شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم

HANAA ALY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

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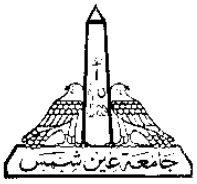

AIN SHAMS UNIVERSITY

FACULTY OF ENGINEERING

Electronics Engineering and Electrical Communications

Design and Implementation of Smart Agricultural Environment Using IoT Technology

A Thesis submitted in partial fulfillment of the requirements of the degree of

Master of Science in Electrical Engineering

(Electronics Engineering and Electrical Communications)

by

Shahenaz Mohamed Shokry Mahmoud Abou Emira

Bachelor of Science in Electrical Engineering

(Electronics Engineering and Electrical Communications)

Faculty of Engineering, Ain Shams University, 2021

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Statement

This thesis is submitted as a partial fulfillment of Master of Science in Electrical Engineering, Faculty of Engineering, Ain shams University. The author carried out the work included in this thesis, and no part of it has been submitted for a degree or a qualification at any other scientific entity.

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Shahenaz Abou Emira

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Thesis Summary

Agriculture plays a significant role in food production. Due to the huge increase in world's population, it is essential to monitor the plant performance in order to meet the increase of food demand. One of the technologies that evolved recently is Internet of Things (IoT), this technology enables the plants to talk and express their needs in order to avoid the excess or less amount of needed resources. Monitoring plants' performance using IoT technology requires high energy due to the large number of connected devices in wireless area networks. Using IoT in agricultural applications is critical due to the problems that appear in agriculture environments.

Supplying the network devices by common power lines are very difficult in agricultural environment so sensors are powered mainly by batteries. One of the critical problems also is replacing the batteries after drainage because sensors are sometimes mounted in unreachable points in agriculture environment. In this study an energy efficient algorithm is introduced using intelligent load scheduling, solar power and battery, this algorithm solved the battery drainage problem. The study focuses on choosing the optimum sleep duration for loads that will not affect the system operation as its calculation depends on the study of three main parameters battery state of Charging, Load Current and Load index. The proposed algorithm

guarantees the system sustainability as it increases the battery life time by the efficient usage of energy which will pave the way for using IoT technology.

This thesis consists of five chapters. Chapter 1 starts with a general introduction about the topic then it presents the main problems that affects agriculture. These problems are categorized as soil problems, Environmental changes, and Plant diseases. It also includes an overview on required parameters for monitoring agriculture performance. It discusses the main measurements required to monitor plants' performance. Chapter 2 presents the techniques used in agricultural applications which use energy efficiently and it also presents the power reduction techniques. It includes a review of literature which shows previous systems for monitoring plant performance.

Chapter 3 presents the main problem that is faced by sensor area network which is the high energy consumption which will lead to battery drainage by time as sensors have limited source of energy. Each sensor node is responsible for more than one task which requires high energy for execution. In this chapter, an energy efficient architecture and algorithm for agro systems are proposed. In Chapter 4, the results and discussion of the simulation are presented. Chapter 5 includes the conclusions and future work.

List of Publications

1- Shahenaz S. Abou Emira, Khaled Y. Youssef, and Mohamed Abouelatta. "Adaptive Power System for IoT-Based Smart Agriculture Applications." Published in 2019 15th International Computer Engineering Conference (ICENCO), pp. 126-131. IEEE, Cairo, 2019.

2- Shahenaz S. Abou Emira, Khaled Y. Youssef, and Mohamed Abouelatta "IoT Based Sustainable Power Architecture for Smart Agriculture Environments." Submitted for publication in Advances in Science, Technology and Engineering Systems Journal (ASTES).

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