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Being Small: Elements and Observations of Small Houses

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Abstract: House is a basic need for people to stay. In competing societies, people can afford only small houses, making them cheaper and easier for maintenance. This article discusses elements of small houses, including house area, construction materials, stair, vertical space optimization, spatial arrangement and space management, multipurpose areas with collapsible-expandable multipurpose furniture, colors, lightings, windows, and mirrors, and privacy of the small houses and occupants. This work gives two modern urban triangle houses as examples, one in Korea and one in Japan, for small house observations.

Keywords: small house design, residential house, triangle house, sustainable house, small dwellings.

小：小房子的要素和观察

摘要：房子是人们居住的基本需求。在竞争激烈的社会中，人们只能买得起小房子，这使得它们更便宜且更易于维护。这篇文章讨论了小房子的元素，包括房屋面积、建筑材料、楼梯、垂直空间优化、空间布置和空间管理、具有可折叠扩展多功能家具的多功能区域、颜色、照明、窗户和镜子，以及小户型的隐私。房屋和居住者。本作品以两栋现代都市三角屋为例，一栋在韩国，一栋在日本，用于小户型观察。

关键词：小房子设计，住宅，三角屋，可持续的房子，小住宅。

1. Introduction

A modern family comprises just three to four members, including dad, mom, and one to two kids. For the economic aspect of both developed and developing countries, urban land is highly costly due to continuous rise, especially in high-density populations

and business areas. People can own a smaller piece of land. Their houses are smaller because it allows surviving in big-city society. Even people with bigger lands may want a small house to have more empty spaces for other activities. People living in rural areas may also want small houses. The goal of this study is to discuss the elements of modern small houses.

Received: April 16, 2021 / Revised: May 14, 2021 / Accepted: June 10, 2021 / Published: July 31, 2021

Fund Project: Small House Initiative partially financial support by Thammasat University, Thailand

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2. Literature Review

Wilson & Boehland [1] studied trends in single-family house building in the USA and suggested downsizing houses to improve quality and resource efficiency. A small house built to only moderate energy-performance standards uses greatly less heating and cooling energy.

Baeissa& Hassan [2] conducted a habitability study on low-cost house designs of modern and traditional mid-rise house units in the City of Mukalla, Yemen. The result showed that the satisfaction levels of the respondents who live in traditional houses were higher than those in modern houses.

Witchayangkoon et al. [3] surveyed to learn an after-stay satisfaction of residents who stay in prefabricated concrete houses in Thailand. They found that noise seems to be the most concern of the townhouses' residents.

Ford & Gomez-Lanier [4] reviewed the tiny house movement/communities under the three-pronged approach to sustainability, including environmental, social, and economic aspects for a holistic sustainability examination of the tiny house movement.

Studies on homeownership in low-cost houses have been conducted in many countries such as Penang, Malaysia [5].

UN Environment and the Yale University's Center for Ecosystems in Architecture present an eco-friendly and affordable tiny house with an area of 22 m² (200 ft²) [6]. The house has a loft or pullout bed with hidden

storage and condensed amenities (e.g., a kitchen). The house is designed to maximize the space to live in.

This article presents the elements of modern small houses, and two examples are given as observations.

3. Elements of Small Houses

3.1. House Areas

Small houses have house area 40-100 m² (430-1080 ft²), medium-size houses 100-300 m² (430-3230 ft²), large-size houses 300-800m² (3230-8600 ft²), and extra-large houses more than 800m² (8600 ft²). Of course, tiny houses [7] will have an area of fewer than 40 m² (430 ft²).

3.2. Construction Materials

Small houses may use strong, modern, lightweight materials, as these materials tend to be smaller but with the same or better functionalities and engineering features. In the view of sustainability, with lightweight from roofing, walling, flooring eco-modern materials and smaller sizes, the total weight of the small house becomes a lot lighter, thus reducing the foundation and the entire construction cost and time.

3.3. Stairs

A stair is an important element to move people from one floor to another. Stairs come in different shapes/styles. Most stairs take spaces about 5m² or more, including the stair-landing area. For small houses, smaller stairs give more room.



Fig. 1 (a) A small area EeStair [8]; (b) A combination of stair and living space [9]

A 1m² area spiral twist steel stair has been invented to save space (see Fig. 1 (a)). For children, they may need to practice and get used to this type of stairs.

One good option is to combine stairs with living space, such as the example in Fig. 1 (b) of the Tread Machiya house, Japan.

3.4. Vertical Space Optimization

Taking most of the vertical space makes small houses effective uses of resources. Most small houses have loft spaces for storage and sleeping. Loft height may vary in the range of 1.2-1.8m (4-6 ft). Varieties of modern wall-mounted box shelves and racks help using

vertical spaces more effectively. Many modern materials are strong, and lightweights are making it possible to use vertical spaces effectively.

3.5. Spatial Arrangement and Space Management

The house needs to accommodate the land area as well as the needs of the houses' owners. With good design, the house areas can look spacious. With limited spaces of small houses, the architectural-based spatial arrangement of functional parts of the house should bring the house to its full utilization. Space management will depend greatly on interior design. Some houses have put drawers in the area under the

stair (Fig. 2), some put a washing machine, and some make it into a restroom, while some make it to a reading space.



Fig. 2 Storage drawers under the stair (created by the authors)

3.6. Multipurpose Areas with Collapsible-Expandable Multipurpose Furniture

Attentions to furniture spatial arrangements are important matters, including types, styles, textures, and colors. Collapsible furniture is helpful due to its foldable-expandable capability. Multipurpose furniture help keeping up more spaces, as furniture serves more functions by simply turning or adjusting parts of the furniture (Fig. 3). At a different time, areas can be adopted from one activity to the other. For example, the bedding area, after the beds are folded, the area can make into a living room.

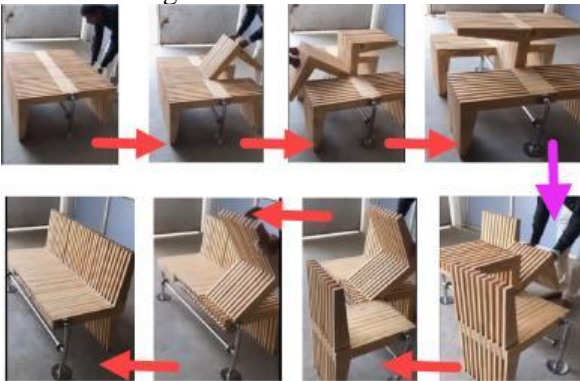


Fig. 3 Multipurpose chair/desk furniture [10]

3.7. Colors, Lightings, Windows & Mirrors

Due to the small space of each functional part of the house, the element of colors, lightings, windows, and mirrors play important roles in small house design. Bright color gives a more environmentally friendly atmosphere. Blue gives cold and cool feelings, while red catches attention, and bright yellow gives expansive feelings and makes the object more distinct [11].

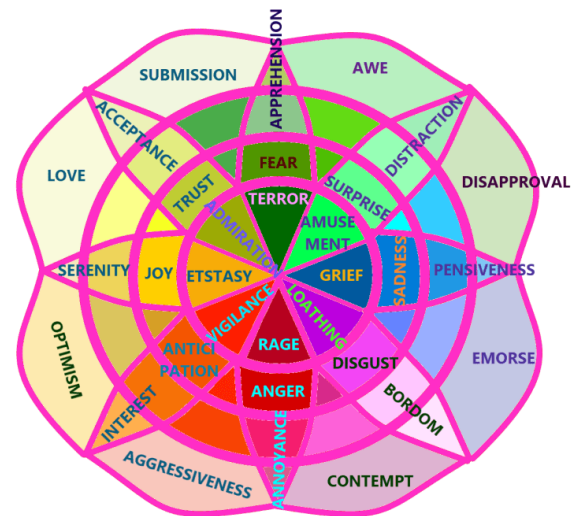


Fig. 4 Color spectrum of Plutchik-wheel of emotion (created by the authors)

White sometimes can make bored and distracted with wandering thoughts. Light creamy color produces more soothe-loving feelings. Windows let natural light and air entering the house will make the house more liveable.

The uses of colors, lightings, and mirrors impact the emotions, cognitions, and behaviors of the dwellers. Selections of right choices of colors, lightings, and mirrors are important as the brain reflects different colors differently. The color spectrum of the Plutchik-wheel of emotion exhibits joy, trust, fear, surprise, sadness, anticipation, anger, and disgust, each corresponding to a color level (Fig. 4). Combinations of different colors, lightings & mirrors can give mixed feelings and behaviors. Compared with Fig. 2, Fig. 5 gives a calmer feeling as light blue/green gives colder and cooler feelings.



Fig. 5 A calmer feeling due to changes in color and lighting (created by the authors)

3.8. Privacy of the Small Houses and Occupants

Like other houses, small houses' privacy can attain and give a sense of security by using architecture and interior privacy design. Trees and curtains can help with visual and territorial privacy. DIY privacy window film or self-adhesive static-cling glass stickers are helpful with opaque capability allowing light to pass through.

If the family lived in a small house is crowded or overcrowded, individual personal space may greatly reduce; thus, the occupants' privacy is difficult to preserve in the small house.

4. USM Studio Projects of Small Houses

At the School of Housing, Building & Planning, Universiti Sains Malaysia, architect students are asked to design projects. Fig.6 and 7 show three students' small house design projects.



Fig. 6 A small house design by Chong Chin Xin, USM (used with permission)

Fig. 6 shows a simple small compact house design having an area of 50-60 m², with a bedroom on the loft floor and everything else on the first floor. Fig. 7 shows a more compact modern house design with a house area of 50-75 m².

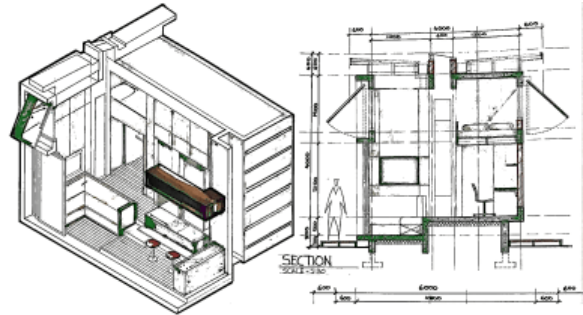


Fig. 7 A small house design by Kelvin Ah Kian, USM (used with permission)

5. Observation Cases

5.1. The Case of a Japanese Triangle House

The famous Japanese architect Kota Mizuishi (Mizuishi Architect Atelier Company) designed a small two-story house in 2010 (see Fig.8. This house is very small, built on the acute angle triangle land in western Tokyo, Japan. Fig.9, the site area is 52m², building area 29m² with a total floor area of 55m². The house was nicely designed to give a comfy cozy environment. A slide entrance door and many slide windows are installed to keep up space. The bedroom is on the first floor. The living & dining is set on the second floor with big glass windows, thus allowing more space and can see the scenery of the neighborhood. The window screens allow fresh air to enter the house. The loft floor provides more private space. The small balcony on the second floor gives a broad scenery view, thus greater feelings.

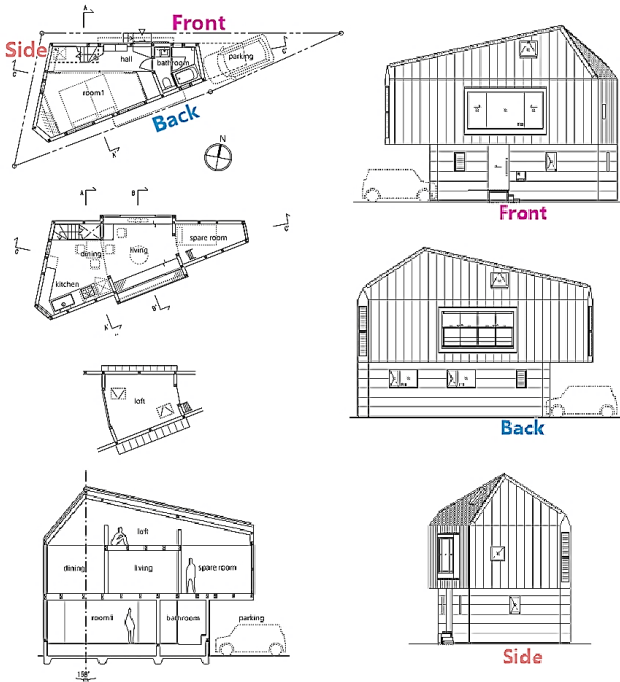


Fig. 8 Design of a small triangle wooden house in Tokyo, Japan [12]

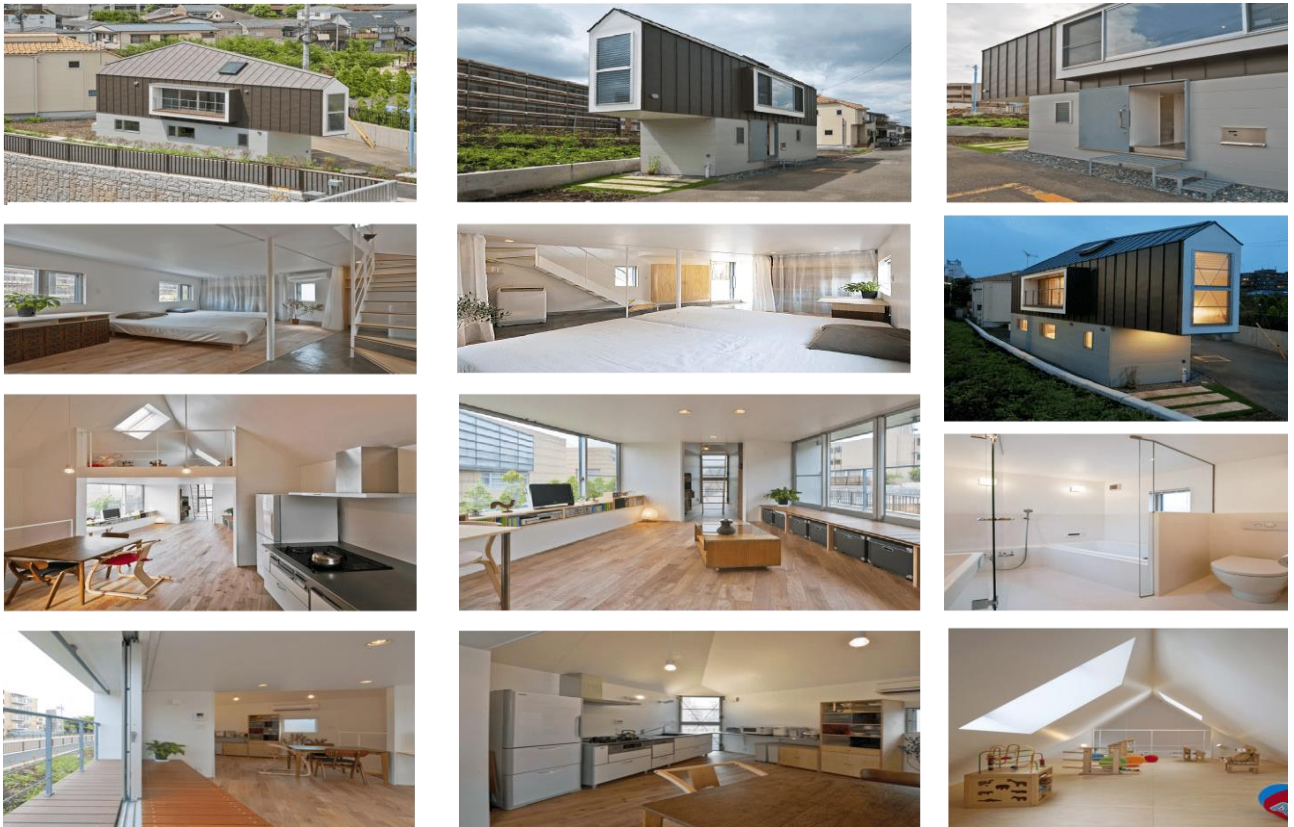


Fig. 9 The small triangle Japanese house after the construction and décor [12]

5.2. The Case of a Korea Triangle House

In the crowded town of Daemyeong-dong, Nam-gu, Daegu Metropolitan City, South Korea, the famous architect Hwang Kwang-Soo (the Inark Architecture Office) designed a triangle three-story house to replace the old one-story house (Fig. 10).



Fig. 10 The small three-story triangle Korea house with the designed floor plan, after the construction and décor [13]

The house family has four members, including a father, a mother, a daughter, and a son. The site area is 34m², with a total building floor area of 84 m². The main skeleton is a steel structure frame (see Fig.10). The first floor is a living room and kitchen facility. At night, the living room is used as a bedroom for father and mother. The second floor has two private rooms, one room for the son with full utilization of the under-stairs area, and the sharp end room is for the daughter with a study desk to fit the sharp end. The third floor is for general utilities, including cloth cleaning. There is a small balcony for cloth hang drying. The stair goes straight from the first floor to the third with a double winder in the last part to go to the third floor. It is seen that all windows are very small; this is for privacy purposes.

6. Conclusion

Tiny houses do not suit everyone, rather suit and fascinating for people who love being small and save money and time. The house's area is smaller; thus, the used resources to build the house are less, thus lowering the construction cost, tax, and maintenance costs. A small house also indicates self-sufficiency, which in turn it provides social sustainability. This article discusses the elements of small houses and provided case studies.

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