

## A SYSTEMATIC REVIEW ON SMART HOME TECHNOLOGY - CURRENT FEATURES AND FUTURE PERSPECTIVES

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**Abstract:** In this era of information Technology Internet has become a very crucial part of the peoples life . It is very hard for a day to start without the usage of the smart devices be it a smart phone or a wearable or any other related equipment . the usage of internet is increasing day by day as this interconnected network has made the life of the people more easier as they can access to anything from anywhere with one click.

The world is moving towards The **Internet of things** which means the inter-networking of physical devices, vehicles also referred to as "connected devices" and "smart devices" buildings, and other items embedded with electronics, software, sensors, actuators, and network connectivity which enable these objects to collect and exchange data through Wi-Fi controlled Via Internet

This Paper focuses on **Smart Homes - Designing a home for the future** it is also known as domotic which is a building automation for the home. The world is running at a very faster pace and people and running even more faster . The 24 hrs in the clock is not a sufficient time to do all the activities so the world is moving to something called as a smart home which involves the control and automation of lighting, thermostats, air ventilation, Ac's , and security, as well as home appliances . Wi-Fi is often used for remote monitoring and control. Home devices, when remotely monitored and controlled via the Internet, are an important constituent of the Internet of Things. The system is controlled with a user interface , mobile phone software, tablet computer or a web interface.

This paper mainly focuses on what are the current features and future perspectives of Smart homes including the need of smart homes for aging population.

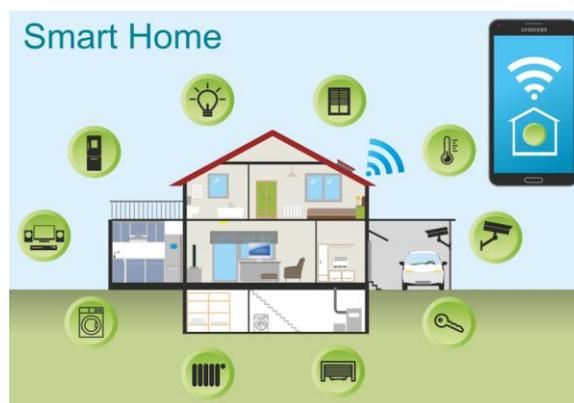
**Key Words:** *Smart Homes, Wearable's, Internet , Internet of Things, Smart devices*

### I. Introduction

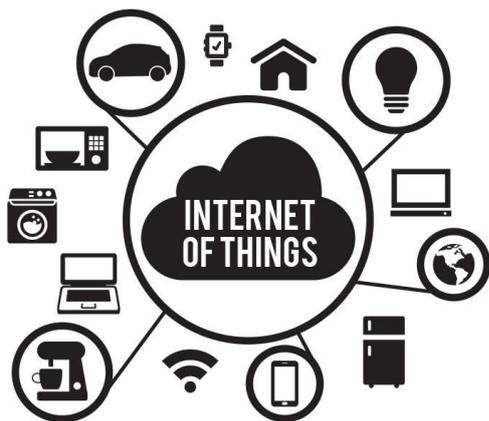
Today, homes are places of comfort and safety that allow people to relax after a long day of work and get a good night's sleep. The homes currently are equipped with comfortable furniture's, lights, and appliances that make the house work . Although homes today are efficient and do their job well, they could become more efficient and do their jobs better. The homes of tomorrow will optimize home security and comfort. These homes will be better, smarter, and more connected. These homes will be smart homes.

Smart homes and smart home devices are revolutionizing how homes today are viewed. Smart homes are houses which are controlled just by a touch of a button . The all appliances of smart homes are connected through one hub, and the entire system can be controlled and monitored with one app. These systems have a lot of capabilities which involves home automation and controls things from not only inside of the house but also outside . The smart homes use a server which acts as a host of technologies and this connects the devices from inbuilt electrical wires to even wireless networking. A large number of appliances can be connected to the system because almost

every device of the smart home can be connected to the electrical grid of the home or the wireless network. There are Some of the companies which have started tailoring their products to smart home owners by equipping smart home capabilities into their smart devices. There are many number of companies that sell hubs and applications which will connect all the devices and also monitor the system. In today's technological driven world Smart homes are changing the way homes look and work and making them a better place to live.



**Internet of Things (IoT)**, is a key component of home automation and smart homes. All the devices and appliances of the residents home will be networked together to provide the resident with an endless control over all aspects of the persons home. Home automation is the ability to control items around the house automatically with a simple push of a button on the cell phone or any other device or even a voice command.



Home automation was there in the lives of people from many decades in terms of lighting and simple appliance control at home , but only recently technology has caught up the idea of the interconnected world, which allows full control of the home from where ever the person is located in that is any remote place becomes a reality. Home automation also dictates that how, when and why a device should react. A schedule is set and the rest is automated based on the personal preferences providing convenience, control, money savings, and an overall smarter home.

Home automation also has a unique feature of alerting the events that an individual might want to know as soon as possible while the person is gone like water leaks and unexpected access of home. In case of events like these when being altered by the smart home devices , the person at anytime can grab a Phone, Android device or other remote control and change the settings of the house as and when desired according to his preferences.

## II. Objectives:

1. To study the growing importance of Smart home devices.
2. To understand the current features and Future perspectives of Smart home technology
3. To know the need and use of smart homes for the ageing population.
4. To offer few suggestions related to the study.

## III. Scope:

The current Paper focuses on the importance and the features of a smart home and home automation technology and its future avenues to make the homes even more smarter . It also studies how a smart home will help the ageing population.

### Research methodology:

It is a descriptive paper purely based on secondary data. Secondary data was collected from authenticated sources like international and national journals, websites and publications.

### Review of Literature

According to G. Demiris<sup>1</sup> , B. K. Hensel The growing field of "smart homes" highlights the emerging role for biomedical and health informatics in supporting aging and promoting quality of life for older adults. As technological advances enable sophisticated homebased solutions, we need to ensure that the design and implementation of informatics applications for older adults are not determined simply by technological advances but by the actual needs of end users.

According To Muhammad Raisul Alam A smart home is an application of ubiquitous computing in which the home environment is monitored by ambient intelligence to provide context-aware services and facilitate remote home control.. It describes collective information about sensors, multimedia devices, communication protocols, and systems, which are widely used in smart home implementation.

According to Marie Chana,b,\*, Daniel Esteve` a,b, Christophe Escribaa,b, Eric Campo a,c In the era of information technology, the elderly and disabled can be monitored with numerous intelligent devices. Assistive Devices like Sensors can be implanted into the home for continuous mobility assistance and non-obtrusive disease prevention. The new Modern sensor-embedded houses, or smart houses, not only assist people with reduced physical functions but it helps to resolve the social isolation which the people face. They are capable of providing assistance without limiting or disturbing the resident's daily routine, giving him or her greater comfort, pleasure, and well-being.

## The Purpose of the Smart Home

The main purpose for the creation of Smart homes was to make homes more comfortable and secure, for the incumbents at a reasonable price . The smart home audience is everyone, but depending on the need and sensors it can have a multitude of specific purposes. The smart home or home automation technology can be applied to the houses and apartments, as the sensors that are used to connect can be placed in a varied number of

places. These sensors can range from motion detectors to thermostats. One of the main purposes of the smart home is to save energy. The another main reason for the smart home is to assist the elderly and handicapped people with daily routine activities and makes the home more convenient so that the user can change the whole dynamics of their home with a single touch of a finger.

#### **Features of Home Automation System**

Home automation systems, by using wireless technologies provide several advantages that could not be achieved with the use of a wired network only.

##### **1) *Lighting Switches On and Off Automatically***

Lighting systems can be programmed to switch certain lights on or off automatically. This means that lights can be set to switch off or dim in certain lighting conditions (for example where natural light is adequate), reducing lighting costs. Alternatively, lights can be set to switch on automatically when one enters a room or a dark stairwell, making the home safer and eliminating the need to fumble for light switches. In addition, lighting can be set to be dimmer or brighter, with certain lights being brighter than others, to create specific moods.

##### **2) *2. The House Can Let You Know How It Is***

Home automation systems allow one to monitor conditions in the home from a remote location, provided the subsystems are connected to one's home internet network. In fact, some systems can alert one to events via text, email, or social media applications like Twitter. Certain security systems can be set to email photos of visitors to the homeowner when the system is armed, and some communication systems can let one know if the fridge breaks down while one is on holiday. The latter type of system has integrated temperature, moisture, and vibration sensors that activate automated messages.

##### **3) *3. Intelligent Climate Control***

Heating and air conditioning systems can be set to certain levels based on expected and actual occupancy, the weather forecast, or the inside temperature. These systems can also be controlled remotely, and can be programmed to switch off if a window or exterior door is left open. Again, this is a great savings mechanism, reducing the amount of electricity wasted on unnecessary cooling or heating. It also ensures that the house is at the right temperature at all times, and will eliminate scenarios where one walks into a boiling hot or freezing cold house after being out and misjudging the weather.

##### **4) *4. Security Systems are More Secure***

Automated home security systems tend to offer a wider range of features than their predecessors. Systems respond to voice and biometric data, and locks can be upgraded to keypads that are opened with codes or swipe cards. These systems can be

turned on or off via remote control, email, or phone, and camera feeds can be sent directly to one's computer. Audible alarms can be used to alert one of intruders, while silent alarms can be used to alert the authorities. That awful feeling of uncertainty that some people feel about having locked all the doors when leaving the house can be eliminated.

##### **5) *5. Home Entertainment Favourites at the Touch of a Button***

Automated home entertainment systems allow users to preset favourite settings to be available at the touch of a single button. Automation removes the need for multiple remotes, condensing all controls into one universal remote instead. With pre-programmed settings one can turn on the TV, tune into one's favourite TV station at the perfect volume, with one's preferred TV settings, by pressing only one button. Alternatively, and where the system allows, one can listen to music, news, or podcasts anywhere in the house.

##### **6) *Houses Have Learned How to Talk***

High end home automation systems feature chat interfaces with natural language controls. This means that the house understands complex sentences and can tell you what is happening. For example, the house can tell you about calls or events, or you can ask a question like "Who phoned last Monday before three in the afternoon?" In addition, the house can explain what it did and why it did it.

##### **7) *Systems are Designed to Work Together***

Home automation systems are designed with the integration of subsystems in mind, allowing one to tie electronic devices together to perform as a unified system. For example, one can have the lights turn off and the thermostats set lower when a motion sensor is triggered as you leave a room. Once again, this ties in with energy and cost savings and environmental responsibility. Lights and heaters or air conditioning will not be left on unnecessarily.

##### **8) *Remote Access***

Probably one of the best features of home automation systems, remote access allows one to control one's home environment from a remote location. One can change settings from the office or while on holiday, or during the commute on the way home from the office. Should one's plans for the day or evening change, one can simply update the settings for the home automation system to avoid unnecessary energy use. One can also monitor the home environment while away, or tweak settings without having to ask someone to go in to make adjustments. This is especially useful when sudden snow or cold can make pipes freeze and thermostats need to be set higher.

#### **Benefits to Home Automation**

- 1. Security**
- 2. Energy Efficiency**

3. Savings
4. Convenience
5. Comfort
6. Peace of Mind

### SMARTHOME TECHNOLOGIES:

The Smart home Technologies use Z-WAVE, X10, Insteon, Universal powerline bus (or UPB), ZIGBEE technologies which provide the interconnected network system. These are the technologies which work behind the walls as the wireless network which make everything possible in the smart homes.

### The Top 10 Companies in Smart Home Technology

These ratings are based on the range of available products within each system, ratings and reviews, pricing and transparency, monthly contract details, and much more. These rankings reflect the companies that are best in class.

- Samsung SmartThings – 1st
- HomeSeer – 2nd
- Nest – 3rd
- Savant – 4th
- Frontpoint – 5th
- Crestron – 6th
- Vivint – 7th
- Iris – 8th
- Control4 – 9th
- ADT Pulse – 10th

### Future Of Smart Homes 2050

Future homes or smart homes of the next generation will take the advantage of the most advanced technology of future robots to do works such as cleaning and organizing of the house and currently this technique is taking shape by Japanese engineers and followed by them and they are developing more realistic and functional robotics that recognize the human speech and respond to them to perform the tasks required by the resident of the house. Smart phone apps are installed which interact with the persons home will be increasing exponentially over the coming years in the future.



*Domestic Robot*

It is said that it is just the beginning as there will be many apps created to interact with the future home robots and they accept commands simple to the most complicated work related commands like putting food in the oven, clothes in the laundry, feed the cat and clean the bathroom. These robots can be controlled by smart phones

The next generation homes can be controlled by smart phones which will be able to check the inventory in the refrigerator or pantry and if they are inadequate they can order more from the grocery store.



*Future Home Theatre*

Future home entertainment systems will be more unique where in they are combining future augmented reality, virtual reality and mediated reality movies and television will become more interactive than ever before. An example can be in a persons living room will be playing a future version of golf or tennis with the persons virtual friends while he/she is watching breaking news or the latest 3-D movie.

Most of the future homes will have their own in built future home offices. The future workplace will become a decentralized, flexible with work flexible hours where in we can interact with co workers virtually, call for meetings, collaborate and communicate all from the future home office. Nowadays people have a common problem that they cannot sleep properly. This problem is also being addressed in future home as the homes will be using something called as a sensory deprivation chambers combined with future medical technology that will target the body of an individual using personalized designer medication

keeping in mind the persons health condition and will ensure sound sleep every night.



### **Future Home Security Using Facial Recognition Software**

Future home security will be on the top most priority which will have cameras outside the home which will integrate with systems inside using facial recognition software to determine who is actually standing out at the door and the system will be automated in such a way that the police can be dispatched when the automation device recognises him as an intruder and sends a message that an unknown person is detected outside the future home.

The future homes will have escalators and moving walkways which will help the elderly people to navigate better in the future homes

All the future homes will be equipped and built according to the age approximation by keeping child-proofing technology already in place that gives different levels of access based upon the age and maturity of each child.

Inappropriate content on the Internet or from the future home entertainment system will be screened automatically by the smart home technology and these systems will be managed by adults at any time making it child safe .

### **Smart Home Technology For aging Population**

As in today's world the elderly would not like to be called as a dependent as even at the age of 65 they would like to stay independent and be in their homes. this is the big reason for smart homes being developed . In recent years advances in health and social care have increased the life expectancy of people (Morris, 2013). Almost 7% of the world's population is now over 65 years old and by 2050 that percentage is predicted to raise to 20%. Smart home technologies allow older people to live in their lives longer in their own homes rather than any costly assisted living establishments. **Assistive domotic** an another name for home automation mainly focuses on for making it possible for all the older adults that is the aging population and people with disabilities need to remain at home, safe and comfortable. Home automation is becoming a viable option for

older adults and people with disabilities who would prefer to stay in the comfort of their homes rather than move to a healthcare facility. The smart homes in the field of home automation or assistive domotic field use the same technology and equipment for security, entertainment, and energy conservation but focuses towards older adults and people with disabilities.. The house could also notify the occupant of any pills they need to take or appointments that they have. The smart home has the ability to maximize the quality of life while reducing the stress on health-care facilities and resources. The smart homes ability to adapt depending on the sensors supports the multiple needs of the elderly and handicapped as well.

### **TYPES OF TECHNOLOGIES**

There are a number of different kinds of devices that can be used to monitor elderly residents. The two basic categories that the technologies fall into are active-intervention devices and passive-intervention devices.

#### **1. PASSIVE INTERVENTION DEVICES**

Passive-intervention devices monitor a patient's condition and safety without intervening in his or her care. An example of such a device is one that can slip under mattress pads to detect heart rate, respiration, and restlessness and Other devices detect motion of the individuals within the home.

- These sensors can provide data regarding the resident's location over time, such as the number of bathroom visits, or can be used with other sensors to develop rich activity patterns.
- If a smart home occupant spends an unusually long amount of time in the bathroom, and a sensor has detected no motion, it can then notify a caregiver.
- Sensors can monitor behaviour ranging from how well someone is sleeping and whether he or she is still capable of washing dishes.
- Humidity sensors check whether homeowners are regularly using the sink or shower.
- Smart Home person's ability to walk as well as detect falls.

These passive intervention devices can indicate a decline in a resident's health or detect problems as they arise. This record of the persons health allows family members and caretakers to act accordingly and take preventive measures, as it is better to take care beforehand instead of remedial ones after an incident occurs.

#### **2. ACTIVE-INTERVENTION DEVICES**

Active-intervention devices as the name mentions will take a more active role in the residents care. As with passive devices, there are various types of active devices. These types of technologies include sensors equipped with alerts, reminder systems, and devices that assist with medication administration.

- **SENSORS** Active-intervention sensors passively monitor residents and may



interfere on the resident's behalf if necessary. For example few active-interventions sensors monitor vital signs while others use silhouette video images to detect if a person has fallen and is unable to get up. The system then alerts the primary care physicians or the family members so the resident who is in the house does not have to activate the system to report a fall or call for a help the automation device only calls for the help.

- **Wearables:**
- Smart clothes which the residents wear are equipped with sensors that monitor behaviour and physiological conditions.
- Smart shirts can detect vital signs, upload electrocardiogram results of the heart, and even measure blood flow. This information can be transmitted to a physician for diagnosis and treatment if necessary
- Smart Watches or bands which are becoming a new statement for health detection can also detect the health condition of an individual any in any emergency can even intimate the doctors. These smart watches can also be used as a way of communication and can also operate the smart home features from anywhere
- **REMINDER SYSTEMS** One of the most important devices which serve as a reminder systems for elderly people have automotive enunciators that tell residents information such as the date, time, what and when the tasks must be performed, and upcoming appointments and events.
- Other devices are designed to alert residents if a stove burner is turned on and left unattended for a set amount of time.
- Many of these reminder systems perform the task if the resident does not respond so to ensure resident safety. Some examples of the tasks that are performed for the resident are turning the stove off, stopping the running of bath water, and locking doors.
- **MEDICATION ASSISTANCE** The another most important device in home automation for elders are the devices that assist in medication administration. which includes technologies such as automated pill dispensers; sensor pads located underneath medication bottles to detect when and if medications are taken; and prototype robots that track owners to give them their pills.
- There are also "virtual pets" that owners feed and care for by pushing buttons. The Owners must push the buttons of the virtual pets only to report when they take their medication, and if they do not

comply with their daily medication regime ,the pet eventually falls sick reminding the owners to take the medicine

- Some smart home technologies remind occupants to take medicine as well as scan the prescription bottle to make sure that it is the correct one.
- Smart Home also keeps an inventory of pills and can call a pharmacy to order prescriptions when running low.

#### Conclusion:

By this study we come to a conclusion that The future homes would rely on smart home technology .Smart homes make the life easier for working population as they can manage and keep an eye on their homes from any remote area with one single click from their phones.

Smart homes are future avenues of assistive living as they take care of the aging population who would like to lead an independent life . The future of smart homes would have a very greater impact the living of the people as it makes life more easier and convenient to live.

The Smart Home Technology is Making home a Better Place to live.

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