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## Smart Homes

Matthew N O Sadiku<sup>1</sup>, Sarhan M Musa<sup>1</sup>, Sudarshan R Nelatury<sup>2</sup>

<sup>1</sup>College of Engineering Prairie View A&M University

<sup>2</sup>School of Engineering Pennsylvania State University

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**Abstract** The smart home is one of the emerging infrastructures. It is an application of ubiquitous computing that provides services to users in form of remote home control or home automation. Smart homes should be regarded as the building blocks of smart cities and intelligent communities. This paper provides a brief introduction to smart homes.

**Keywords** smart homes, smart houses, smart buildings, smart living, adaptive house.

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### Introduction

The term "smart home" refers to a residence that has all appliances (from cameras to coffee makers) that are capable of communicating with one another and can be controlled remotely. A smart home is usually a new building that is equipped with smart features and technology to enable occupants to remotely control devices in the home. Things one can set up and control include lighting, heating, air conditioning, TVs, computers, appliances, security systems, thermostats, sprinklers, intercoms, and robots.

For example, a homeowner on vacation can use a smart phone, tablet, laptop, or Apple watch to interact and control a home security system, control temperature gauges, and switch appliances on or off.

The main objectives of a smart home are to improve the quality of life, increase automation, facilitate energy management, and minimize environmental emissions. Smart homes automate electrical devices and control the environment inside. A smart home allows the occupants to remotely arm or disarm security, lock and unlock doors, control lights. They can also get alerts about events such as when children arrive home from school.

### Underlying Technologies

Technological innovations, from telecommunication to intelligent appliances, introduce new possibilities to the smart home. The underlying technologies for a typical smart home include [1]: (1) sensors, (2) computers, (3) software, (4) user input devices, (5) user output devices, (6) mechanical hardware, (7) wireless technology, (8) batteries and other power sources, (9) Internet of Things (IoT), (10) smart appliances, (11) GPS, and (12) other related technologies. The devices connected by these technologies form a home area network, where communications are enabled by different protocols. For example, IoT will connect devices in the home to the Internet.

Since the smart home consists of a wealth of connected gadgets, it is equipped with different kinds of sensors: door sensors, motion sensors, temperature sensors, water flow sensors, accelerometer sensors, gas sensors, reed switch sensors, piezoelectric sensors, and light switch sensors [2]. These sensors along with connected devices can make home life more enjoyable, relaxing, fulfilling, and convenient. Wireless technology provides an invisible connection and communication among devices. The more bedroom gadgets one has, the better one might be able to sleep at night. With the gadgets one has in the kitchen, one feels inspired to cook and clean.



A smart home has some measure of automation built into it. Home automation technologies include X10, ZigBee, Z-wave, Universal Powerline Bus (UPB), Smarthome, Arduino microcontroller, and Wi-Fi. These will let you control your home from anywhere you have access to the Internet.

### **Home Energy Management**

Users are usually motivated by the cost-saving potential of smart homes. There are different kinds of users, such as home or apartment occupants, building management authorities, and office management authorities. Instead of depending on the power company, a smart home can generate its own energy using solar panels, wind turbines, geothermal plants, and other energy sources. Smart homes within the same neighborhood can form a microgrid and trade energy among themselves [3]. The energy price is dictated by the local microgrid and the utility provider which uses the Internet to receive energy consumption information.

Smart home energy can be managed by proper selection of efficient appliances. Smart meters can be employed for measuring energy consumption. A smart oven cooks faster and healthier based on selected recipe. It can communicate with other devices such as cell phone, smart fridge, and fire alarm. Managing power consumption with home automation helps in effective use of limited resources such as water, gas, and electricity.

### **Benefits**

One of the greatest motivations for having smart homes is to assist elderly and disabled people and enhance their well-being and independent living. Studies show that old people tend to isolate themselves from others, which may have negative impact on their health, and that they prefer staying in their own homes, a phenomenon known as age-in-place. With the worldwide development of aging societies, there is a calling for smart technologies providing independence, productivity, and quality of life among elderly people [4]. Senior citizens living in smart homes tend to live longer in their homes by reducing caregiver burden.

Some senior citizens are not computer literate. Some sensors are not appropriate for elderly people, who may not be willing to wear them. While people want smart domestic appliances to help in their menial tasks, they want to remain in control.

### **Conclusion**

There is a growing interest in the idea of smart homes. To be regarded smart, a home must include techniques of activity recognition and must be capable of providing a better quality of life for the inhabitants. It must be able to “think” for itself. Smart homes are supposed to enhance living experience and support independent living, especially for the elderly. Smart home technologies have been introduced all over the world. The concept of smart homes promises that household devices would communicate with their owners. The concept has been extended to smart buildings such as smart offices, hospitals, and sport centers. The true benefits of the smart home will not be realized without improvement in underlying technologies.

Smart homes have bright prospects; they are an exciting and challenging field for engineers, architects, city planners, and designers. However, smart homes face some challenges and have not generated a breakthrough. Cost and work required for installation present major challenges. Smart homes are homes of the future. As prices for equipment fall and consumer demand rises, smart home technologies will make their way into more new homes. The benefits of a smart home (independence, safety, mobility, and energy cost savings) far outweigh the initial expense.

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#### **About the Authors**

- Mathew N.O. Sadiku is a professor at Prairie View A&M University, Texas. He is the author of several books and papers. He is an IEEE fellow.
- Sarhan M. Musa is a professor in the Department of Engineering Technology at Prairie View A&M University, Texas. He has been the director of Prairie View Networking Academy, Texas, since 2004. He is an LTD Spring and Boeing Welliver Fellow.
- Sudarshan R. Nelatury is an associate professor at Penn State University, The Behrend College, Erie, Pennsylvania. His teaching and research interests lie in electromagnetics and signal processing.

