

Editorial

Smart Cities and Homes: Current Status and Future Possibilities

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1. Introduction

The advancement of sensing technologies, embedded systems, wireless communication technologies, nanomaterials, miniaturization, vision sensing and processing speed have made it possible to develop smart technologies that can generate data seamlessly. By applying the generated by smart sensors and sensing technology, it is possible to utilize the resources in a more effective and intelligent manner. In exploring the current available technology, significant advancements have been made towards the implementation of smart homes and cities along with numerous future possibilities.

This Special Issue on smart cities and homes, current status and future possibilities reports advancements in various fields of science and engineering along with their beneficial applications for humanity.

Sensors and sensor networks make it possible to monitor different appliances for our day-to-day usages, with the collection of data measured by all sensors through sensor networks and intelligent data analysis helping to provide a safe environment [1]; to determine the wellness of the person monitored [2]; and to detect occupancy [3] as well as to forecast future behaviour to prevent unforeseen incidents [4]. These developments have led to the concept of a wellness sensor network for smart home environments [5]. Smart sensors and wireless sensor networks make it possible to monitor electrical appliances and power consumption [6], along with remote controls, using the Internet of Things technology to make homes more comfortable to live in [7]. This SI will present contributions of the reported research activities in the general area of sensors and sensing technology for different areas of application in smart homes.

Smart sensors can also be extended to intelligent implanted sensors for orthopaedic implants to monitor healing after spine surgery [8]. Research will also be extended to the security aspect of smart home systems as reported in [9,10]. Another paper proposed a similar system and technology that can also monitor a large building consisting of many homes, as well as identifying challenges of wireless communication and network technology for further exploration [11]. Smart cities consist of a combination of different technologies spanning electricity, internet connectivity, traffic light, air pollution, weather forecasting, water quality, and many more. Different types of sensors and interfacing electronics as well as communication technologies are used to make this feasible [12].

In modern sensor technologies, remote monitoring is becoming very common as it provides numerous advantages; the data measured by the sensor are uploaded in the cloud, making them IoT-enabled sensors [13]. Some of the technologies that are commonly used in smart cities include the following:

2. Internet of Things (IoT)

The IoT is a network of connected devices that can collect and transmit data. In the context of smart cities, IoT sensors can be used to collect data on everything from air quality to traffic patterns to water usage. These data can then be analysed to identify trends and patterns and make more informed decisions about resource allocation.



Citation: Mukhopadhyay, S.; Suryadevara, N.K. Smart Cities and Homes: Current Status and Future Possibilities. *J. Sens. Actuator Netw.* **2023**, *12*, 25. <https://doi.org/10.3390/jsan12020025>

Received: 13 March 2023

Accepted: 14 March 2023

Published: 16 March 2023



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3. Artificial Intelligence (AI)

AI technologies, such as machine learning and natural language processing, are increasingly being used in smart cities to enable predictive modelling and real-time decision-making. For example, an AI system could analyse traffic patterns and predict where congestion is likely to occur, enabling city planners to proactively adjust traffic flow.

4. Big Data Analytics

Big data analytics, along with artificial intelligence and machine learning, promises to solve many challenges to society. With so much data being generated by IoT sensors and other sources, big data analytics are essential for making sense of it all. By using machine learning algorithms and other advanced techniques, cities can identify patterns and correlations that would be difficult or impossible to detect manually. This can enable more effective decision-making and resource allocation.

5. Smart Transportation

Transportation is a major focus of smart city initiatives, with the goal of reducing traffic congestion, improving safety, and reducing emissions. Technologies such as intelligent traffic management systems, connected vehicles, and public transportation apps are being used to achieve these goals.

6. Renewable Energy

Smart cities are also looking to renewable energy sources to reduce their environmental footprint and improve energy efficiency. Technologies such as solar panels, wind turbines, and energy storage systems are being used to generate and store energy more efficiently.

In the context of smart homes, the technologies being used are somewhat different. Smart homes are typically equipped with a variety of connected devices that can be controlled remotely, either through a mobile app or voice commands. The following points explore some of the technologies commonly used in smart homes:

7. Connected Devices

Connected devices, such as smart thermostats, lighting systems, and security systems, are the foundation of smart homes. These devices can be controlled remotely and can be programmed to respond to specific triggers, such as a door opening or the presence of a person in a room.

8. Voice Assistants

Voice assistants, such as Amazon Alexa and Google Assistant, are increasingly being used to control smart home devices using natural language commands. This technology makes it easy for users to control their home environment without needing to use a mobile app.

9. Energy Management Systems

Energy management systems are designed to optimize energy usage in the home. These systems can analyse energy usage patterns and adjust this usage to reduce waste and save money.

10. Environmental Sensing

Air quality sensors are another critical area for smart cities. Poor air quality can have a significant impact on public health, and sensors can be used to monitor levels of pollutants such as nitrogen dioxide, ozone, and particulate matter. These data can be used to inform decisions about traffic management, urban planning, and the location of green spaces.

In the future, we can expect to see more advanced sensing technologies being used in smart cities. For example, LiDAR (Light Detection and Ranging) sensors can be used to create 3D maps of cities, which can be used to optimize urban planning and identify areas

where buildings can be constructed. Machine learning algorithms can be used to analyse the data from these sensors to provide insights into the behaviour of people and vehicles in the city.

11. Smart Homes

Smart homes are becoming increasingly popular, and the use of sensing technologies is a critical element of this. Sensors can be used to monitor energy consumption, temperature, and humidity levels, as well as the presence of people and pets in the home. These data can be used to automate various aspects of the home, such as turning off lights and heating when no one is home.

In the future, we can expect to see more advanced sensing technologies being used in smart homes. For example, smart mirrors can be equipped with facial recognition technology to provide personalized recommendations for skincare and makeup. Smart windows can be equipped with sensors that can detect changes in light and temperature, and adjust these automatically in the home.

In the kitchen, sensors can be used to monitor the freshness of food and alert users when items are about to expire. Smart appliances can be connected to the Internet, enabling users to control them remotely and receive alerts when maintenance is required.

The use of sensors in smart homes can also have a significant impact on the environment. For example, sensors can be used to monitor water usage and identify leaks, which can help homeowners to conserve water and reduce their bills. Additionally, the use of energy-efficient appliances and automated lighting can help to reduce energy consumption and lower carbon emissions.

This Special Issue welcomes more in-depth research in the field of smart homes and cities with advanced technologies that continues to address the challenges we face today, such as climate change, air pollution, water quality and shortages, comfort of lives, and energy crises.

Acknowledgments: The GEs extend their sincere thanks to the current and future authors for their contributions of original articles to make this SI a successful one.

Conflicts of Interest: The authors declare no conflict of interest.

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