Chapter 6
IoT Sensors for Smart Automation:
A Systematic Review

C. L. Chayalakshmi
Basaveshwar Engineering College, Bagalkote, India

Mahabaleshwar S. Kakkasageri
Basaveshwar Engineering College, Bagalkote, India

Rajani S. Pujar
Basaveshwar Engineering College, Bagalkote, India

Nayana Hegde
https://orcid.org/0000-0001-7467-2553
Reva University, India

ABSTRACT

The internet of things (IoT) has changed the comforts of every individual. Sensors and communication models play an important role in the effective implementation of IoT systems for any applications. Sensors can be classified based on the parameters to be measured and on the working principles. The second significant component in IoT-based systems is communication models, which help to exchange the data between the two IoT devices. Basically, there are four types of communication models that are commonly used: device to device, device to cloud, device to the gateway, and backend data sharing communication models. This chapter explains various sensors that can be connected to the internet for transferring data between IoT devices, application areas and communication models. The classification of IoT application areas is based on the scope of functionality, use, and adaptation. Sensors are classified on the basis of types of measurement such as vision, position, physical, and others. Basic communication models and open research challenges are explained at the end.

DOI: 10.4018/979-8-3693-0659-8.ch006

1. INTERNET OF THINGS

Internet of Things (IoT) plays a significant role in our day to day life. It includes various application areas such as health care, vehicles, entertainment, home and industrial appliances, and sports (Ammar et al., 2018). IoT is a vast and a fast growing technology which connects the objects/things anywhere in the world in a network through internet. IoT is an amalgamation of sensor technology, computational intelligence, communication, artificial intelligence and microelectronics (Poornima, 2021). Things in IoT with the processing unit are able to aggregate, process, take decisions, and transmit/receive the generated data, without intervention of human beings (Alanzi et al., 2019). It is estimated that 15 billions of IoT devices in 2023 and may increase to 21.5 billion in 2025 (Tariq, 2018). The main motive of IoT is to transform real devices to smart and intelligent virtual devices and to connect all devices under a common network. The basic components on every IoT are devices, data processing, connectivity and user interface. Collect, communicate, analyse and act are the four distinct steps of IoT life cycle. IoT devices are collecting the data from various areas of application. Collected data will be transmitted to other devices through the network. Received data will be converted to information and the action is based on the information and data. Consumer IoT (CIoT) and Industrial IoT (IIoT) are the basic types. Consumer IoT focuses on the communication between consumers and Internet of Things. Industrial IoT is concerned with employing IoT for designing industrial systems (Parthasarathy, 2022).

IoT architecture is a basic method to devise the components of IoT for delivering the services effectively over the network. Various types of IoT architecture exist to cater the needs of different applications. Three layer, four layer, five layer and Service-oriented Architecture (SoA) are the types as shown in Figure 1. The most fundamental IoT architecture is three layered architecture with perception layer, network layer and application layer (Al-Qaseemi et al., 2016; Wu et al., 2010). Three layered architecture was not sufficient for large scale IoT applications. So four layered architecture came into existence with perception layer, network layer, data processing layer and application layer. To provide services to various industries, institutes, companies, and government sectors and to enhance the security features, five layered IoT architecture was designed by researchers. Along with all layers of three layered architecture, business layer and middle ware layer are added in five layered IoT architecture (Zhong et al., 2015; Kakkar et al., 2021). SoA architecture is a top layered architecture. System functions are provided to the end users (Miorandi et al., 2012; Li et al., 2015).

A. IoT Applications

Internet of Things has expanded its status in modern days for connecting all the things such as devices, sensors, equipments, software, and information services through internet (Samani & Wahaishi, 2015; Atanasovski et al., 2015). Applications of IoT are many and endless. Some of prominent IoT applications are as follows.

- **Smart Mobility:** Smart mobility is the intelligent transport and mobility network. The basic objective of the smart mobility is to provide reduction in noise generated due to automobiles, more flexible, multi modal transport system, preventing or reducing road accidents thereby enhancing the road safety, and to develop an advanced traffic flow (Zorzi et al., 2010).
- **Smart Grid:** Smart grid is an electrical network with digital and wireless communication technology to detect and react to the variations in usage of energy. The basic objective of smart grid is