	504,206	952.36	4465.08	951.92 km <sup>2</sup>

# ANALYZE OF THE HUERTA SURFACE, URBAN SURFACE, GLOBAL SURFACE IN MURCIA, SPAIN

TUTOR: Marcos Ros Sempere; STUDENTS: Radhika Jagdishchandra Mehta; Pavankumar Sureskumar Patel

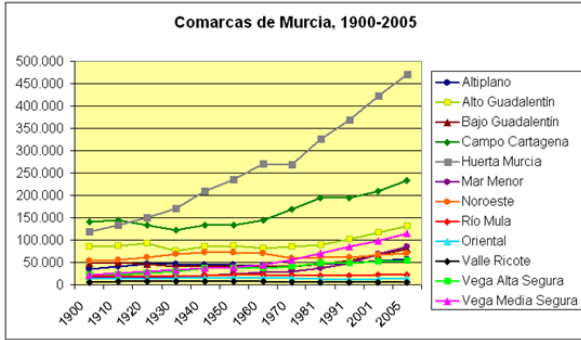


FIG. 01 Demographic development of the Huerta de Murcia (gray line) compared to the other counties in the region

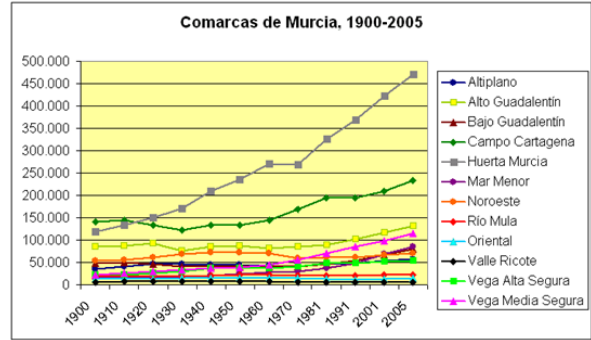


FIG. 02. Evolution of the relative weight of the Huerta de Murcia in the total region.



FIG.03. Global Surface Area of Murcia 1945.



FIG.04. Urban Surface Area of Murcia (RED) 1945.



FIG. 05. Huerta Surface Area of Murcia (GREEN) 1945.

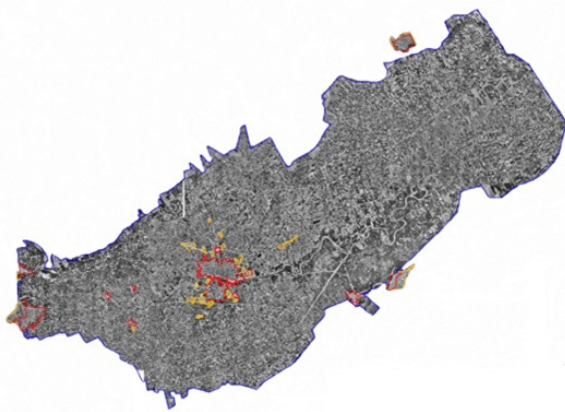


FIG. 06. Global Surface Area of Murcia [(RED-1945) (YELLOW-1956)].

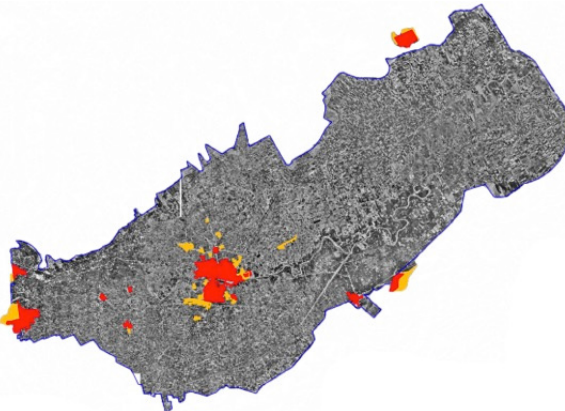


FIG. 07. Urban Surface Area of Murcia [(RED-1945) (YELLOW-1956)].

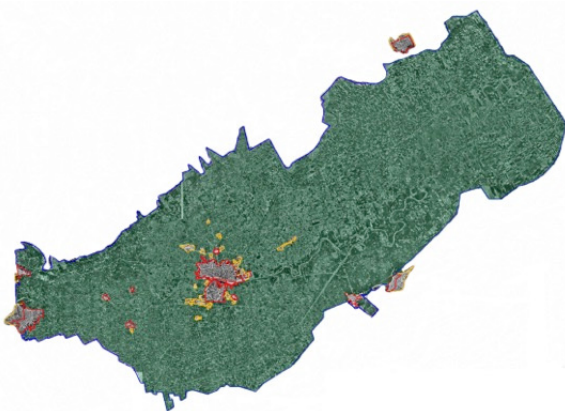


FIG. 08. Huerta Surface Area of Murcia [(Green)] 1956.





FIG. 09. Global Surface Area of Murcia [(Red-1945) (YELLOW-1956) (PINK-1981)].

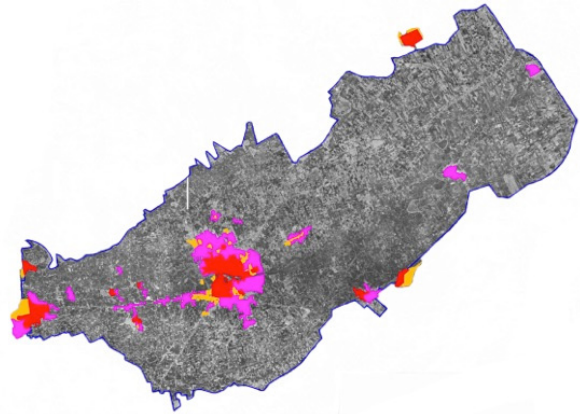


FIG. 10. Urban Surface Area of Murcia [(Red-1945) (YELLOW-1956) (PINK-1981)].

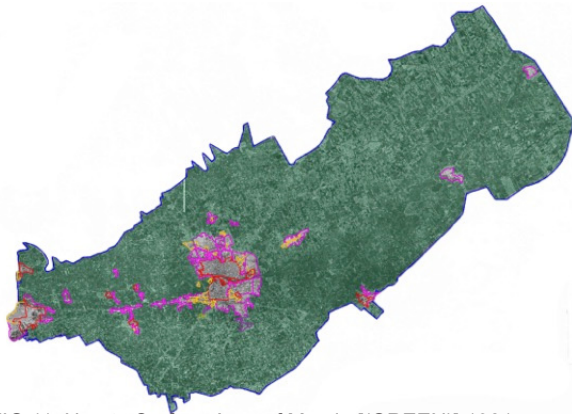


FIG. 11. Huerta Surface Area of Murcia [(GREEN)] 1981.

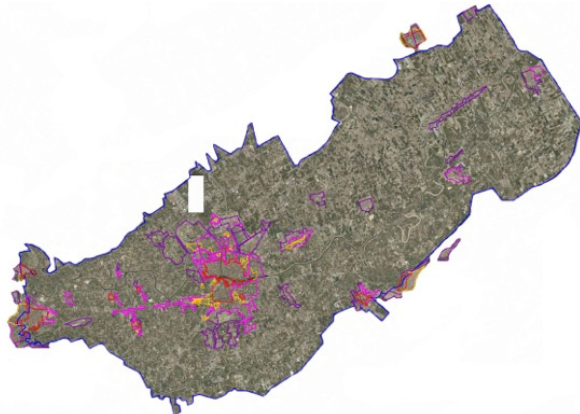


FIG. 12 Urban Surface Area of Murcia [(Red-1945) (YELLOW-1956) (PINK-1981) (PRUPLE-2002)].

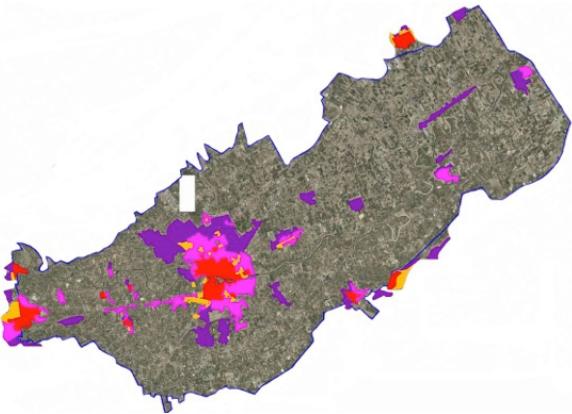


FIG. 13. Urban Surface Area of Murcia [(Red-1945) (YELLOW-1956) (PINK-1981) (PRUPLE-2002)].

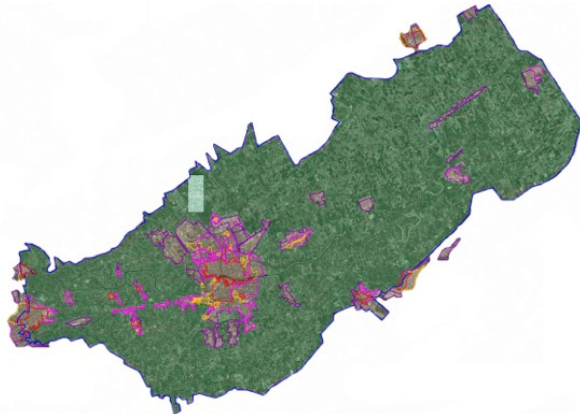


FIG. 14. Huerta Surface Area of Murcia [(GREEN)] 2002.

The Authors wish to acknowledge the support and guide from our Professor Ros Sempere, Marcos – PhD Architect. University professor of Urban Planning., Departamento de Arquitectura y Tecnologia de la Edificacion, Universidad Politecnica de Cartagena (UPCT). Without his constant support and guidance we wouldn't have been possible to complete our work.

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 Cartomur , <http://cartomur.imida.es/visorcartoteca/>



MEHTA RADHIKA JAGDISHHANDRA

*From the day I came to Spain, I have experienced various things, be it culture, nature of people, learning methods, teaching methods, food, lifestyle, and so on.*

*Being the first exchange programme for both Veer Narmad South Gujarat University and UPCT, This has been an amazing experience for me in terms of learning , project work, work experience and the once in a life time opportunity to explore and learn about Spain and other parts of Europe.*

*Spain is a unique place in itself, studying in Cartagena has a different experience all together, starting from our stay at Alberto Colao, Residencias Universitarias – The staff and the facilities provided to us has been very good, Domingo sir has been very helpful and so has been the staff.*

*About the University – UPCT has a great campus with a good location, the campus is well made and the location is amazing, when we were first taken to visit all the campus, I was fascinated by the spaces that are made and the idea of using the old buildings. The atmosphere that forms makes the learning experience more interesting.*

*My professor, Sir Marcos Ros, is a very good professor, he has helped us out in our research and supported us throughout, learning from him has a different experience all together, his methods are different and innovative, I got to learn a new software and also he enlightened us about Spain.*

*I have found a friend in my professors with whom I have worked with.*

*David Sir , Juana Mari Maam , Maria Mestre Maam they have not only been my teachers or helpers but a friend, they have always been there to solve our Queries at the earliest.*

*Learning Spainsh has been an adventure – the most wonderful experience, if it wasn't Juana Mari Maam it wouldn't have had been the same. Going to her classes was a thing one wouldn't want to miss, her teaching methods are wonderful one can go on and on learning, without feeling sleepy, hehe.*

*The people have been very polite and helpful in every manner inspite of different languages, they tried to understand us and help us out in every possible way, the food here is a bit different but worth trying.*

*I have got to explore my abilities, and have discovered a new me. I now see a growth in my work and as a human been, coming out of my shell and breaking it open, is what it is like working and learning in UPCT and at my firm.*

*I have made a few friends here who have been very good and have become a friend for life.*

*It takes me back to the day when we were returning to Spain from our easter holidays, all I had in mind was, "I AM GOING HOME".*

*Coming to Spain has been an opportunity of a lifetime, and no matter what and where I go in future it will be the most Cherished.*



PATEL PAVANKUMAR SURESHKUMAR

*Spain-The country with different experiences in each part and way of life made my point of view broader about observing different culture of world that I have till now.*

*In Spain, As an Architecture student in UPCT, Cartagena I got many opportunities to explore myself and my skills in various fields. I have learned many things through the programme which is planned for us. I am very much interested in URBAN PLANNING and I got a chance to do it in Europe, what else I need. Having a Research Work on topic of Urban and Regional Planning under the supervision of Dr. Marcos Ros Sempere is a great honour for me. While doing my research I have gone through different techniques which helped me in my research and also Prof. Marcos asked me to do it on my idea and it worked. Learning new software makes my way easy for me and my work. As my topic is wide enough to research I have to do my work continuously and rapidly. So that it will help me to understand how city grows in terms of urban planning during the years and how it evolves due to demand of people. I have done four different cities as part of research to understand the Urban Development in same year especially how the landscape of the city changed during the years passed. Different aspect of urban planning increase more interest for me to do master in Urban Planning. For the same matter I travel a lot around Europe to make my view broader.*

*For Sports Spain is my favourite country but what I found most interesting thing in Spain is the Spanish people , their nature , style of living their life, food and it's culture, the festivals which is more or less same as India have but the tradition and style of celebrating is different. India has Diwali and Spain has Falles but the way of celebration is different and many more.*

*The most amazing thing I did is "SPANISH CLASSES" by Prof. Juana Mari Belcji Martinez, such a lovely person she is.*

*The most important thing I did is to represent my INDIA in front of world!*

## Sustainable Projects

Joaquín Contreras  
Sonam Allies Seema Abdulaziz Kanti

### INTRODUCTION - WHAT IS SUSTAINABILITY?

*“Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”*

- The idea of sustainability, or ecological design, is to ensure that our actions and decisions today do not inhibit the opportunities of future generations
- Sustainability creates and maintains the conditions under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic and other requirements of present and future generations.
- Sustainable architecture uses a conscious approach to energy and ecological conservation in the design of the built environment. Sustainable construction leads to usage of locally available efficient materials and construction techniques and comfortable environment by passive heating and cooling.

### AIM

- To find the parameters which makes the project Sustainable and to apply it on a particular project of Region of Spain.

### OBJECTIVE

- To understand the constrains of the project.
- To understand the environmental, as well as socio-economical impact on design.
- To understand the new methodology or techniques in the context of sustainability.
- To understand parameters which makes the project sustainable.

### METHODOLOGY

- By finding architects who work on Sustainability.
- By referring various book on sustainability, as well as the sustainable projects.
- By sorting out the projects.
- Analysing the projects, to find sustainable parameters.
- Comparing various sustainable projects.
- Finding sites on which sustainable parameters can be applicable.
- To create a programme, analysing the site.
- Application of sustainable parameters on that site.

### OUTLINE OF THE PROJECTS

There are some architects association which are working on social, economical as well as environmental part of the design in a sustainable manner. Let's flashing the light on some of the sustainable projects.

#### TYIN architects

'Architecture of Necessity'

Aim -To build strategic projects that can improve the lives for people in difficult situations. Through extensive collaboration with locals, and mutual learning.

TYIN Tegnestue Architects was established in 2008 and since then has been involved in projects in poor and underdeveloped areas in Africa, Asia as well as in Norway.

TUTOR: Joaquín Contreras; STUDENT: Sonam Allies Seema Abdulaziz Kanti

The firm centres on a philosophy of an architecture of necessity. Solutions to fundamental challenges call for an architecture where everything serves a life-purpose, an architecture that follows necessity.

TYIN's key aspect of an 'architecture of necessity' is about decisions that have real consequences for real people now, but also in the future and the involvement with the local people in a project ensures that there is a connection with culture, philosophy, vision and daily life of the users. They believe that their projects can have an impact beyond the physical structures.

#### Soe ker tie houses

In the fall of 2008, TYIN travelled to Noh Bo, a small village on the Thai-Burmese border to design and build houses for Karen refugee children. The 60 year long conflict in Burma forced several hundred thousand people to flee from their homes. The conflict leaves many children orphaned, with little hope for the future. Ole Jorgen Edna from Levanger Norway had opened an orphanage in Noh Bo in 2006 and was now in need of more dormitories. The orphanage sheltered 24 children, however the intention was to house around 50. The main driving force behind the Soe Ker Tie House was to provide the children with their own private space, a place that they could call home and a space for interaction and play.

The Soe Ker Tie House is a blend between local skills and TYIN's architectural knowledge. Because of their appearance the buildings were named Soe Ker Tie Haus by the Karen workers; The Butterfly Houses.

#### Cassia Coop Training Centre

French businessman Patrick Barthelme approached Norwegian practice TYIN tegnestuen architects with a briefcase full of cinnamon and a plight for labourers in Sumatra living and working in unsafe and unsanitary conditions. this region of Indonesia is responsible for 85% of the global production of cinnamon, however farmers and locals are forced to work long days under poor conditions. Just over a year later the 'cassia coop training centre' was completed, giving a safer, sanitary and most importantly ethical facility for the community as a fair socially functioning enterprise with proper wages, healthcare and education.

#### ECOSISTEMA URBANO

Aim - Urban Social Design

By which they understand 'The design of environments, spaces and dynamics in order to improve self-organization of citizens, social interaction within communities and their relationship with the environment'. It is a Madrid based group of architects and urban designers operating within the fields of urbanism, architecture, engineering and sociology, founded in 2000 by architects Belinda Tato and Jose Luis Vallejo who have been the directors since then. They have used this philosophy to design and implement projects in Norway, Denmark, Spain, Italy, France and China.

#### Eco-boulevard

The municipality of Madrid launches tender to generate ideas for the bioclimatic Boulevard of the Ensanche de Vallecas; and two objectives: one of a social nature, which generate activity; and other environmental, climate conditioning of a space. The boulevard is part of the new district of Madrid, which was promoted as an innovative residential project.

The winners were the architects of Urban Ecosystem (Belinda Tato and Diego José Luis Vallejo García-Setién). The construction of three large cylinders aligned arises, forming a playful ride that anger mixed with the barren and desolate neighbourhood on the outskirts of Madrid cityscape.

#### ELEMENTAL

Aim - Searching for innovation and design in projects of public interest and social impact, for which they count on a team highly enabled in the development of complex initiatives that

require coordination of public and private actors alongside participatory processes for decision-making.

#### Quinta Monroy

The Chilean Government asked ELEMENTAL to resolve the following equation:

To settle the 100 families of the Quinta Monroy, in the same 5,000 sqm site that they have illegally occupied for the last 30 years which is located in the very centre of Iquique, a city in the Chilean desert.

They had to work within the framework of the current Housing Policy, using a US\$ 7,500 subsidy with which they had to pay for the land, the infrastructure and the architecture. Considering the current values in the Chilean building industry, US\$ 7,500 allows for just around 30 sqm of built space.

And despite the site's price (3 times more than what social housing can normally afford) the aim was to settle the families in the same site, instead of displacing them to the periphery.

#### PHILIPPE RAHM

*"It's not to design solid shape and form, it's to design climate."*

Philippe Rahm is a Swiss architect, principal in the office of Philippe Rahm architectes, based in Paris, France. His work, which extends the field of architecture from the physiological to the meteorological, has received an international audience in the context of sustainability.

While architecture is often concerned with the formation of space through the composition of solids, architect philippe Rahm has developed a practice which fabricates environments based on their climatic and physiological aspects. This alternative approach, regarded as 'meteorological design', uses light, temperature, humidity, and pressure to inform spatial and experiential qualities to produce an increased sensorial engagement with the world.

#### Convective Apartment

The design of this condominium building is based on the natural law of Archimedes that makes the warm air rises while the cold air falls. The apartment become like a thermal landscape, with his different altitude of heat, where the inhabitant could freely wander inside like in a natural landscape, looking for specific thermal qualities related to seasons or the moment of the day. In thermodynamics, energy transfer by heat can occur between objects by radiation, conduction and convection. Convection is usually the dominant form of heat transfer in gases. This term characterises the combined effects of conduction and fluid flow. In convection, enthalpy transfer occurs by the movement of hot or cold portions of the fluid together with heat transfer by conduction. Commonly an increase in temperature produces a reduction in density. Hence, when air is heated, hot air rises, displacing the colder denser air, which falls. In this free convection, gravity and buoyancy forces drive the fluid movement.

If the process of the design follow the new goal of energy reduction linked to the recommendations of the sustainable development, it especially offer, through this new constraints, some new shapes and new ways of living.

## **SUSTAINABLE HOUSING PROJECT IN BAHIA BELLA**

### **Los Alcazares, Murcia, Spain**

#### Introduction

Looking at the nearest and interesting natural and artificial environment, the Mar Menor, the professor proposes thinking about the ways and residential systems developed by the tourism model. The resolution of the project will need to work on the concept of temporality, program, sustainability, gaze, water and interpretation of traditional docks.

## SUSTAINABLE PROJECTS

TUTOR: Joaquín Contreras; STUDENT: Sonam Allies Seema Abdulaziz Kanti

No	Sustainable parameters	Soe Ker Tie House	Cassia coop training centre	Eco-boulevard	Casa de la Tierra, vivienda bioclimática	Agroecology center	Quinta Manroy	Convective apartments
1	location	Noh Bo, Tak, Thailand	Sungai Penuh, Kerinchi, Sumatra, Indonesia	Vallecas, Madrid, Spain	The Brave, Molina de Segura, Murcia, Spain	Rafa, Bullas, Murcia, Spain	Iquique, Chile	Hamburg, Germany
2	Climate	tropical wet and dry	tropical	continental	Mediterranean	Mediterranean	mild desert	Oceanic
3	Local & recycled materials and local techniques	<ul style="list-style-type: none"> <li>The local construction technique-bamboo weaving is used.</li> <li>The foundations cast in recycled tyres</li> </ul>	Locally available Bricks and the trunk of the cinnamon tree are used.	The air trees are made with 90% recycled materials like rubber floors, steel structures & concrete	traditional or simple techniques are used while favouring the inclusion of organic materials.	Locally available material is used.	It's half construction is done by inhabitants itself by local techniques of construction.	
4	Passive system for energy efficiency and use of natural resources.	<ul style="list-style-type: none"> <li>Structural components and material's own properties which allow easy ventilation and light to the interior spaces.</li> <li>Structural components like roof is such that it promotes easy drain and also rainwater can be stored for dry season.</li> </ul>	<ul style="list-style-type: none"> <li>Composition of structural elements is such that it promotes easy ventilation and lighting.</li> <li>E.g. The height difference between building and roof creates natural ventilation beneath a roof surface.</li> </ul>	<ul style="list-style-type: none"> <li>The trees planted in 'air tree' will cool the surrounding, and it reducing the heat island effect.</li> </ul>	<ul style="list-style-type: none"> <li>In a Mediterranean climate which has hot and dry summers and cold and wet winters, it is essential to design passive techniques for heating, cooling and ventilation.</li> <li>For example, in this project, for cooling, heating and ventilation-cooling towers, fireplace and solar chimneys are used.</li> </ul>	<ul style="list-style-type: none"> <li>The cross ventilation is ensured by adjustable wall and ceiling outlets.</li> <li>All buildings are oriented north-south, that allows the best solar control in different seasons</li> </ul>	Optimize use of resources like land (in limited budget provided, maximize space for small land area)	<ul style="list-style-type: none"> <li>Reducing the temperature (Depending on our physical activity and thickness of our cloths) to our exact need in different areas of building, can save a lot of energy.</li> <li>Every vegetation has particular quality with respect to sun and wind. By taking advantages of it one can create a good and energy efficient atmosphere.</li> </ul>
5	Energy generation through Active system			<ul style="list-style-type: none"> <li>Solar photovoltaic to meet on-site energy needs.</li> <li>wind catchers steerable that bring warm air from outside</li> </ul>		<ul style="list-style-type: none"> <li>For ventilation in the half-buried areas static forced chimneys are placed.</li> <li>biomass and solar panels are used</li> </ul>		
6	Smart materials							<ul style="list-style-type: none"> <li>Reduction of atmospheric effect by choosing appropriate materials.</li> </ul>
7	Intelligent building, sustainable living							Intelligent component like, thermal sensor, curtains and intelligent software are something which can automatically control inside atmosphere (depending on wind direction, renew of new air related to num. of people inside, etc.) and make it comfortable.

### Program

The exercise raises the realization of 10 houses above water, on a site in the coastline near Los Alcazares.

Area - Approximate area of 1.5 ha: Housing - 5 housing for 2 people; 5 housing for 4 people

• Each of the homes will be devoted to a double use throughout the year. During the spring and summer residents will be tourists. During fall and winter, the houses will be inhabited by researchers.

• In addition, we will propose a building intended for common areas (reception, kitchen, cafeteria, laundry, storage, etc) on the beach, in the natural terrain.

### AIM

- Use of the local techniques or technologies, the local materials;
- Passive methods to obtain energy: sun, wind, water, vegetation;
- Active methods to obtain energy: (renewable energy): sun (photovoltaic solar system), wind (wind turbines), water storage;
- Re-use, possibility to re install in another place.

### CONCEPT

• The whole housing is like a sea vegetation which floats on the water.



FIG. 01. Site plan (A – house for 4 person  
B – House for 2 person)

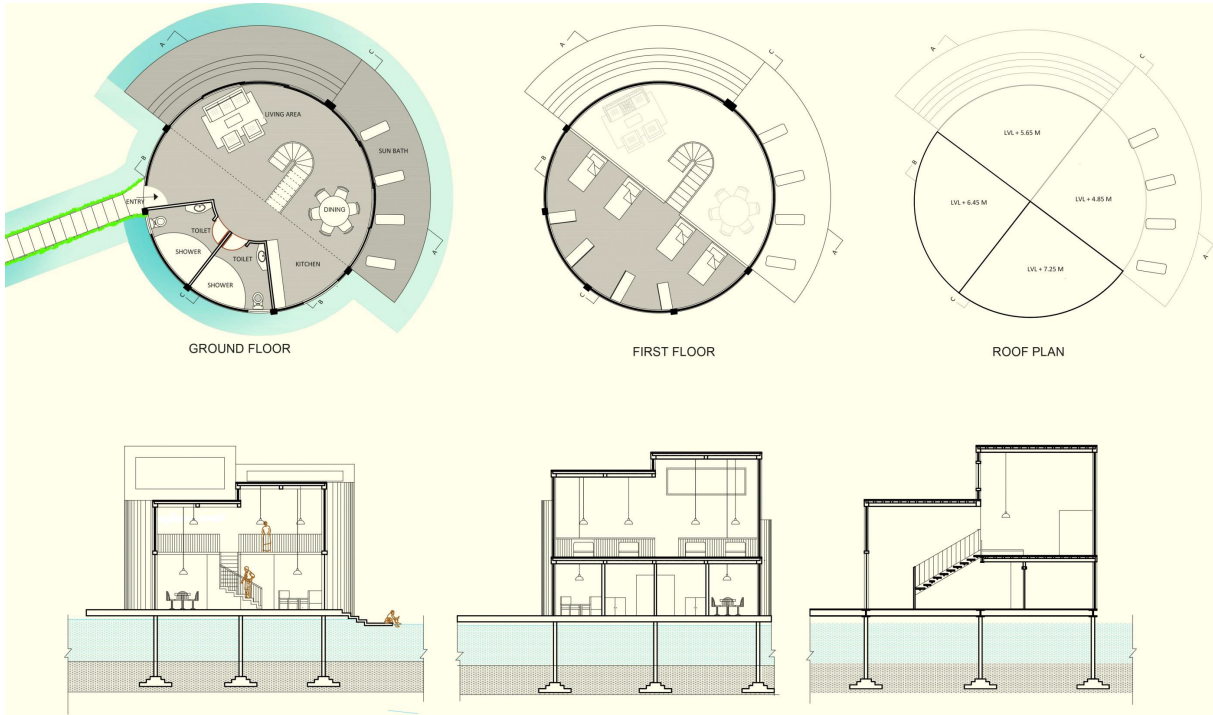


FIG. 02. House for 4 people

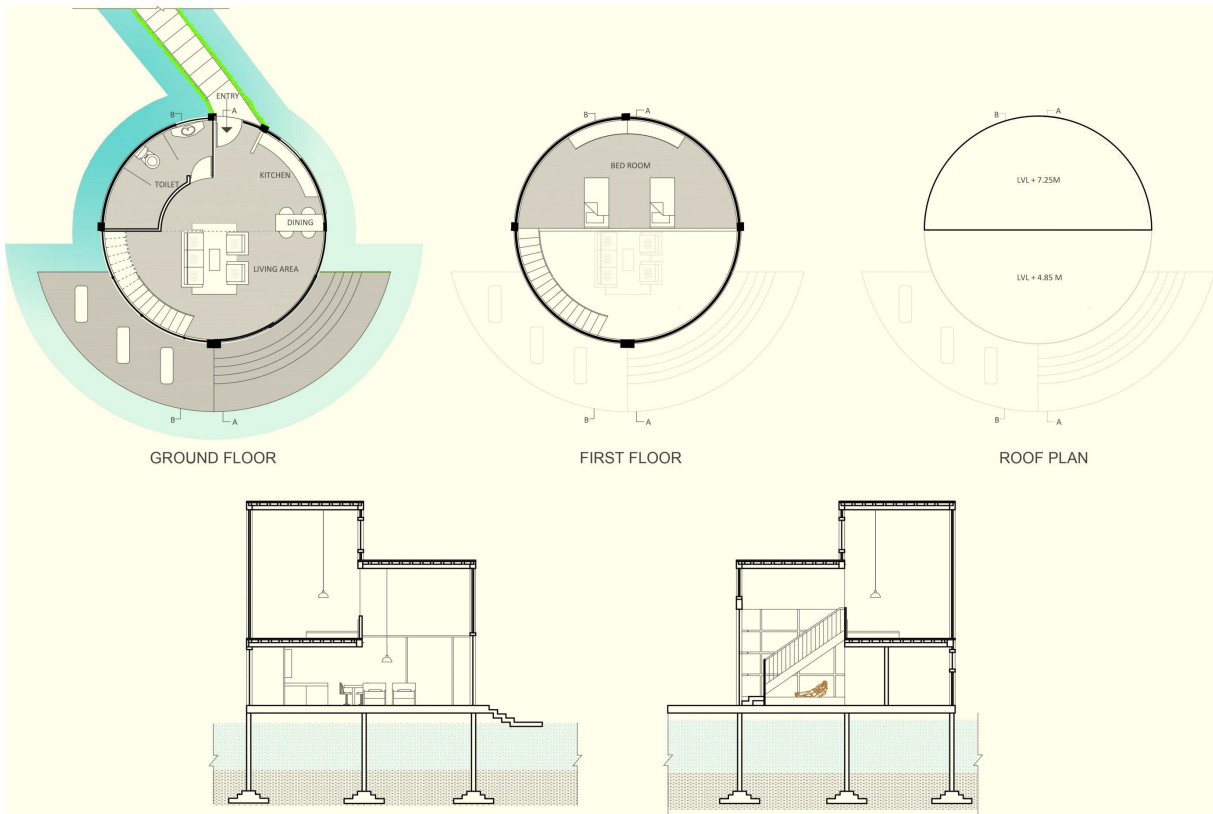


FIG. 03. House for 2 people

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KANTI SONAM ALLIES

*I have done my research on 'Sustainable Projects'.*

*It changes my perception towards role of Architects. What i like about the architects on which i have done my research is that, How architects work on social, economical and regional issue and also doesn't compromise in it's aesthetic value.*

*While Architecture is often concerned with the formation of space through the composition of solids, architects like Phillippe Rahm believe in designing the climate. I think it is a new concept in the field of Sustainability. Sometimes we just look over the small projects of these architects by refering famous architects, but this research procures enlightening these small projects of architects and makes me think beyond the physical structure and how small projects can also be leave the essence of architecture.*

*By doing design projects with prof. Joaquin Contreras, I have learned some local technics and method of Spanish architecture. I would like to thank my prof. for giving me such an interesting topic and help me to do my research work. During the research we travel the other part of Europe also and got the opportunity to explore its architecture. Cartagena is very beautiful city to live and I am very happy to be part of UPCT and this whole program. All the persons and professors attached with this program was very helpful and responsive. I would like to thank prof. María Mestre for always been so supportive and responsive and I would like to thank UPCT to provide us a such a great platform for our future.*