Chapter 24

The Categorization of Development Boards to Implement the Embedded Systems and Internet of Things With Cloud Database for Volcano Monitoring Drones

Aswin Kumer S. V.
Koneru Lakshmaiah Education Foundation, India

Venkatasubramanian K.
QIS College of Engineering and Technology, India

Ayeesha Nasreen M.
https://orcid.org/0000-0003-4771-7319
RMD Engineering College, India

Lakshmi Bharath Gogu
Srinivasa Institute of Technology and Science, India

Jayalakshmi S.
QIS College of Engineering and Technology, India

ABSTRACT

Instead of sending human beings into volcanoes, drone-bot is used to measure the live lava temperature, and it alerts the ground station to protect people near the surroundings. The thermocouple is used as a temperature sensor. It can measure a wide range of higher temperatures, and it can be interfaced with the TTGo T-Call development board to process and send the temperature data to the ground station through GSM as short message service (SMS). Also the ESP-32 CAM is interfaced with that development board to capture the snapshot of the mountain if the temperature is high and the same snap is shared to the ground station through Wi-Fi. The GPS module is also interfaced with the development board to know the location of the volcano.

DOI: 10.4018/978-1-7998-9640-1.ch024

INTRODUCTION

The Embedded system can be implemented by using the set of sensors and bunch of actuators connected with the Microcontroller or a Development Board with microcontroller like Arduino, ESP8266, ESP32, TTGo-T-Call and Raspberry Pi, etc., and the development board is programmed by using some programming languages like C Programming, C++ Programming, Python Programming, Micro Python programming, etc., to perform specific task. If the embedded system is connected with internet, to monitor and control the actuators based on the sensor data from the remote location with high data security, then it is called Internet of Things. There are many stages in Internet of Things which are to be discussed in this chapter.

Embedded systems

The bunch of sensors and actuators connected with a microcontroller or a development board which can be operated and controlled through a software or firmware to perform the specific task is called an embedded system (Ma & Jiao, 2020). The basic structure of an Embedded system is shown in figure 1. There are variety of microcontrollers available to implement an embedded system (Martínez-Rodríguez, Valle, Brox, & Sánchez-Solano, 2020). They are 8051 microcontroller and its variants, PIC microcontroller and its variants and ARM microcontroller and its variants (Arredondo-Velázquez, Diaz-Carmona, Barranco-Gutiérrez, & Torres-Huitzil, 2020). These are the standard microcontrollers widely used in the industries to perform the particular tasks (Kwak & Lee, 2020). The assembly language programming and Embedded ‘C’ programming is used for programming these microcontrollers (Zhang, Seo, Donyanavard, Dutt, & Kurdahi, 2021). These microcontrollers never produce noises when handling the inputs and outputs because of its reliability(Muthukumaran V et al., 2018).

The high reliability microcontrollers are always used in the industries for good efficiency. These microcontrollers can be used with the development boards to implement the tasks easily. The other development boards are Arduino and its models which uses AVR family microcontrollers, ESP8266, Node MCU, ESP 12, ESP 32, TTGo-T-Call and its models, and Raspberry Pi and its different versions. These development boards can be programmed by using Embedded ‘C++’ through Arduino Integrated Development Environment (IDE), Micro python IDE, and Thonny python IDE. The Raspberry pi is the only development board which is having the operating system to perform the tasks(Muthukumaran V et al., 2021).