Chapter 1
The Age of Autonomous Internet of Things Devices:
Opportunities and Challenges of IoT

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ABSTRACT

The age of autonomous sensing has dominated almost every industry today. Our lives have been engaged with multiple sensors embedded in our smartphones to achieve sensing of all sorts starting from proximity sensing to social sensing. Our possessions (cars, fridges, oven) have sensors embedded in them. The art of autonomous IoT has shifted from a mere detection of events or changes in the environment to dominant systems for social sensing, big data analytics, and smart things. Recently, sensing systems have adapted connectivity resulting in input mechanisms for big data analytics and smart systems resulting in pervasive systems. Currently, a range of sensors has come to existence, for example, mobile phone sensors that measure blood pressure at patients' figure tip, or the sensors that be used to detect deforestation. In this chapter, the authors provide a technical view upon which autonomous IoT devices can be implemented and enlist opportunities and challenges of the same.

INTRODUCTION

The Internet of things (IoT) and their applications have increased pervasiveness, they have a great impact on our daily lives and change the way people interact with this physical world (Alli and Alam 2019). Autonomous sensing devices possess intelligent systems that are powered by machine learning, deep learning, communication systems, electrical and computational resources, smart algorithms for predictions and decision making. Bechtsis asserts that firms' production and performance are becoming data-driven, this can be enhanced through the utilization of autonomous and distributed devices (Bechtsis, Tsolakis et al. 2017). Additionally, incorporating the Internet of Things calls for the design and implementation of autonomous sensing devices to address the anticipated challenges in industries and homes (Alur, Berger et al. 2016). Therefore, autonomous sensing devices are getting more useful in the field of information engineering, robotics, and artificial intelligence.

Autonomous IoT devices can be categorized into service and rescue robots, exploring disaster areas and waste management (Birk and Carpin 2006). Looking at homes, these perform cleaning like Roomba vacuum cleaning robot, office delivery of goods and services like the FedEx unveils autonomous delivery robot and RP-VITA (Remote Presence Virtual + Independent Telemedicine Assistant) that is basically found in health public hospitals. Autonomous devices were created in the same architecture as a human, they use sensors, laser scanners, spectrometers, and vision cameras as their mechanism to perceive the environment in making quick and safety decisions. They possess an embedded system that makes a quick decision even without the notice of its brain called the computer. They also use actuators like motors display instructions such making the movement (Pratt and Williamson 1995). Considering this background, the purpose of this chapter is to detail the technical and theoretical aspects of autonomous sensing and connected devices. In order to achieve this aim, the specific objectives of this chapter are to;

i.   Highlight some of the components used to implement autonomous connected devices and how they are integrated.
ii.   Present the system engineering perspective on the conceptual design and integration of the crucial tools used in the internet of things (IoT) to come up with autonomy ability.
iii. Present the importance of the internet of things in various sectors of applicability.
iv.   Discuss the key challenges associated with the use of autonomous devices.
      v.

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