ULTRA-LOW-POWER PLUG-AND-PLAY SENSOR SYSTEM FOR URBAN FARMING PURPOSES

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ABSTRACT

Urban farming is a well-explored method of meeting the global food supply needs as the global population starts to shift into living in urban areas. To facilitate the growth of urban produce, a monitoring system is necessary. However, most existing monitoring systems tend to neglect the farmers in their operation by making the system too complex to operate without having the necessary technical skills. This study brings to the table a smart urban farming system that is easy to operate and install without being a direct party in the growth of the farm. By making the system plug-and-play, low power and independent, farm owners can easily install this system into a farm hassle-free while also allowing the system to operate for a long period of time. By using the Lorawan technology as a means of transmission, data from the sensors can be collected into a cloud database with long range and low power. This system was also a method of combating emerging pollutants from the excessive use of fertilizers by monitoring the amount of fertilizers used. The monitoring was achieved in a software developed using Keysight Vee. The use of new technology in pH detection, the 2-electrode cell used in this project to measure the amount of pH correlated with the fertilizers while being compact in size when compared with the conventional pH sensors. The device created in this project, dubbed the sensor pack, is a comprehensive Internet-of-Things gadget capable to be deployed out of the box, easily integrable and scalable. It was studied that the sensor pack drew current close to 80 μA on average in the span of a 5-minute cycle, making it ultra-low power. Further research in this area should include data analytics in order to optimize the yields of these urban farms even further.

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INTRODUCTION

1.1 Research Background

An urban farm, as the name implies, is a farm that is in an urban setting like a town or city. There are several types of urban farms in existence, each with its own method of counterpoising space of farm and volume of yields. There have been multiple efforts to solidify indoor urban farms that use aquaponics, aeroponics or vertical farming methods into a business venture however not many manage to take root [1]. The main issue with current urban farming effort is the excessive use of chemicals which causes a concern even among the farmers themselves, impeding the growth of urban farms [2]. Therefore, this study wishes to highlight a less-innovated method of urban farming which revolves around farming in unused or non-desirable spaces such as high-rise rooftops and areas under electric pylons [3].

1.2 Motivation

The inspiration behind this project takes root on the fact that agriculture systems are in abundance, but they rarely take the farmers' situation into account. Employing a system like these require full commitment into rearrangement of the whole farm just to accommodate the electronics. Thanks to this restriction, the agriculture industry does not see many innovations that can alleviate the human workforce in catering to the crops. This project believes full automation of the agriculture industry can be achieved but without relying on existing tools that would require the farm's architecture to be accommodative to the electronics from the ground up. This project believes that there are still room to cultivate a full automation system that is adaptive, modular and non-disruptive even in the saturated and mature agriculture technology market. The author wishes to introduce a new system that improves upon the users' experience even before the system begins its operation.