CHAPTER 13

Spatial Conceptualisation as a Foundation for Social Interactionism in Virtual Worlds

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Introduction

In a world relatively recently immersed in the virtual domain, sprung upon unsuspecting newbies still struggling to understand what a 20k computer could deliver, few anticipated the massive change that was about to be wrought by technology. One generation later and new opposing dichotomies still exist: the techno-centric world and those techno-phobic or the still skeptic. Those lucky enough to be caught in the revolution understand the realities impinging on both worlds, but those lost in the analogue reality and the new generation that grew up with virtual access seem to be lost in their own concept of space. It is difficult to conceptualise living without the digital version, but such is still a reality for some who still cling to hardcopies, atlases and paper, whilst equally perplexing that the new generations do not access such but immerse themselves in virtual worlds that may yet represent real space, which in turn has resulted in the loss of linkages to the real world. Case in point is the need to establish mental connections of place between the two worlds: the availability of online map services, but few really understand their physical space and the inherent relationships between the players in their routine activity.

The scope of this paper is to visualise a socio-technic approach that creates virtual worlds that are understandable to new users, those who have yet to venture in the virtual immersive domain and build their worlds for eventual interactivity. It is futile for the social sciences to continue their century-old practices when dealing with the realities of the new society; counseling, sociology, social psychology, criminology as well as other natural sciences inclusive of medicine cannot abide by. Their need is imperative to understand the new domains in order to come up with new actions to understand the interactionism pertaining to the new societies that inhabit apparent alien domains. What Tim Berners-Lee unleashed in 1989 (1) through his world wide web (WWW) proposal (Berners-Lee, 1989) is still under study, even though it has taken over social change. This paper posits a process employed in Malta to bridge the gap, by creating a seed that transposes the real and understandable world to the uninitiated through the creation of a place they understand: a map of the islands.

In Search of Space

Access to online tools and information has spread rapidly, with inter-generational access to services such as email, browsing, recreation and retail, amongst other activities. The access itself is made available through 2D or pseudo-3D, though 3D technologies are emergent. Interestingly, the knowledge of place features highly in daily activity, exiting one's dwelling, travelling to school/work/recreation, walking in known places, returning home until a pattern is established. Such known places take on a concept of space due to the interactivities with one's social and psychological interactionism dynamics: meeting people, congregating and interacting with significant others. Such is the reality of known space that specific theories such as Routine Activity Theory (Cohen and Felson, 1979) have sought to understand how people interact in everyday life and how others study such interaction of their illicit deeds.

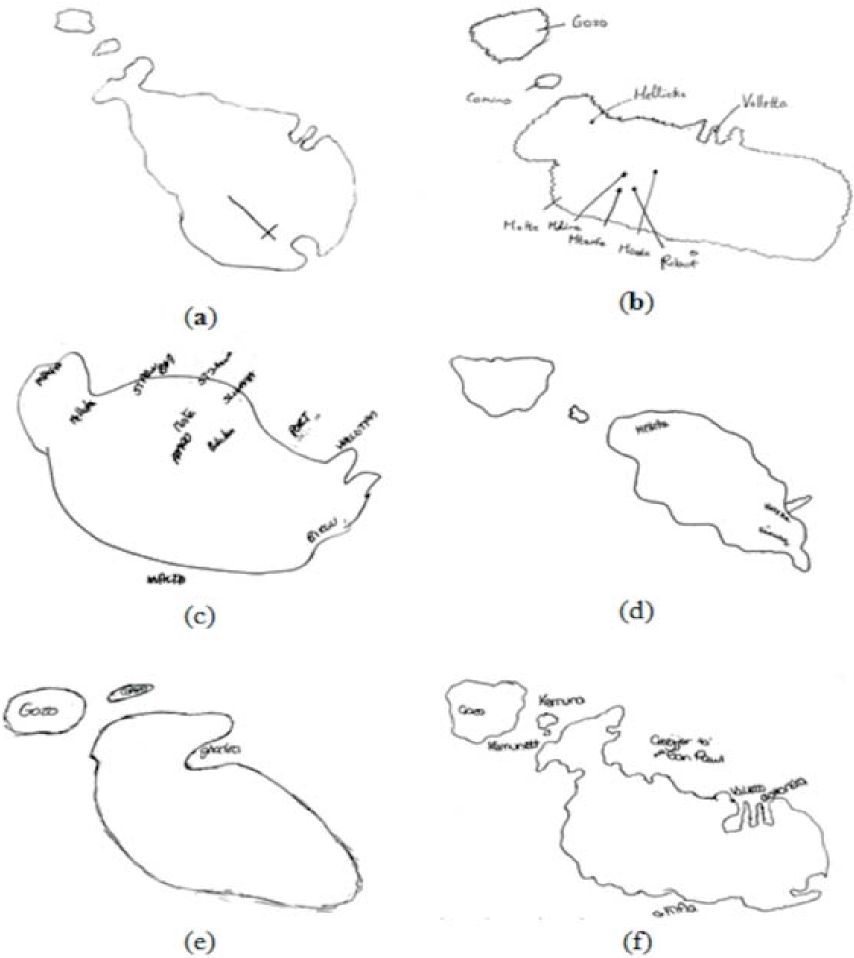
This concept is established as the basic tenet for the porting of the real world to the virtual one as it is one that is experienced by all, non-technics and the technic generation.

Such is the best concept for analysis as this physical interactionism is taking on a parallel shape in virtual worlds: meeting in known spaces in such worlds as 2D constructs as are social media (Facebook is an example) and in 3D constructs such as Second life. Gaming enthusiasts have attempted to bridge the gap with such creations as modules or files that depict some kind of known place (SimCity), the Sims, whilst others have taken on a national dimension (such as flight simulators) (2), though on an ad hoc basis and rarely immersive. This study depicts the steps taken to establish a dataset that establishes a baseline structure for world building, through the transposition of the known space that all generations are cognizant of, or at least cognizant of the known space. The creation of a national-level dataset encompassing the entire Maltese terrestrial and bathymetric (up to 1 nautical mile from the baseline coast) zone, should enable users to interact in worlds that can be related to the real world, whilst allowing for the creation of new scenarios for the academic and professional domains, wherein they can create scenarios both for social and physical change, as against sole gaming. The main scope for testing this in a gaming scenario, was also facilitated through the availability of technology development in this field that moves away from high-end expensive proprietary systems to low-cost and highly accessible systems created for the game engine evolution.

Understanding Interactive Space

The initial steps to understand known space was accomplished through an introductory study on how far users are aware of their known place. Whilst the wider scope was aimed at understanding whether users know the reality around them and in the wider spaces, the focus was maintained on the knowledge of national space through the depiction of the national map of the islands. Studies show that such a process is highly difficult for all users (Grasland, 2007), the higher the expected perceived space is investigated. The study included the depiction of a map of the World, a map of Europe, a map of the Maltese Islands and a neighbourhood map.

Figure 1: Islands' depiction across the age groups



As knowledge of known space deteriorated with wider places and due to the fact that it is difficult to verify the neighbourhood-level accuracy, the Maltese Islands level was deemed best to understand how far they know their real space.

The findings were surprising due to the fact that such an image was abstractly defined but highly erroneous in detail enhancement. The need to create an environment that was both national (in order to aid users become cognizant of their space) as well as highly detained an recognizable at their 'neighbourhood' level was established. This was required to ensure that such knowledge is not lost of the subsequent generations, whose daily activities are increasingly more virtual with lessening forays into the real physical world (Virtual Human Interactive Lab, 2014).

Figures 1a-f depict some maps drawn of the islands, with Gozo faring worse than Malta, the latter sporting the classic fish-shape depicted in classic accounts. This outcome is found irrespective of island of provenance, but shows the difficulty encountered in the transforming a thought process (mental shape) into a meaningful image. And this is bound to get worse as successive generations are losing touch with the physical world and entering the neo-geographic one situated in virtual space.

Creating the Virtual Spaces: First Steps in DIKA

The acquisition of the concept of space is an essential requirement for immersive migration from the real to the virtual worlds. Knowledge of space and place posit a hard-to-acquire concept for the non technological person. The move from a techno-centric reality to a socio-technic one has aided the transposition of the non-technic disciplines to take up the virtual environments as the next level interactive domain. The resultant knowledge gain is yet to yet fully established, as technology has outshone the actual transition, with most disciplines still struggling to understand the shift. This paper reviews the issue of knowledge of spaces, the efforts made to acquire a reality-to-virtual transition, as pushed through the establishment of a spatial information system. The DIKA model detailing the datacycle process was employed in this process through its data acquisition of real world coordinates, it being given a meaning through spatial information systems as are GIS, its conversion to 2D environments (raster mapping) and in turn to 3D space (vrml, obj, stl) as a knowledge markup (recognition of known space in the virtual environment and the final action process employed to create the interactive space through a gaming engine).

Conceptualisation and Actuation: the ERDF Mechanism

The data used in this study was that emanating from a major project funded under the European Regional Development Fund (ERDF), specifically through the project entitled Developing National Environmental Monitoring Infrastructure and Capacity (MEPA, 2009).

The project's baseline data was acquired specifically for the terrestrial and bathymetric areas of the Maltese Islands which also included innovative imagery captures such as oblique imagery and Light Detection and Ranging (LIDAR) data. A bathymetric survey of coastal waters within 1 nautical mile (nm) off the baseline coastline, complemented the survey. The data capture included the following outputs:

- LIDAR Scan: Terrestrial (Topographic Light Detection and Ranging);
- Results - Digital Surface Model (DSM) and Digital Terrain Model (DTM) (316 km.sq);
- LIDAR Scan: Bathymetric aerial survey - depths of 0 m to 15m within 1 nautical mile from the Maltese coastline (38 km.sq) – capture was reliable up to 50m depth, highly exceeding requirements;
- Bathymetric Scan: Acoustic (side scan sonar);
- Digital Surface Model and an acoustic information map of sea bed (415 km.sq);
- High resolution oblique aerial imagery and derived orthophoto mosaic and tiled imagery of the Maltese Islands (316 km.sq);
- Satellite imagery (GeoEye, RapidEye, Quickbird) (316 km.sq).

The outputs were made possible through a the creation of baseline data having a sole aim of the provision of an Open Data structure where the series of 3D aerial and bathymetric surveys which will facilitate the dissemination of data to the general public.

GIS and Integrative Results

Spatial Data, or geographical information systems, refers to those information streams that deal with location: data as it is related to a point in space. These are generally known as geographical information systems that allow one to view data in the form of a static image, a dynamic map or an online interactive system. Systems in place include the MEPA mapserver, the ERDF SEIS (Shared Environmental Information System) (MEPA, 2009), the EEA geoservers, GoogleMaps, BingMaps and other similar systems. Since interactionism happens somewhere, the requirement for authoritative reference geospatial data is vital for all branches of central government. This necessitates the need for an increased awareness of the value of 'place' and 'location' as vital components in effective decision making and for linking public-sector information together. It is important to distinguish between levels of reference maps:- while free or web-based mapping are sufficient in locating the nearest restaurant, central government dealing with national and societal interests, and in some cases life-critical situations like disaster management, requires authoritative and quality-assured geospatial data at a national level. Taking this process to the next level; that of interactionism within a virtual world, one can operate through an interactive engine such as a gaming application, The latter serves as a higher-generation tool that sits on the proprietary or GI-domain technology (Formosa, 2012). The creation of such technologies follows various legislative transpositions from European Directives or United Nation conventions such as SEIS (European Commission, 2014), GEO - Global Earth Observation

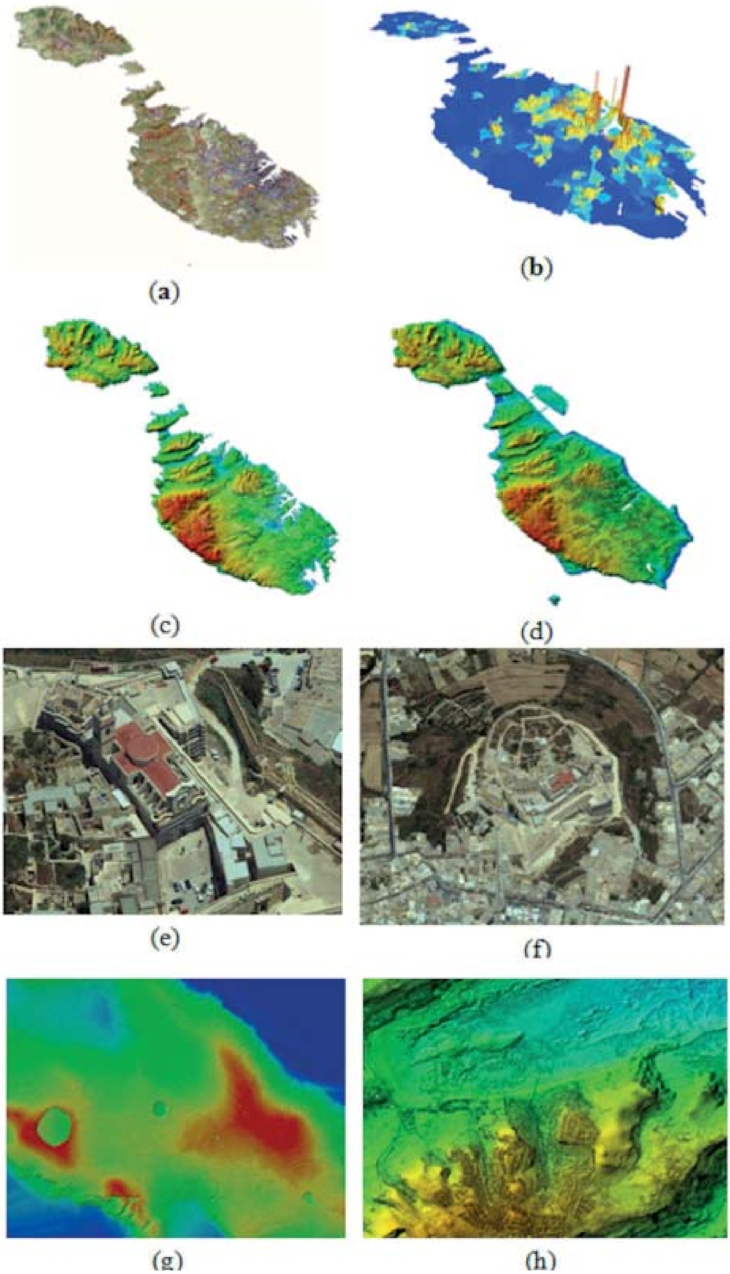
(GEO, 2014), PSI - Public Sector Information (OJ, 2003a), INSPIRE - Infrastructure for Spatial Information in the European Community (OJ, 2007), Aarhus - Public access to environmental information (OJ, 2003b) and FOI - Freedom of Information (Government of Malta, 2012).

Whilst GIS allowed for a visualisation basal-output, in order to process the data for immersive analysis, a number of steps were required to integrate different datasets inclusive of satellite imagery (Figure 2a), thematic data (Figure 2b), terrestrial lidar (Figure 2c), terrestrial and bathymetric lidar (Figure 2d), orthoimagery (Figure 2e), oblique imagery (Figure 2f), underwater data points (Figure 2g), and multisource data integration (Figure 2h).

The process to establish an integrative interactionist medium has long been the target, particularly due to the fact that for one to target Open Data structures, a strategy is required to ensure the uptake by all entities involved in the process to acquire, share and integrate data. The current scenario where an ad hoc and sporadic framework exists is untenable, even more so when Malta is required to establish its requirements based on the INSPIRE Directive and Malta's subsequent transposition of the same Directive. GIS technology is very useful, allowing many different departments and the public access to the same basemaps and database. This means that each entity does not have to keep separate versions of other departments' maps and data in order to use them for their own needs. Features or attributes need to be modified and updated on only one basemap and database and then be shared by everyone. By creating a shared database, entities and the general public benefit from the work of each other. Data is collected once and used many times. Departments can portray mapped information at whatever scale they require, using the colours or symbols they want and accompany the maps with text and reports tailored to meet their needs.

Through international processes such as GEO, governments and their agencies are utilizing GIS technology because it offers a way of understanding and dealing with complex spatial problems by organising the data, viewing their spatial associations, performing multiple analyses, and synthesizing results into maps and reports. This has now become a prerequisite for international collaboration and data integration, such as the EU's activities to ensure data harmonisation; one such example being the creation of the Corine Land Cover across all the EU states and neighbouring countries. Other works relate to ESPON (3), CDDA (4), bathymetric and terrestrial data gathering through GMES (5), GEO, (6) GEOSS (7), Copernicus (8) and other initiatives.

Figure 2: Integrative Steps

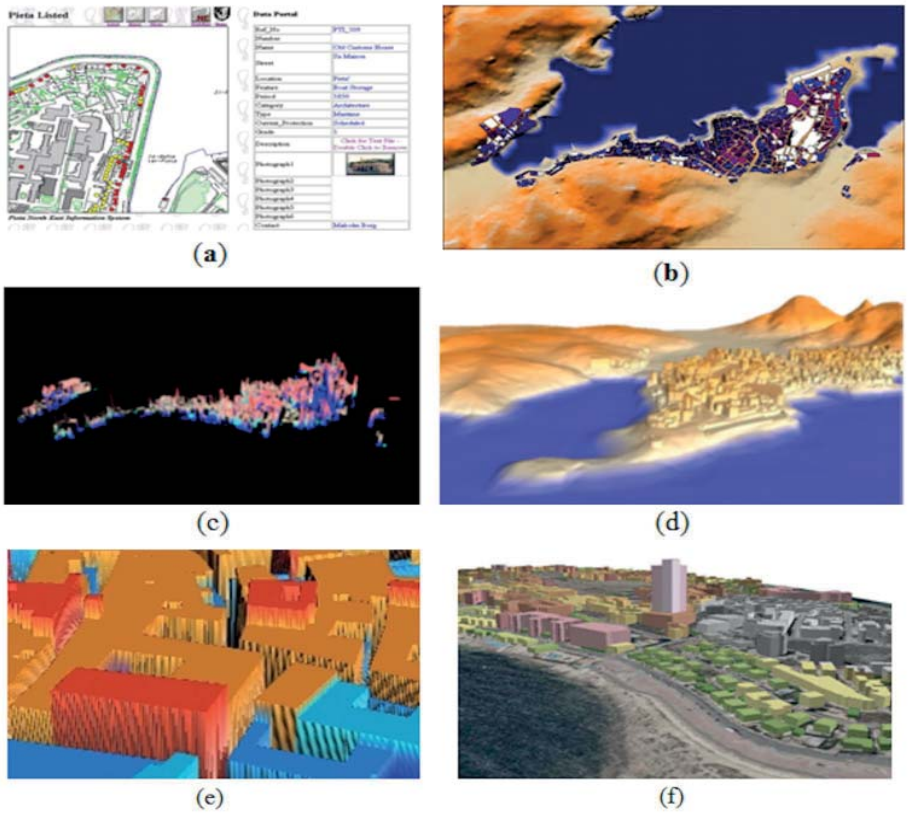


Transposition from Isolationist Domains to Immersive Virtuality

Stepping into the void

Malta's forays into the integrative aspect were initiated early through an initial project employing Census image-mapping exercise incorporating a webGIS option which was initiated in the mid-2000s (Borg and Formosa, 2008) (Figure 3a). This activity was followed by initial steps to take the 2D option to a 3D one, hampered at the time by available technologies, particularly the crude raster-mapping tools available, which rendered images in low-resolution modes for such analysis as illegal development (Figure 3b), pseudo-3D height analysis (Figure 3c), normalized data extraction (Figure 3d), the first height-data and imagery integration (Borg and Formosa, 2008) (Figure 3e) and early 3D systems employing ArcScene (Conchin, 2005) (Figure 3f).

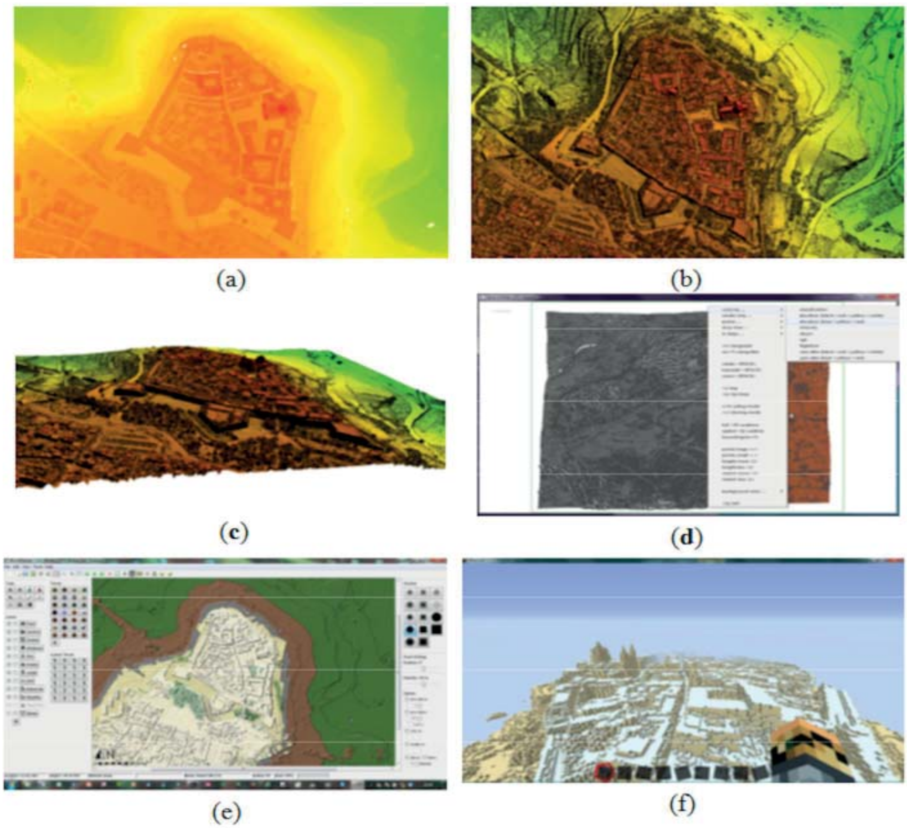
Figure 3: The transformative process



Are there enough blocks?

The process analysed for this study related to that employed in the conversion of various datasets emanating from the ERDF156, a process that required the transposition of the bathymetric and terrestrial data from a lidar height point to a 3D visualisation structure. This was initially taken up through the implementation of lineage protocols that recorded the steps undertaken in line with the INSPIRE Directive, to be followed by a series of analytical processes (3d-ification) that converted the lidar data depicting the citadel of Mdina (Figure 4a) to a raster image or a tin file (Figure 4b) that is viewable in a 3D format. The raster image is cleaned of outliers and ported to a bridging application that converts the raster imagery to the respective format for immersive experience. Two applications were used for this process with the converter being Worldpainter (Figure 4c) and the game engine being Minecraft (Figure 4d).

Figure 4: 3d-ification process



With the potential for rapid expansion of the virtuality to other domains, inclusive of other gaming technology, such as Unity3D, the age-old Simcity take on a specific dimension for social interactionism, particularly as the generational shift towards virtuality is made complete. In term of GIS technology, this development could also result in gaming integration in these information systems, allowing for scenario building and testing, a step above today's dedicated thematic modules that allow one to view but not interact.

On the other hand the porting of the reality domain to the masses is already here.

Conclusion

Social interactionism and place have been found a strange bedfellow, with gaming technology bridging the perceived abyss between the social disciplines and the nature of the technological beast. They study sought to understand those tools that could be used to turn a concept of place into a research tool for spatial analysis, with gaming engines being the best placed for such interactivity. Geographical information systems may have sought to bring visualisation to socio-technics and the general public, but the inherent learning curve posited a problem for interactivity. Gaming applications and intermediate conversion tools served the basis for the push to the creation of virtual worlds that are loyal to the real one, inherently due to their being resultant of real world coordinates.

The resultant recognition of place within a virtual world in turn helps to create a legacy of space, knowledge and recollection of moments in time should informational packets be tagged to the 3dimensional points.

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Notes

(1) Available at: http://www.w3.org/History/1989/proposal.html (accessed on 30 March 2014)

(2) Available at: http://www.maltascenery.net (accessed on 30 March 2014)

(3) ESPON – European Spatial Planning Observatory Network

(4) CDDA – Common Database on Designated Areas

(5) GMES – Global Monitoring for Environment and Security

(6) GEO – Group on Earth Observations

(7) GEOSS – Global Earth Observation System on Systems

(8) Copernicus – Previously known as GMES, is the European Programme for the establishment of a European capacity for Earth Observation