

1.1. TYPES OF TURKISH HOUSES

Although the houses are named differently in different regions, these houses have basic properties similar to each other which can be grouped within typologies. The regions in Turkey mainly take place in mild temperate zone even though they may have great differences from coastal to inner regions and from north to south. These differences cannot be seen in the plan types (figure 2).

Mostly each house has a space suitable to use in summer and another in winter. In some cases houses are suitable and used both in winters as well as in summers and second houses are used (for example: summer palaces “kasır” in Mardin or upland houses in Black Sea region.) Coastal and inner regions have different climatic and geographic properties. Also coastal regions have affected by external influences as well as local ones.

Eldem stated that fifteen different types of houses can be counted and it can be increased with a more through classification but the differences between these types are mostly details and specifications (1984). In other words, in a more general point of view the houses can be assembled in seven groups: (figure 2)

- Blacksea shore hinterland region
- Istanbul and Marmara region
- Aegean hinterland region
- Mediterranean region
- Central Anatolia region
- Eastern Anatolia region
- Southeast Anatolia region

Eldem also stated that Istanbul and Marmara region have a special place of importance among these regions and called Istanbul house as a “pure” Turkish house because it has the most characteristic quality seen in Turkish house.

1.2. MATERIALS AND CONSTRUCTION METHOD:

The most distinctive factor for the formation of the houses is the material as well as the most characteristic factor for the usage of the material is climate and environment. The climate affects the creation of natural material and houses are designed appropriate for climatic circumstances. It is not a coincidence to build a masonry house in South-east region, in which timber is rare and stone is generous. Also masonry building supports to create inner spaces with natural ventilation and suitable for the regions’ climatic conditions.

The main materials for the houses are mostly wood and stone. The types of wood and stone may vary according to the region and they play a great role in the construction system. (Günay, 1998)

1.2.1. Timber-framed houses:

- They are the most characteristic types of Turkish house.
- They are mostly 2-3 storey’s high
- In the ground floor masonry or wooden pillared structures are mostly used.
- In the upper floors the frames are wooden which can be varied through the region.
- The filling material also differs. Local materials are used as filling material: adobe, clay, brick, stone, earth etc.
- They are mostly built in the areas where central government is strong. They are also built in the regions near the coastline and some inner regions: Marmara, Aegean and Black Sea.

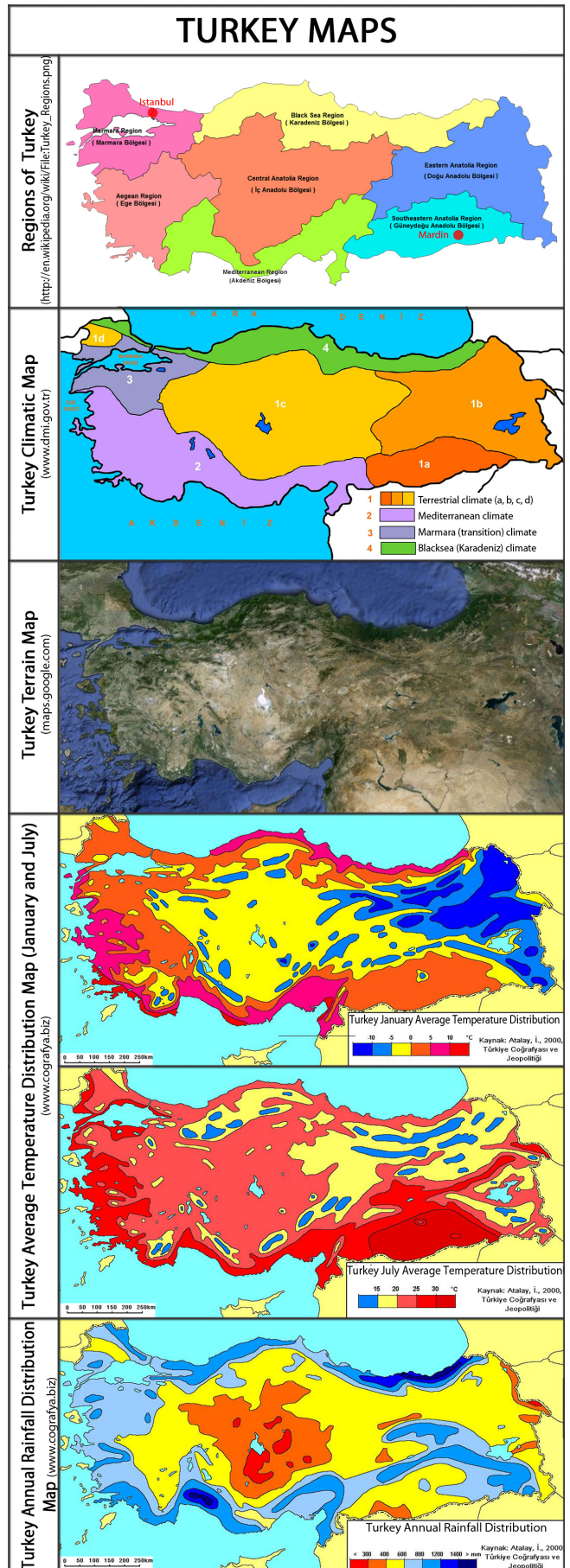


Fig 2. Maps of Turkey

- Although rarely seen, totally wooden constructed houses also exist. They are mostly built in forestry and mountainous areas where it is rainy and wood is an easy material to find. For example: In some middle and east regions of Black Sea.

1.2.2. Masonry houses

- They are mostly 2-3 storey's high
- Stone is the main material which can be varied through the region.
- In some of the houses wood is used inside the houses as a decoration material or for roof.
- The houses have courtyards, atriums, cloisters or similar open and semi-open spaces.
 - Inner regions of Anatolia, Cappadocia and Southeast regions:
 - Mostly ashlar wall or cut-stone wall covering is used.
 - The houses have courtyards, atriums, cloisters or similar open and semi-open spaces.
 - They mostly have flat-roofs and terraces.
 - Aegean and Mediterranean regions:
 - Rubble wall with mortar is used.
 - They mostly have flat-roofs or hipped roofs.
 - Some of the houses have wooden oriels.
 - East regions:
 - Rubble wall with mortar and wooden beam is used.
 - They mostly have flat-roofs.
 - Near the Taurus Mountains:
 - Wooden beam and rubble wall with mortar (dry masonry) are used.

Apart from these there are several special and traditional methods such as beehive adobe houses in Harran and cave dwellings in Hasankeyf.

Most of these houses were designed with the local material and suitable construction method. They were designed to be in harmony with climate, topography and environment. They were evolved and developed over time as the cultural, social environment and needs have changed.

1.3. FORMATION OF TURKISH HOUSE AND ROOM AS THE MAIN ELEMENT

Turkish house, in respect of the geography it had spreader, have always been in the center of dualities: south-east, analytical-synthesis, concrete-abstract... In this sense Turkish house is a unique synthesis which is formed by our inner world and at the same time has a surprisingly analytical structure. (Yürekli and Yürekli, 2005) Therefore the elements that create Turkish house are both functional and have philosophical and symbolic meanings.

A classical Ottoman city differs from a classical Greek City. The houses are not settled on a grid plan. On the contrary, streets have formed after houses have been built. The sizes of the streets were derived from human size and climatically reasons. Hot and/or rainy regions have shadowy and protected narrow streets. Social structures affect the spaces. The houses were built introvert and on the ground floors mostly garden walls or services were placed. On the upper floors there are spaces extrovert which have windows. The houses were built respectful to each other. They didn't block each others sun, wind or view. The design of the house evolves from inside to outside. (Bektaş, 2007) They are minimalist, sustainable (local material is used compatible with the environment) and rationalist. And also many

scholars highlighted Turkish house as to have many principles of modernism. (Eldem, 1984; Bektaş 2007, Yürekli and Yürekli, 2005; Bozdoğan, 2007) All those principles emphasize that Turkish house is not only functional but also reflects the life philosophy, design and technology.

Traditional extended family order influenced Turkish house. New rooms or additions can be done while the family expands or house or rooms can be divided in need. With this flexibility Turkish house became open to expansion and development. Mostly ground floors are used as service spaces, while upper floor have rooms, "sofa", "hayat" and "eyvan". Sofa and hayat are multi-purpose halls between rooms. House can be shaped by the type of sofa (Eldem, 1984) or hayat (Kuban, 1995). Eyvans are semi-open spaces between rooms. Expansions of the houses are mainly designed with the help of these spaces.

The main element of a Turkish house is the room (Yürekli and Yürekli, 2005). The size of the room is determined by the material and the size of the house is determined by the room. Önder Küçükerman stated that the origins of a room are based on tents and the properties of the settlements bore from the nomadic life style (2007, Figure 3) Rooms can be described as pure, light and multi-purpose spaces similar to tents. Rooms carry multi-functional purpose: eating, living, working, sleeping are all occur in the same room. Therefore there are storage units for different needs. Turkish House can be varied through details and material but rooms are main elements of the houses.

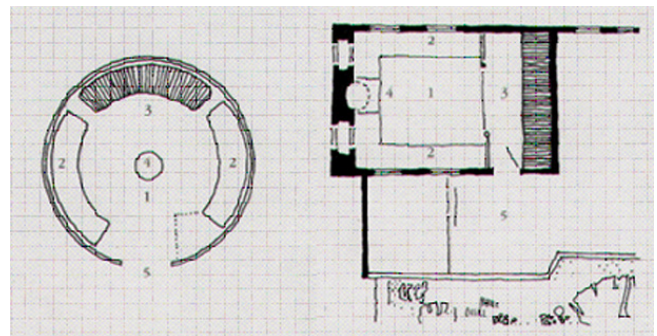


Fig 3. Tent and room (Küçükerman, 2007)

Turkish house mostly used standardized materials and modulation can be found on space-relations, windows, doors and other details (Yürekli and Yürekli, 2005). The constraints of the construction material help the modulation and standardization while on the other hand, a great deal of variety can be found both on the plans and on the details. This case can be seen as another type of contrast or duality: many different types of houses which were built with the defined, limited materials. In short, Turkish house cannot be degraded to a single type ignoring the variety of the houses; both in physical and in philosophical sense.

2. Mardin Houses

Mardin is a city in the south eastern region of Turkey. The old city is located on a sloping terrain looking towards the Mesopotamian Plain. The houses in the city are masonry and bear the main principles of a Turkish house (figure 4). The city has terrestrial climate, in which summer days are hot and rainless, while winters are snowy and cold. Stone as a material is a very rational solution as well as semi open spaces - eyvans.

Mardin is one of the well-preserved cities in Turkey with its unique masonry architecture. The terraced urban pattern of the city is an example of usage of traditional stone from Anatolian soil. New housing and improper additions to traditional old buildings are mostly endangering the houses as well as the heritage of the city itself.



Fig 4. Mardin (2005, Belinda Torus)

The houses are formed with rooms and eyvans where eyvans play an important role in the perception of the city. The open spaces like courtyards are enclosed by walls which form the street (figure 5). The scenery of Mesopotamian Plain and the orientation play an important role in the configuration of these units. The places cause different effects according to their inclinations and location. (Torus, 2005) The city as well as houses evolves in time according to the needs. The constraints of the masonry building system affected the size of the room.



Fig 5. A typical street in Mardin (2005, Belinda Torus)

The modular vocabulary of Mardin house consists of three types of spaces: open, semi-open and closed spaces (Alioğlu, 2000). Therefore the house grows primarily by adding a semi-open space (eyvan) and a closed space (room). In the center of a house there is a semi-open space (eyvan) which serves as a living and a circulation area. Eyvans serve as buffer zones both for climatic reasons and to support privacy. Closed spaces are the rooms that have kitchen, living space, workshop and bedroom functions.

There are three types of semi-open spaces which have different names (eyvan, revak, kosk) according to their relations with other spaces. Semi-open spaces are the main vocabulary of Mardin architecture. Mostly they are open on the south site overlooking the valley. (Torus, Çolakoğlu, 2009)

The inclination of the site and orientation toward the valley and south are dominant factors for the configuration of Mardin Architecture. The houses are oriented without blocking each others view, sun and wind. On the ground floor usually common spaces are found related to an eyvan or a courtyard. Kitchen,

living room, workshops and service spaces are the main functions. On the upper floors private spaces, bedrooms exist which were also connected with eyvans and terraces.

2.1. NEW HOUSES IN TRADITIONAL SETTLEMENTS

Bektaş stated that the new houses and residences built today in Turkey are intended to suit a different style of living. Bektaş also called this new period “influenced”, “integrated” or “modified” and a new synthesis, which have not matured at present, will evolve (2007). The new houses and residences are mostly built similar to each other, ignoring all the climatically, geographical and local influences which traditional Turkish house valued a lot.

New houses mostly lack the environmental and contemporary values, culture and social development. Number of houses built is the main concern so mass and rapid production is emphasized in which these recent settlements mostly ignore the functional and semantic values. As material and construction system, reinforced concrete and tunnel forms are mostly used. Local materials are not used and air conditioning and acclimatization is solved artificially. These types of houses are also built in Mardin and the cultural texture of the city is affected negatively.

Mostly three types of houses and residences built. Mass - produced repetitive single houses are built which lack the individuality and in some of the projects the size of the mass-production may cause overwhelming results for environment. Another type is apartment blocks which are built almost everywhere without considering any environmental condition and cultural aspects. And in most of the cases very close to each other (figure 6). The third type of houses is single houses, which are only imitations of the Turkish house again ignoring all the aspects except some formal similarities (figure 7).



Fig. 6. New apartment blocks in Mardin (2005, Belinda Torus)



Fig. 7. KIPTAŞ Turkish house (www.kiptas.com.tr)

3. Mapping and Interpretations of Mardin Houses

There are many scholars who studied and analyzed varied properties of Turkish houses. Some of these works are mainly focused on formal relationships of the spaces while others are focused on details like decorations on façades or window configuration etc.

One of the extensive studies in Turkish houses is the studies of Gülen Çağdaş. In this study, the shape rule schemata is used for characterizing formal compositional aspects of the historic style of Turkish houses (Çağdaş, 1996). Çağdaş presented the parametric shape grammar rules to develop traditional Turkish houses and re-generates them with the shape rules sets. Çağdaş also draws trees of different plan layouts with different types of halls (1996, figure 8). The formal elements and rules are described and different plan layouts of the houses are generated

within the limitation of these rules. While Çağdaş stated the general rules of Turkish Houses, Füsün Alioğlu presented the properties of Mardin houses (2000). The works of Çağdaş (1996) and Alioğlu (2000) draw a general frame for the formation of Turkish houses and Mardin houses. The information gained from these studies can be evaluated and interpreted in different ways.

Hakan Özbek evaluated the plans and derives the shape rule schemata of Mardin houses (2004). Özbek analyzed mainly ground floor plans and set the spatial rules (2004, figure 9). These rules are derived and are set in plans and schematized in a very abstract level mainly focusing on the spatial and formal relations. The relations between open, semi-open and closed spaces, relations for third dimension, expanding rules are all stated. Özbek designed new houses for Mardin using these rules and if needed set and used new rules (2004). The generation is made by a hand-made model (figure 10).

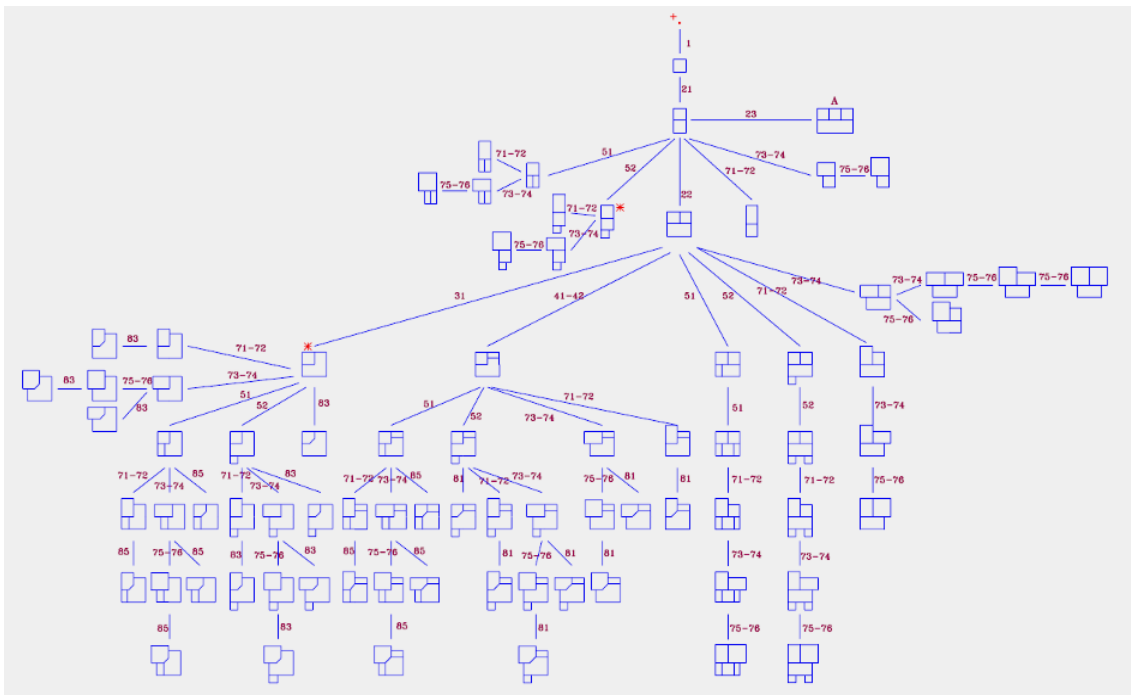


Fig. 8. Part of the tree of plan layouts with an outer hall generated by the shape rules (Çağdaş, 1996)

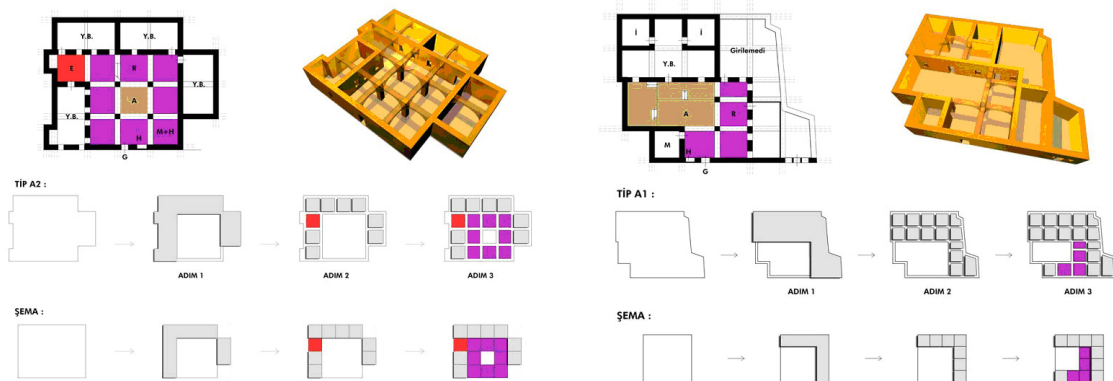


Fig. 9. Analysis of two different plan types (Özbek, 2004)

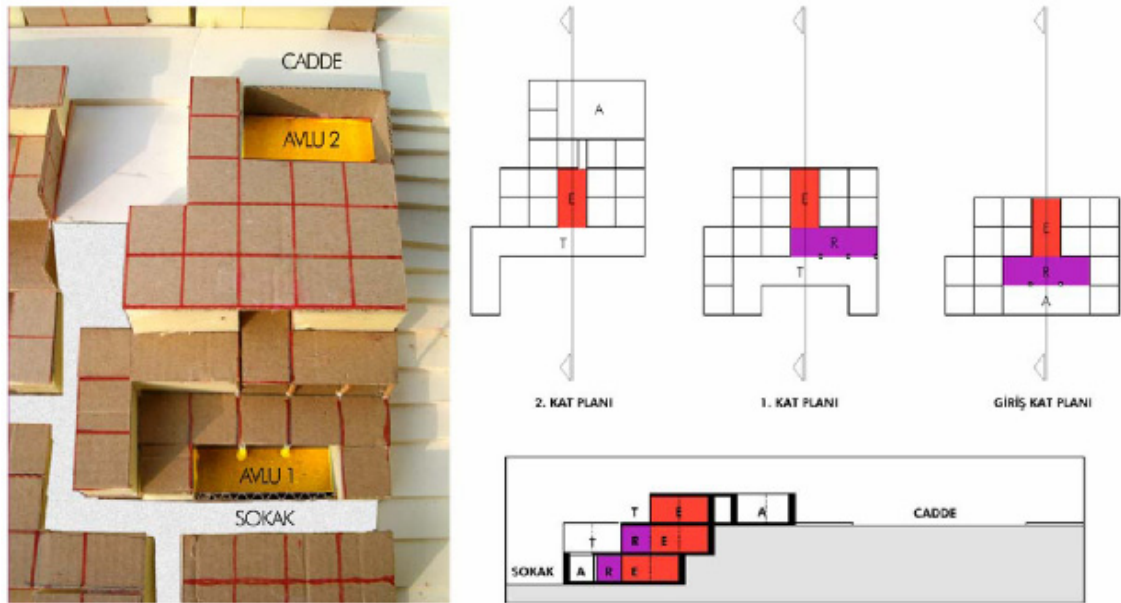


Fig. 10. Generation of new houses for Mardin (Özbek, 2004)

Similarly, Togay Özkaraduman also designed new houses for Mardin basically using the rules derived by Alioğlu and Özbek (2008). Özkaraduman added his own set of rules and designed the houses (2008). First the size of the site for a single house is set and divided into grids. The site is divided to 12 squares and half of the lot is planned to be open spaces (figure 11). Different houses are designed manually and the site is set for the houses to form a neighborhood with the designed houses (figure 12). Özkaraduman also detailed some of the plan layouts and interpreted them for contemporary users (figure 13). While Özbek generated by hand-made models, Özkaraduman used computer aided three dimensional models for the houses. These two studies are different interpretations of the same grammar by different architects.

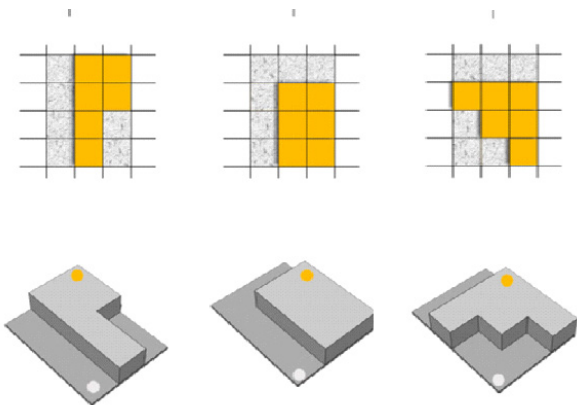


Fig. 11. Examples of the grid for houses with open and closed spaces (Özkaraduman, 2008)

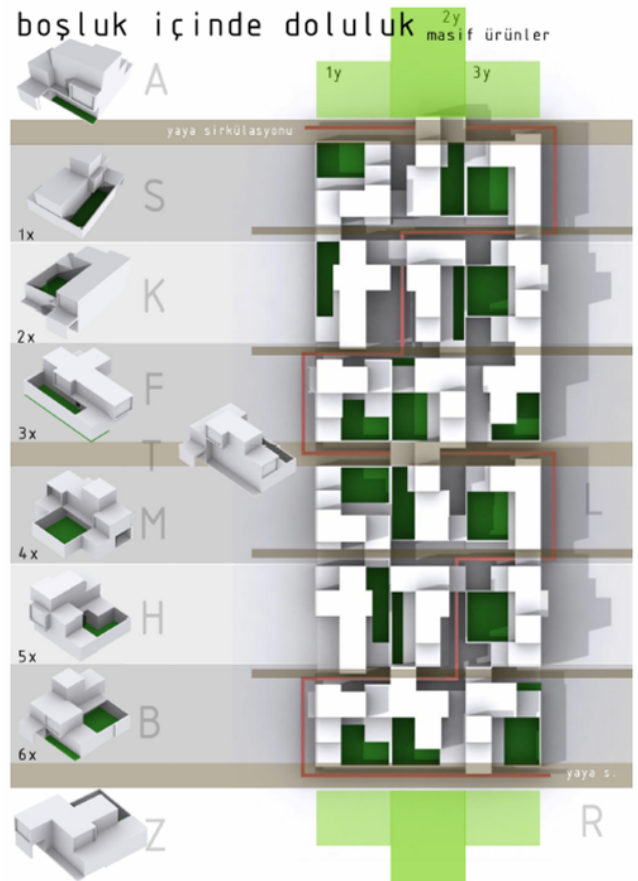


Fig. 12. Site plan for the neighborhood (void in solid) (Özkaraduman, 2008)

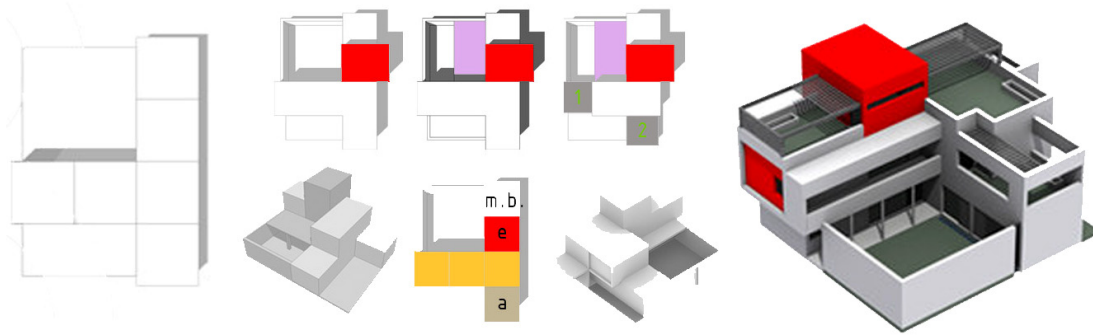


Fig. 13. Design of a house; from plan layout to detailed three dimensional model (Özkaraduman, 2008)

4. Parametric Plan Layout Generator for Mardin Houses

The knowledge from the aforementioned studies is also used in another interpretation of the grammar. PLG – Plan Layout Generator is a parametric program which generates different plan layouts for Mardin houses within certain limitations (Torus, 2008).

These works also support technological advances and mass-customization. Mass-customization is a relatively new term for architecture. But the advances in computational technologies encourage these systems which combine mass production with individual customization. With this method, computationally designed flexible projects with low unit costs can be produced.

Ferhan and Hülya Yürekli stated that modulation and standardization can be found in many details as well as space relations in Turkish house (2005). A great deal of variety can be seen in Turkish house, in which rooms are the main elements. In other words, the modulation and spatial relationships of Turkish house also enables flexibility.

In PLG, the flexibility of Mardin houses is analyzed. The orientation, functional and spatial relations are used as basic parameters for the rules. On the ground floor living, kitchen, workshop and less-private spaces are found whereas on upper floors bedrooms and guestrooms can be found.

A very simple interface is designed and only four parameters are asked to the user (figure 14). The dimensions of the site (x, y), the number of floor (z) and the number of rooms (a) can be entered in the interface. There are limitations for these parameters. After the values are set on the program, before the generation some calculations are done in order to control the parameters and evaluate them.

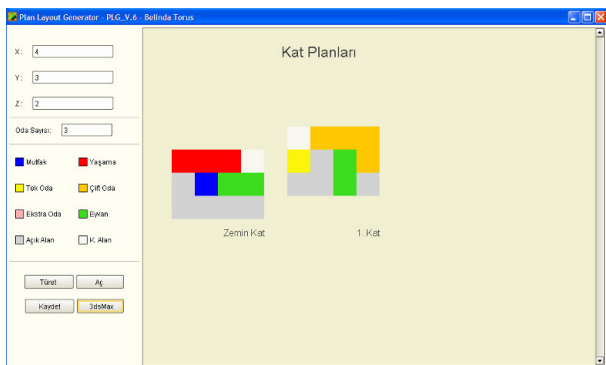


Fig. 14. Interface of the program PLG (Torus, 2008)

The program firstly controls the given data and evaluates them with the rules. If the site is inadequate and the house cannot

be generated in the given limits, the program gives an error message indicating the problem. Otherwise it generates rapidly starting from ground floor. The numbers of semi-open spaces are set randomly and the grids are drawn according to the given data. Semi-open space living spaces (3 units), kitchen (1 unit), open spaces and unused spaces are placed respectively. If there is more than one floor, semi-open spaces rooms and open spaces are placed on the upper floor in relation with the lower floors.

Even though the program is working independently, these new house form compositions can be transported into 3dsMax environment for further architectural articulations (figure 15). Different house composition alternatives can be generated very rapidly with specified values (Torus, 2008, figure 16). Generation alternatives for different parameters can also be searched in the program which in fact supports mass-customization completely (figure 17). In brief, PLG is designed to generate plan layout alternatives for houses in Mardin, in which the alternatives for selected or different parameters can be sought rapidly and products can be used as preliminary designs.

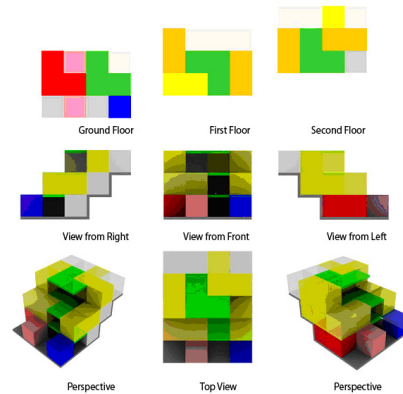


Fig. 15. Different views of a generated solution (Torus, 2008)

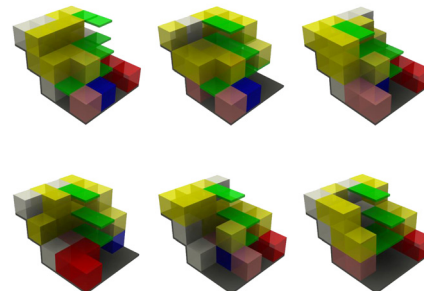


Fig. 16. Alternatives generated with the same parameters in PLG

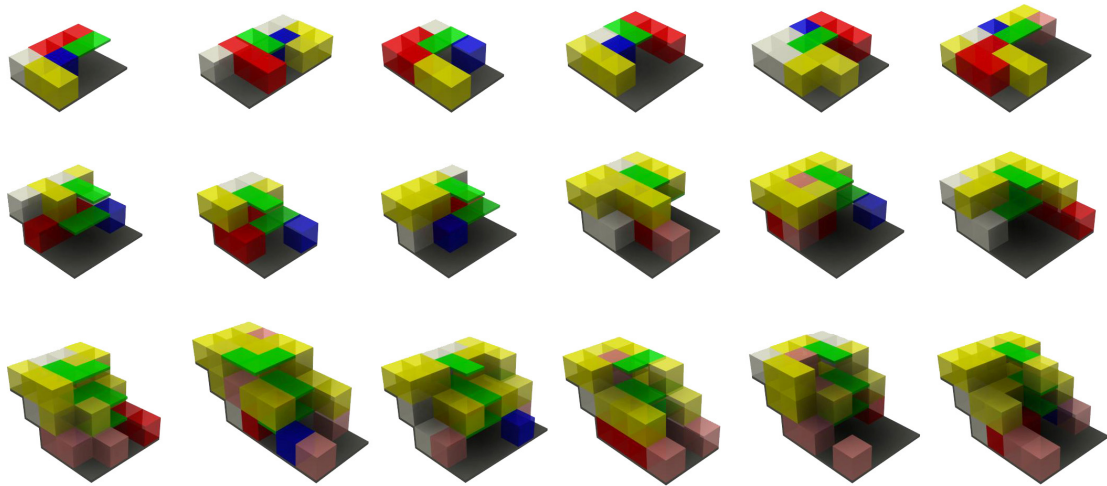


Fig. 17. Generation alternatives with different parameters in PLG

4. Conclusion

Turkish house had formed and evolved in time and reflected the life philosophy, design and technology of its era. A great variety can be seen in different regions and different types of Turkish houses can be found. It has mostly been built rationally and respectful to the environment. Construction method also supported the formation of the houses. Mostly local material is used and the limits of the size of the material caused standardized yet flexible spaces and details. Most of these properties are lost or ignored and new houses and recent housing settlements are built ignorant to the abovementioned values.

Mardin house is an example of masonry built traditional Turkish house on the southeast of Turkey while the city has a texture formed by houses and organically formed streets. There are many project proposals for new houses in traditional settlements; three of which are emphasized in the paper. All these projects aimed to generate mass-customization in the settlement which has certain properties of Turkish house as well as some new ideas of the architects. In all the projects, rules of Turkish house and Mardin house have merged with the rules set by the designers. This method succeeded to generate housing alternatives in Mardin with different solutions. While Özbek (2004) derived rules for Mardin and generated the houses by hand-made models, Özkaraduman (2008) designed a neighborhood and detailed a number of houses in 3d computer models.

On the other hand with PLG (Plan Layout Generator), different plan layout alternatives of Mardin houses are generated rapidly within the help of a program developed by the author (Torus, 2008). By using various parameters, a wide range of plan layouts can be obtained and these preliminary designs can be manipulated or detailed on subsequent phases. PLG supports mass-customization computationally which also supports efficiency in time and cost management.

This method can also be used in other traditional areas, on different types of Turkish houses, and new projects can be developed in order to generate these houses. After a throughout analysis of a certain housing type, similar studies can also be pursued. Furthermore with the help of computational technologies, tools and programs can be developed which help mass-customized production of the houses.

Another important point is that these types of generations and programs can be improved in time, adding other details

which can either be added to the rules of the generation or to the program. It may encourage different properties, such as the utilization of local material. In this way houses may be more compatible to environmental conditions and variety of projects can be obtained both manually and computationally.

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