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A smart system based on wireless sensor network for monitoring and controlling mushroom growing conditions

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Abstract

The word mushroom may mean different things to different people in different countries. Mushrooms can be used as food, tonics, medicines, cosmeceuticals, and as natural biocontrol agents in plant protection with insecticidal, fungicidal, bactericidal, herbicidal, and nematocidal activities. Plant growth is affected by various factors. The most important factors for the quality and productivity of plant growth are temperature, humidity and light. This research presents the design and implementation of a smart system based on the wireless sensor network for monitoring and controlling mushroom growing conditions for farmers. The system contains five main units; namely sensing, transmission, decision making, controlling and monitoring. The system contains two main unit named as transceiver unit and receiver unit. The humidity sensor, temperature sensor and soil moisture sensor measure current environment condition and send the sensed value to the receiver unit using ZigBee. Then the ZigBee module which contains in the receiver unit receive the sensed value and gives to the Arduino board. Then Arduino board compares sensed value with pre-set value and ON or OFF pump, fan and heater automatically as well as send the SMS to farmer's mobile phone using Global System for Mobile Communication (GSM) module. Therefore, farmer is able to monitor the mushroom cultivation room in remotely instead visiting the mushroom cultivation room and can save time and labor which is needed to cultivate mushrooms.

Keywords: GSM, Mushroom cultivation, Wireless sensor network, ZigBee

Introduction

Mushrooms show an incredible impact on agriculture and the environment, and they support to build a great socio-economic impact in human welfare on local, national, and global levels (Chang and Wasser, 2017). Mushrooms are not just like plants, they derive their all energy and growth material from their growth field. Therefore in the mushroom cultivation, it is especially important to consider the environment condition of the mushroom cultivation room. When considered the environment condition impact to well growth of mushroom, it is related to the humidity level of around 95-100% and substrate (growth medium) moisture level of 50-75% (Mile and Chang, 2004). Therefore in the mushroom cultivation, there should be a correct combination among humidity, temperature and substrate moisture level.

In this research, we consider only about the indoor mushroom cultivation. In the indoor mushroom cultivation, farmer builds windowless, purpose-built buildings for cultivation. Indoor mushroom cultivation helps to tightly control the light, temperature and humidity while excluding contaminants and pests. There are six steps in the indoor mushroom cultivation (Wuest et al., 1988). They can be identified as composting, fertilizing, spawning, casing, pinning and cropping. Preparing the growth medium for the mushroom is the first step of the mushroom cultivation. Then they are placed on the trays in the mushroom cultivation room.