



ARTIFICIAL INTELLIGENCE IN HOME AUTOMATION AS A BOON FOR CIVIL ENGINEERING

Gaurav Mishra

Assistant Professor, Department of Civil Engineering, Aryabhata College of Engineering and Research Center, Ajmer (Rajasthan).

Article DOI: <https://doi.org/10.36713/epra10347>

DOI No: 10.36713/epra10347

ABSTRACT

Technology has made human life easier and more lavish. After civilization, the construction industry is the oldest industry. It is getting advanced day by day through technological innovations and advancements. Artificial intelligence is a new dimension of the use of technology for improving the quality of human life. It is an emerging trend in Civil Engineering, which is presently being used to improve the construction sector's performance. Artificial intelligence has taken smart home technology or home automation system in Civil engineering. Smart homes are well equipped with devices linked to the internet. Smart doors and windows, smart locks, smart safety alarms, smart lifts, escalators, etc. are being used in this new era's buildings. This paper focused on artificial intelligence applications in the construction of residential buildings equipped with the home automation concept, applications used in smart homes, the pros and cons of this technology, etc.

KEYWORDS: *Artificial Intelligence, Construction Industry, Home Automation, Robotization*

INTRODUCTION

Artificial intelligence is a trending term nowadays. It is a branch of science that deals with problem-solving like the human brain. The word Artificial intelligence is a combination of two words where artificial means 'not natural or machine-related and intelligence word is related to our cognitive skills. So artificial intelligence is a machine or computer that behaves intelligently like the human brain. Basically, it is the application of human intelligence in a computer-friendly or machine-centric way. Artificial intelligence (AI) is the capability of computers to execute tasks that actually need the human brain. Tasks may comprise visual perception, decision-making, speech recognition, and translation. Broadly it can be said that it is concerned with the roboticization of human behaviour. Artificial Intelligence works in the civil engineering and construction industry with the goal of executing and pertaining functions of the human brain, logically and intelligently. Artificial Intelligence is a branch of study that explains itself intelligent behaviour in the terms of computational processes (Robert J. Schalkoff, 1990). Artificial intelligence is a new technique that stores a high amount of information to solve problems with high speed.

The term Artificial intelligence is now broadly being used in computer science, information and communication technology, cybernetics, linguistics, engineering, and many more fields. If we consider artificial intelligence in Civil engineering, it is being used in home automation, smart homes,

construction, predictions, risk analysis, decision making, and optimization, construction management, building materials, hydraulic optimization, geotechnical and transportation engineering, and management of many other civil engineering works. Different methods of artificial intelligence are used in the collection and analysis of large data that reduces the cost, time, effort, and resources.

HOME AUTOMATION CONCEPT

Home automation is a term that is used to automatic and electronic control of household activities and appliances. It is the use of internet in house utilities and facilities. It makes today's busy life more convenient, comfortable, and secure. It is not a new concept; it came into existence in the late 1990s and early 2000s. Our desire for convenience, security, and energy efficiency has pushed innovators to develop solutions to cater to our needs. More importantly, developers must focus on the connectivity and interactivity of various devices, both of which are essential for overall efficiency and performance. For example - imagine a situation where all things and home appliances are 'intelligent'. you wake up after hearing the alarm, tea maker that is linked with your clock turns on and make a cup of rejuvenating tea for you. When you enter the room, lights automatically switch on and the room temperature is set accordingly. All these types of activities happen in automated homes. So these homes are also known as 'Smart homes' also. This smart home technology is useful to enhance

performance and efficiency. It consumes less energy and resources and leads to sustainable construction.

Home automation is a new dimension of the use of technology for the betterment of human life. It is providing the foundation for 'intelligent living' because it is based on integration where all appliances or devices of the home are interconnected and communicate with each other in a controlled

way. All processes can be controlled by the use of versatile ways. This technology is useful to make our life more comfortable, convenient, and secure but as well as it is more beneficial for old age persons and persons with any disability.

A basic structure of the home automation is given in below diagram-

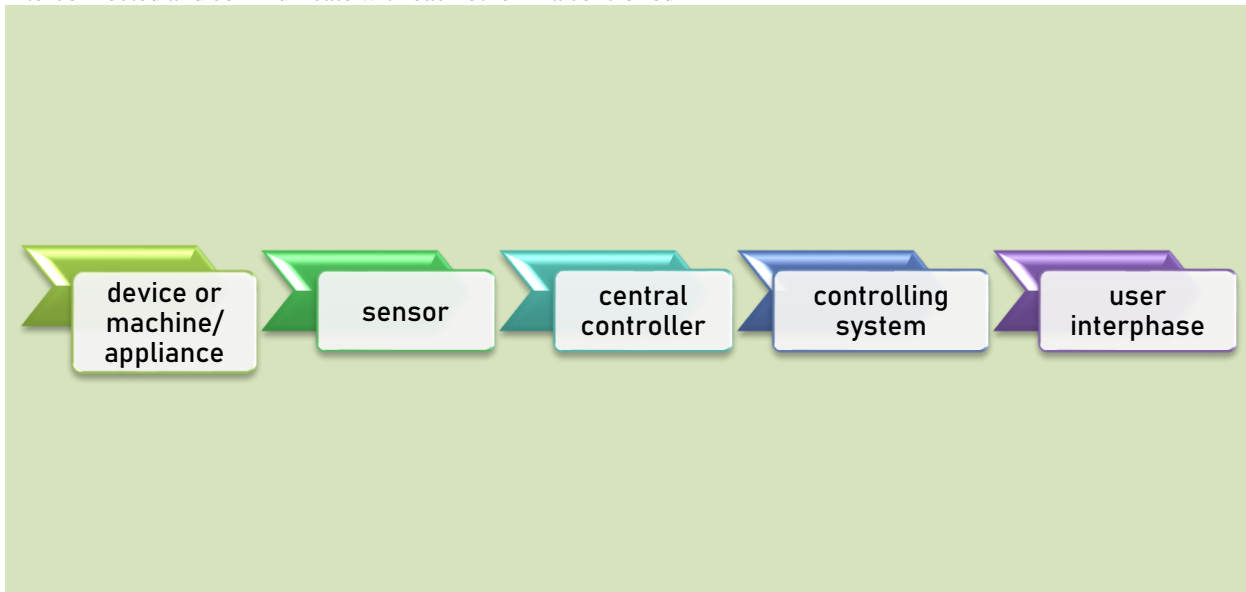


Figure 1- The basic structure of the home automation

User interphase is a device that provides commands to monitor or smart phone. The transmission medium may be wired or wireless like Bluetooth.

SOME APPLICATIONS OF HOME AUTOMATION

Today various applications are available for home automation. These are useful from the point of view of cost reduction, efficiency, affordability, convenience, etc. basically home automation includes smart lighting, safety, security, HVAC, entertainment, management of energy and other resources, etc. Home automation is a network of hardware, communication,

and electronic interfaces that work to integrate everyday devices via the Internet. We can manage them with our smart phone or laptop. There are three main elements of a home automation system -

1. **Sensors** can monitor changes in daylight, temperature, or motion detection.
2. **Controllers** which control the devices like personal computers, tablets, or smart phones.
3. **Actuators** may be light switches, motors, or motorized valves that control the actual mechanism or function.

Some popular home automation applications are as follows -

Smart Temperature Control	<ul style="list-style-type: none">• They automatically adjust the temperature of the home according to your routine.
Smart Thermostats	<ul style="list-style-type: none">• It reduce energy bills and monitor the internal climate system. It detects any issues with the A/C or furnace to save energy
Smart Security System	<ul style="list-style-type: none">• People can monitor their homes remotely, identify visitors or deliveries, and control access to their homes. Security options include cameras, video doorbells, motion sensors, smart locks, and much more.
Smart Lighting	<ul style="list-style-type: none">• Set timers to set a schedule for them to turn on and off throughout the day. Smart bulb, an internet-capable LED light, is to allow to control its brightness or on/off capabilities from the smart phone.
Safety Sensors	<ul style="list-style-type: none">• It include alarms that can sense gas, fires, carbon monoxide levels, water leakage, etc.
Smart Bathrooms	<ul style="list-style-type: none">• Smart shower heads for water conservation, voice-activated showers and automatic temperature settings based on personal preferences.
Smart Kitchen Appliances	<ul style="list-style-type: none">• A dishwasher that turns on after reaching its threshold capacity, a fridge suggests ingredients for recipe of choice, a stove that turns off when it detects gas leakage, and much more.

Figure 2 - Popular home automation applications

**Benefits of Smart Home Technology or Home Automation :****LIMITATIONS OF HOME AUTOMATION**

As we know well technology has made our life easier and more comfortable but this is only one aspect of technology. On the other side of the coin, if a thing has some pros, it has some cons too. It has no doubt that home automation or smart home technology has taken a revolution in our lives but it has some limitations also. Some limitations or drawbacks of home automation are as follows -

- Installation cost is quite significant
- Reliability of internet is mandatory
- Sometimes security issues occur
- Technical and technological issues in connected homes
- If technology fails, a person cannot do anything instantly.
- Every person is not a master in smart technology.
- Repairing and maintenance issues occur.

CONCLUSION

Artificial intelligence is crucial for home automation. In this era of fast-growing technology, artificial intelligence is getting introduced in every sector. In civil engineering especially referring to home automation, various applications are available with high performance, excellence, and cost-effectiveness. Here in the review, various applications of home automation have been discussed. In the future, this smart home technology become more affordable and smarter.

REFERENCES

1. *Applications of Home Automation*, published march 17, 2015. retrieved from *Applications of Home Automation | Blog | Link Labs (link-labs.com)*
2. Hadi Salehi1, Rigoberto Burgueño (2018). 'Emerging Artificial Intelligence Methods in Structural Engineering'. Manuscript_824f38aeb6473dfd4189789143a454f1. Retrieved from *Emerging artificial intelligence methods in structural engineering (sciencedirectassets.com)*
3. Purohit D., Ghosh M. (2017). 'Challenges and Types of Home Automation Systems. *International Journal of Computer Science and Mobile Computing*'. IJCSMC, Vol. 6, Issue. 4, April 2017, pg.369 – 375. retrieved from *V6I4201799a1.pdf (ijcsmc.com)*
4. Rajput, M (2019). 'IoT and Home Automation – Is it the Future?'. *IoT and Home Automation – Is it the Future? (readwrite.com)*
5. Poonam Bagora, Shanu Sharma (2021). *Incredible Change in Construction Era by Using Artificial Intelligence*. *Science, Technology and Development. Volume X Issue XII December 2021. 26-dec2021.pdf (journalstd.com)*
6. *What Is Home Automation and How Does it Work? | Xfinity*
7. *Smart Home Definition (investopedia.com)*