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Climate Responsive Smart Homes

[1]Ar.Rashmi Tijare, [2] Ar.Nikhil Wasade,
[1] Assistant Professor, PIADS ,[2] Associate Professor, PIADS

***Abstract* - Home Automation is a multidisciplinary. It involves almost all branches of science & engineering. While learning in the urban context of residential design it was realized that the standard of living in terms of quality has come down. Quality, not in terms of material and standard of living or technology, but in terms of the feature of space. Further exploring this topic lead to, the Automation of Building parts so as to suit climate of the region and act smartly according to climatic situation. The study further extends and develops a series of modifying and adaptive elements for residential spaces that are responsive to the climate, lifestyle and its effect.**

***Keywords:*--- home automation, climate responsive architecture,**

I. INTRODUCTION

Home automation or smart home, also known as domotics or domotica, is the residential extension of building automation. It involves the control and automation of lighting, heating/cooling, ventilation, air conditioning (HVAC), and security, as well as home appliances such as washer/dryers, ovens or refrigerators/freezers.

They use Wi-Fi for remote monitoring and are a part of the Internet of things.

Modern systems generally consist of switches and sensors connected to a central hub sometimes called a "gateway" from which the system is controlled with a user interface, that is interacted either with a wall-mounted terminal, mobile phone software, tablet computer or a web interface, often but not always via internet cloud services.

II. SMART CITIES: INDIAN SCENARIO

India is undergoing a transformation due to upcoming smart cities. There are 98 shortlisted cities, of the 98 cities and towns that five years down will graduate into smart cities, 24 are capital cities, another 24 are business and industrial centres, 18 are culture and tourism influenced areas, 5 are port cities and 3 are education and health care hubs.(The Hindu, smart cities: what are they, JAN 28, 2016 13:33 IST)

It means all major urban areas and agglomerations will undergo a tremendous transformation.

According to document released on smart cities website, (http://smartcities.gov.in)The core infrastructure elements in a smart city would include:

1) Adequate water supply,
2) Assured electricity supply,
3) Sanitation, including solid waste management,
4) Efficient urban mobility and public transport,
5) V. Affordable housing, especially for the poor,
6) Vi. Robust IT connectivity and digitalization,
7) vii. Good governance, especially e-Governance and citizen participation,
8) viii. Sustainable environment,
9) ix. Safety and security of citizens, particularly women, children and the elderly, and
10) X. Health and education.

The concept of Smart City varies from city to city and country to country, depending on the level of development, willingness to change and reform, resources and aspirations of the city residents also participation of citizen in process.

The Smart cities also need smart built environment and smart buildings.

Residences make the major part of cities. India is the second most populated country in the world with nearly a fifth of the world's population. According to the United Nations in July 2016, the population stood at 1,326,801,576. India is projected to be the world's most populous country by 2022, surpassing China, its population reaching 1.7 billion by 2050. India occupies 2.41% of the world's land area but supports over 18% of the world's population. At the 2001 census 72.2% of the population lived in about 638,000 villages and the remaining 27.8% lived in more than 5,100 towns and over 380 urban agglomerations and the migration from rural to urban is unstoppable as due to uncertain climate and

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irregular rains many occupations got affected. So in search of better life rural population keep migrating in urban areas increasing the load on existing infrastructure. It leads in formation of new slums deteriorating the life quality in urban areas. Smart houses can be good solutions for this problem providing ample light and ventilation creating healthy life in small spaces.

What if you could design a building that, at any given time, was optimized for the environmental conditions around it?
What if that building meant more satisfied dweller, a lower carbon footprint, and significant savings in building and operating costs?

And what if you could do so without compromising the aesthetics of your building's design, perhaps even enhancing it?

Some buildings around the world have been studied in quest of finding answers to above questions. These buildings are working on same principal of climate responsive architecture, through automation.

Following building are studied

1. Sharifi-Ha House, Iran
2. Sliding House by dRMM, UK
3. The D*Haus, (concept)

Case 1: Sharifi-ha House

This is a House designed by Tehran studio, Next Office, Sharifi-ha House features three rooms that can be rotated 90 degrees to open up views and terraces during Iran's hot summers, and turned back to a horizontal position to keep the house warmer during the cold, snowy winters

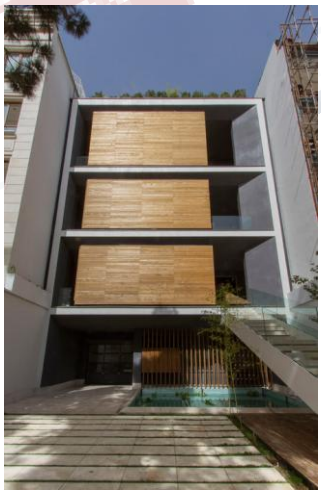

Fig.1: Front view of Sharifi Ha House (Closed)

Like many urban plots, this one had a noticeably narrow facade-width compared with its depth.

The three pods house a breakfast room on the first floor, a guest room on the second floor, and a home office on the third floor.

Each one features a door at the side that provides access to the terrace when they are turned open, and access to the house when they are closed.

Fig.2 Front view of Sharifi Ha House (Semi open & Open)

The house adapts to the functional needs of its user.
The guest room can be reconfigured for different purposes. Similarly, the home office and breakfast room can change the formality of their appearance according to their residents' desires."

Case2: Sliding House by dRMM

London architects dRMM have designed a house with mobile walls and roof that can be moved to cover and uncover parts of the dwelling. The house, in Suffolk, England, features a sliding structure that fits over the static main house, guest annexe and greenhouse.
The mobile element, which is 28 metres long and weighs 50 tons, move along rails set into the ground. As it moves, the sliding element creates shifting outdoor living areas between the static elements as well as altering views, lighting conditions and the sense of enclosure inside the house.

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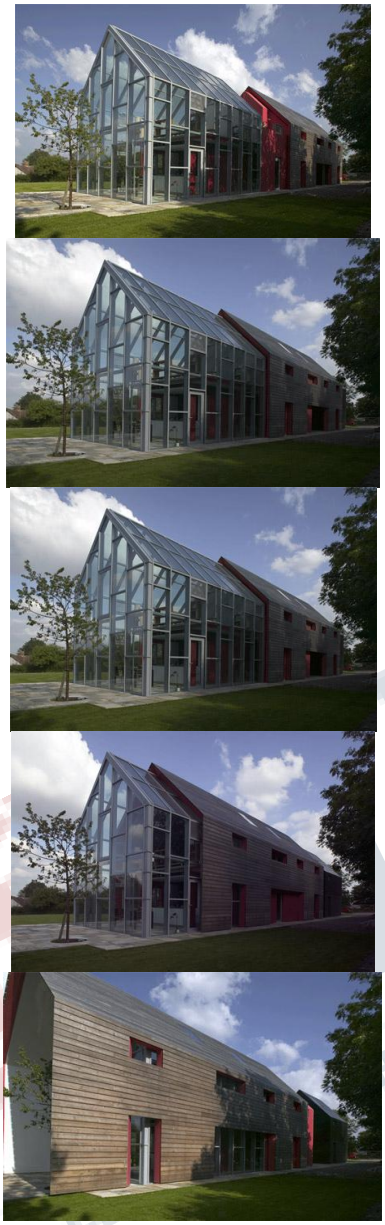

Fig.3: View of Sliding House in Different Positions

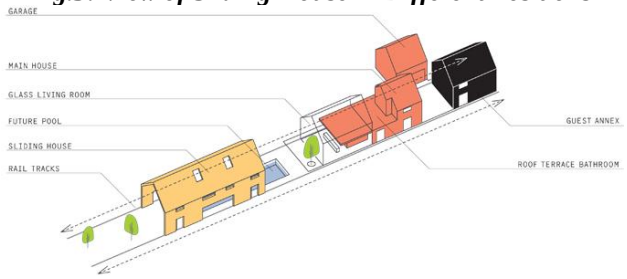

Fig 4: Concept of Sliding House

Case 3: The D*Haus Concept

"Conceived for the harsh, climatic extremes", The D*Haus concept can respond dynamically to its environment by controlled adaptation to seasonal, meteorological and astronomical conditions."

The D*haus is a radical transforming building with eight specific configurations and all kinds of deployments in between. Imagine a view you can control on demand, and exposure centered around annual weather cycles. The flexibility of the D*Haus allows adaptation from winter to summer, and day to night by literally moving inside itself."

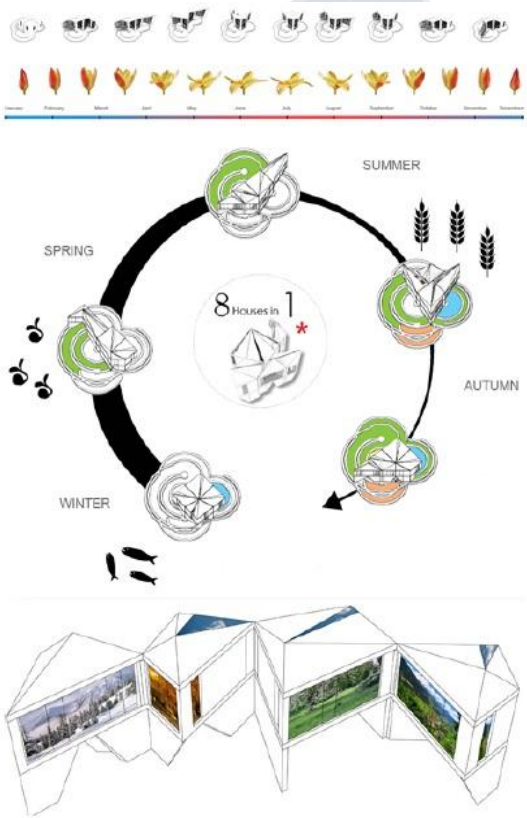

*Fig.5: The D*Haus concept*

Aside from the seasons, there is also security and open plan

Versatility: "The thick heavy external walls unfold into internal walls allowing glass internal walls to become facades. Doors become windows and vice versa."(Fig.6)

So a futuristic kinetic facade might be for your building design.

"A joint venture between Buro Happold and Hoberman Associates dedicated to designing a new generation of buildings that optimize their configuration in real time by responding to environmental changes."

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A system of rectangular cells opens and closes to regulate sunlight and solar gain, as well as block sand and dust from entering the open-air traditional Market.

*Fig.6: The D*Haus Transformation*

CONCLUSION

These types of smart houses can respond to extreme and harsh climate. Adaptation is essential for survival and success. This is as true for our buildings as it is for all other aspects of our lives.

Rising energy demands, along with the lack of design solutions that sufficiently respond to the changes in our environment, may well be the defining problems of our century.

Adaptation is the means by which we can begin to address these daunting challenges and enter a new era of innovation.

With compelling but simple logic, Buildings with adaptive systems use less energy, offer more occupant comfort, and feature better overall space efficiency than static buildings do. These technological advances allow us to create buildings that are self-optimizing, rather than merely best-fit compromises.

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