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INNOVATIVE TECHNOLOGIES FOR TEMPORARY ARCHITECTURE

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Introduction

New demands of mobility on the territory are caused by a more and more pressing condition of social instability, due to changes that have upset the human beings in the last decades (local crisis, civil and military fights). This condition together with the increasing frequency of natural and environmental disasters of our planet, also due to the overwhelming exploitation of environmental resources, causes a situation of ever growing living emergency which needs flexible housing solutions, fulfilling different people needs.

As a consequence of such situation, the academic world is deeply involved in its task of transmitting knowledge and of awaking the new generations to problems which need immediate solutions, even in the field of architectonical design.

One of the spheres inside project experimentation, which allows to check environmental fitting of handworks, techniques, building procedures and materials, is that of temporary architectures. If properly used, they exploit environmental resources without determining territorial irreversible transformations thanks to their intrinsic peculiarities.

Light structures and wide functional purposes are needed to satisfy the necessities of new forms and ways of living. Temporary buildings are required not only for living emergencies (due to earthquakes, floods, landslides etc.), but also for refugees, exiles, migrants, nomads, homeless housing units. Moreover, they can be useful for parking-houses (used in urban changeover and recovery cycles), accommodation facilities for itinerant tourists, support systems to mass demonstrations and so on.

The requisites that have been basic for temporary architecture design until now are the result of an integration among traditional building design elements (such as environmental comfort, durability, safety, hygiene) and light prefabrication specific needs, such as lightness, handiness, assembling and dismantling without any specialized labour, storage, equipping, modularity, retrievability.

Today, in accordance with what it has been written above, the need of a serious analysis on the environment and technological aspects rises also in the project approach towards temporary building typologies. Therefore, there is the need to include among requisites of temporary architectures those related to the use of environment fitting materials and of technologies based on the use of renewable sources, considering the concepts of bioclimatic design.

They are low energy consumption materials and products, both in production, placing, removal and draining. They don't emit dangerous substances, having easy maintenance, reusing and recycling characteristics. They use solar energy as a source of heat and light.

Many designers had been interested, in the past, in temporary architecture. They applied the results obtained from research and experimentation of new materials and techniques to the elaboration of their proposals. A meaningful example is given by R.B. Fuller. Since late 20's, he has been making researches on possible housing solutions to be realized with light prefabrication and using technologically advanced materials. For his temporary houses, inspired by technological utopia, he uses corrugated plate, steel, aluminium, plexiglass, corrugated cardboard, but also mineral wool insulations, polyester resins, plastic. The dangerous effects caused by the use of some substances had not been known yet. In the past, even in transitory housing system designs, some materials with direct harmfulness on people have often been used.

Even today the materials used to build temporary houses are still scarcely controlled, showing themselves to be not suitable or dangerous for health, even after some time, causing illness to people and operators who follow the working placing and dismantling processes. Some products need superficial treatments that can be dangerous because of the injurious dust and exhalations, They can also be flammable and toxic in case of fire or provide condensate provoked by a wrong choice of material stratifications making the sandwich panels.

The components used for the realization of temporary housing are in fact, in most cases, multilayer panels, obtained by gathering together two external layers, of different kinds (plastic reinforced by incorporated fibreglass, steel, aluminium, wood, etc.), which protect a more or less structural core. They are completed by one or more insulating material layers, generally made up of synthetic material or mineral wools. As far as laying and use of all mineral wools are concerned (glass wool, dross wool, rock wool), dangerous effects on health have been discovered, for example skin, eyes, mucosal and breathing irritations, as a consequence of the inhalation of fibres released by panels, after a period of time. It is for this reason that these insulators have been covered with protective, no-emitting elements, which created a steam barrier. This provoked condensate, preventing the outing of humidity coming from internal rooms.

Many containers used by Civil Protection as emergency houses showed to be very harmful for health due to high inner condensate produced inside the rooms. They quickly became dangerous places to live in.

In transitory architecture a new behaviour can recently be found. It deals with the realization of houses which are thought for inhabitants' wellness, taking also into consideration ecologic and environmental quality. One of such criteria to achieve that aim is the use of materials with low energy consumption, easy maintenance, reusing and recycling characteristics. They must be, above all, without any dangerous emitting substances in all their life cycle: from production to placing, and finally to removal. It is very important that technological innovation applied to temporary constructions is realized not only in studying but also in experimentation of materials and techniques that can satisfy the technological requested requisites of this type of design. A deeper attention and awareness of their choice and use is also necessary, so that with equal performances, they can guarantee a less strong environmental impact and a more care for health and energy consumption.

The design proposal presented here want to show the experiences had in the Course of Environmental Design of University of Architecture in Palermo, with the cooperation of university students, dealing with studying and applications of new technological solutions for the realization of transitory and ready to be used housing systems.

Modularity, sustainability and lightness in temporary architecture: A.L.A.P.A. Project

Project proposal by StefanoGervasi, Serafino Giannola, Salvatore La Versa.
Professor: Tiziana Firrone
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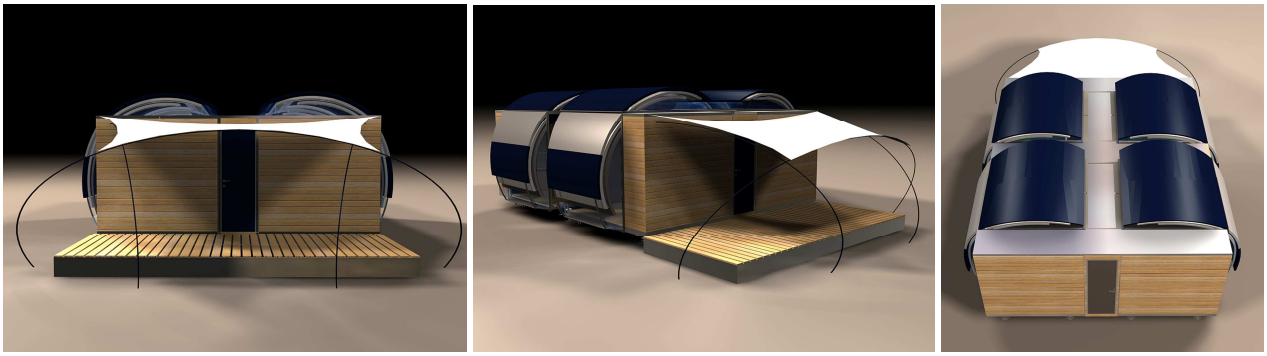
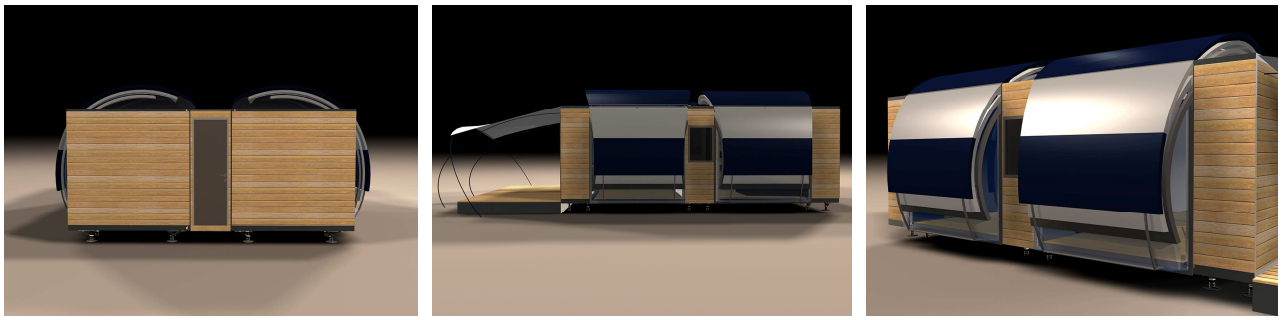
The living module **A.L.A.P.A.** (**Architettura Leggera Autonoma Provvisoria Aggregabile**) is an example of dwelling system used for transitory housing, organized and studied to meet peculiar living and environment needs.

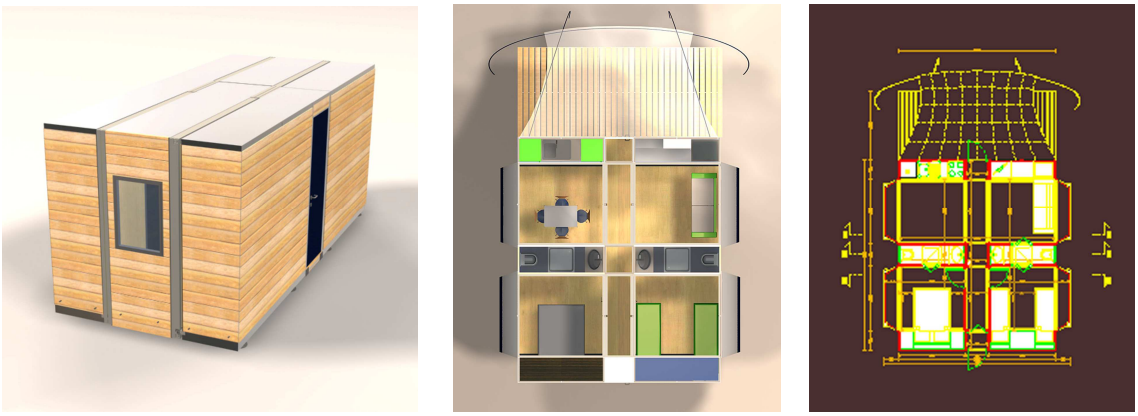


Front, side and top views of A.L.A.P.A. project



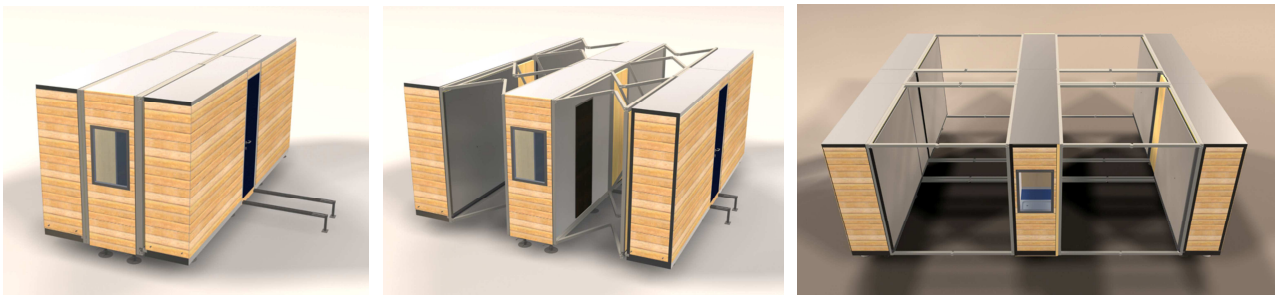
Front and side views of A.L.A.P.A. project

The main aim of the system is to pursue high performance levels in transportation, assembling and using.
The maximum obstruction, during transportation, is a volume of 5,60 X 2,40 X 2,40 m. satisfying the standard sizes of road, railway and ship transportation. In use, the module occupies a surface of about 40 square metres, enough to host a family of four-six people. The weight of the closed module is suitable to the moving procedures done with ordinary instruments.



Closed module, module in use and plan

The realization of foldaway supports, put at the basis of the structure, allows the easy placing of the housing unit on the ground, even if the ground is in bad conditions, without any need of a levelled surface or other basic works.
Its easy and quick placing is obtained through a structural system realized with steel arms, which are foldable through square hinges. This system is the frame on which the panels forming the walls and the floor are set.
These panels are hinged in fixed blocks and can be reversed when the structure is completely opened.



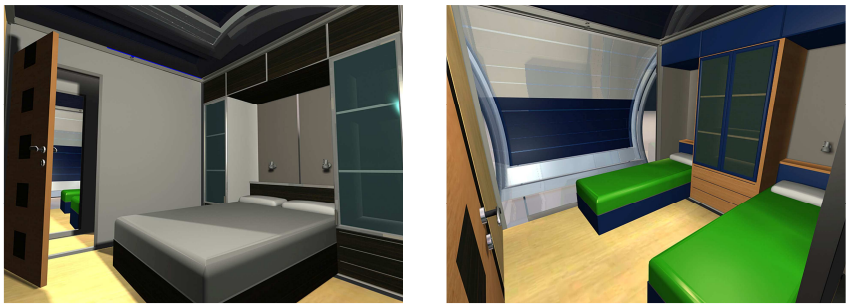
Module development phases

Module development phases and structural system for the housing unit opening

The realization of foldaway supports, put at the basis of the structure, allows the easy placing of the housing unit on the ground, even if the ground is in bad conditions, without any need of a levelled surface or other basic works.

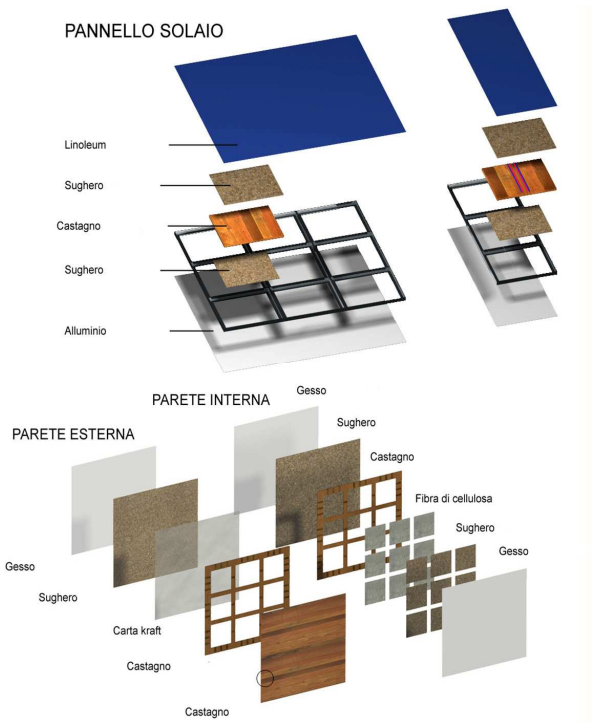
The module has got all the important components inside it (technological unit, bathroom, kitchen area, basic furniture) and anything necessary for the working of the unit, both in autonomy and in an dwelling system.

Daytime internal views

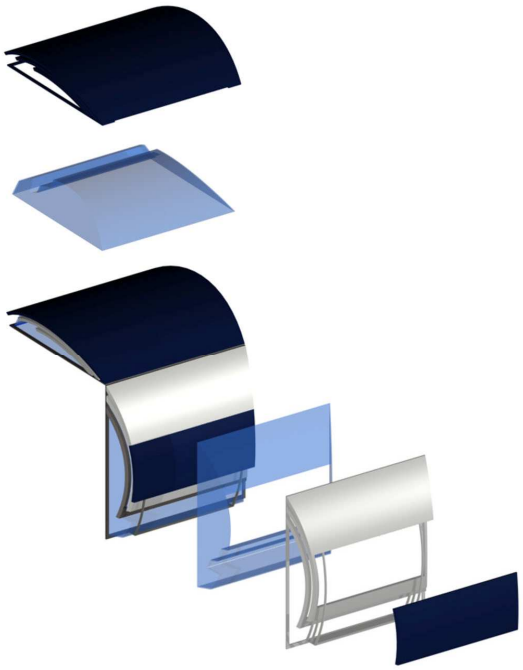


Internal view by night.

The supporting structure is provided with steel section bars.
The outside closing and floor system is that of “sandwich” panel: single blocks are suitable to each other and can be put one on the other; the lateral walls, composed by panels that can be dismantled, allow first to suit and then to get the single module back, to replace a ruined panel, to change a panel with openings with a blind panel and inversely.
The sandwich external closing walls are composed by a supporting structure realized with chestnut lists, a chestnut external panel, an internal plaster covering and an insulating cork core.
The internal divisors are insulated with cellulose fibres covered in both sides with plaster.
The floor is composed by a supporting structure realised with a recycled aluminium section bar and square chestnut panels, insulated with cork and covered with linoleum.
The chestnut external panels are covered with natural resins.
The covering elements “casings” are realised with recycled aluminium closed by polycarbonate panel. This casing guarantees both indirect illumination and the ventilation within the rooms. This ventilation is obtained by a sliding system which consent the opening of the upper part of elements covering the external panels.
The covering elements are carried inside a principal container, which is used as an entrance to the housing system in use.
The furnishing elements are realized with environmental friendly materials. They are in sealed containers and can be reversed when the structure is fully opened.
The hydraulic and electrical systems are under the floor and the partition panels.



Stratification of panels' components



Covering element with sliding system

A technological unit lodges the main technology devices for wiring, heating and all other instruments necessary in guaranteeing the total autonomy of this temporary architecture.
The photovoltaic panels doweled on the covering panels produce the electrical energy necessary to guarantee the self sufficiency of the living module. Electric energy is accumulate in storage batteries located within the technological unit. Each unit is sufficient for two lights.
A system of solar convectors guarantees climatization and sanitary hot water production.
The project also involves rain water gathering and recycling and a grey water recycling system.

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