Chapter 14
Smart Vacuum Cleaner:
Vacuum Cleaner Using NB–IoT

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ABSTRACT

In this chapter, the aim is to provide the design of an automatic vacuum cleaner that will help to make household work convenient and much easier. This vacuum cleaner operates in both autonomous and manual mode, along with additional features such as time scheduling and dirt container with auto-dirt disposal mechanism. They are seen as more convenient to use because they can suck dust on their own. This work can be very useful in improving lifestyle of modern humans. The purpose of this project is to design automatic vacuum cleaners using digital image processing with the help of OpenCv technique. Vacuum cleaner robot is designed to make cleaning process much easier rather than by using manual vacuum.

INTRODUCTION

Internet of things (IoT) is considered as a network of devices that can interact with each other in terms of sending, receiving, and processing data. These devices may include vehicles, home appliances, smart phones, essentially any physical device that can connect to the Internet. Narrowband Internet of things (NB-IoT) is a low power wide area (LPWA) technology built to support a wide range of new IoT devices and services. NB-IoT significantly enhances user device power consumption, system performance, and spectrum quality, especially in large coverage. For wide variety of uses, it is possible to support a battery life of more than 10 years. New physical layer signals and channels are planned to meet the challenging requirements of expanded coverage – rural and deep indoor – and ultra-low complexity of devices. The costs of NB-IoT modules are less when compared with other alternatives. Nevertheless, the underlying technology is much simpler than the other forms of IoTs in use today. Its costs are projected to decrease steadily as demand grows up.

In today's life, time management is considered as one of the most important factors. A very notable household chore is floor sweeping that is often seen as a challenging and tedious task. In most cases, cleaners are employed to do the job, rather than the occupants of the home. The difficulty caused by this repetitive chore warranted the creation of a vacuum cleaner capable of assisting humans with such a task. A vacuum cleaner is an electro-mechanical device that is usually used by suction to clean walls, chairs, rugs, and carpets. The electric motor inside the unit turns a fan that produces a partial vacuum and allows air to rush into the vacated space outside. That pushes any dirt or dust around the nozzle into or stuck to the outside of a bag inside the unit. The demand to reduce the manpower level has led to the design and development of automatic control systems, which enables unattended operations of the machinery. The current automatic integrated systems cover all aspects of Automatic vacuum cleaner operations.

In the recent years, automatic robotic vacuum cleaners are best suited for home and office cleaning. Robotic vacuum cleaners are the smart devices that take care of our cleaning chores with just a single click. These are equipped to clean an entire floor and covering difficult corners, they are the perfect appliance for people who find it difficult to take out time for sweeping and cleaning. These jobs are still taken care of by the house help. This appliance will reduce our dependency on them and the process can be taken care of without time constraints.

In this chapter, a comprehensive study of NB-IoT based automatic vacuum cleaner and its basic structure has been described. A well-planned literature survey has ensured the availability of information for efficient system performance, technology usage, specialization, and management of available resources. The study includes the current knowledge, findings, as well as different methods for the development of IoT based vacuum cleaner using image processing. It involves concept development, which is a set of activities carried out in the system engineering to collect parameters of operational needs and develop a suitable system for implementation. In recent years, a lot of automatic vacuum cleaners have been introduced in the market which provides different features for cleaning. The automatic floor cleaner shows intelligence programmed to scrub a selected space through a vacuum cleanup assembly. The cleaner is price effective, convenient, setting friendly that saves the precious time of someone.

The reminder of this chapter is organized in sections. In section 2, we present the literature review for the chosen topic. In section 3 we provide the basics of the smart vacuum cleaner. In section 4, we present the needs and requirements of NBIoT for this vacuum cleaner along with the design details. In section 5, we present the future research directions for this vacuum cleaner. In section 6, we conclude this chapter with the main points.

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