

Design and development of autonomous ground-level weather monitoring station

ABSTRACT

Weather is one of the important factors influencing human daily activities. Not only that, weather also influence societal progress and industries such as agriculture. In general, traditional weather station relied on manual equipment to measure weather parameter. However, the modernization of technologies has introduced personal and professional weather station. Nonetheless, recent technological advancements have introduced long-range personal weather station, but the reliance on Wi-Fi limits the access to weather data in areas with poor internet coverage. In addition to this limitation, some of these weather stations may require manual data storage, such as using memory cards, which can prevent users to have access to weather data remotely. Furthermore, certain weather stations may utilize bluetooth as an alternative communication method. However, bluetooth short-range nature can restrict remote access to weather data, presenting challenges in scenarios where users need data from a distance. Meanwhile, for extended data collection in remote, unattended locations or small areas like a greenhouse, professional weather station may introduce inherent inaccuracies due to the fixed locality limitation whereby the location of the professional weather station may be located far away from the user location of interest. Thus, installing multiple automatic weather stations to increase accuracy can be costly. In this paper, an autonomous ground-level weather monitoring station has been built integrating sensors, microcontrollers and software to provide a real-time and reliable weather data as well as the location of the weather station for users. This prototype integrates LoRa technology as the communication medium between the transmitter and receiver. Additionally, this prototype also uses a custom monitoring software to complement the weather station for data processing and visualization thus, catering to both personal and professional needs. Hence, the test was conducted to verify the workability of the overall system. It was found that the transmitter of the weather station was able to transmit weather data wirelessly to the receiver. Simultaneously a custom monitoring software were able to visualize and log the real time data thus providing users with an insight of the current and past weather condition.