**Fayoum University**



**Engineering Faculty**

**Electrical Engineering Department**

B. Eng. Final Year Project

**Smart Farming System**

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*Supervisor(s) Date of examination*

Evaluation **Form**

|  |  |  |
| --- | --- | --- |
| Item | Maximum | Marks |
| Potential in Electrical Engineering | (55) |  |
| Problem Statement | (5) |  |
| Goals and Motivations | (5) |  |
| Timeline and planning | (10) |  |
| Bill of materials | (10) |  |
| Sponsors | (10) |  |
| References | (5) |  |
| Total | (100) |  |

Evaluation List

DECLARATION

I hereby certify that this material, which I now submit for assessment on the programme of study leading to the award of Bachelor of Science in *Electrical Engineering* is entirely my own work, that I have exercised reasonable care to ensure that the work is original, and does not to the best of my knowledge breach any law of copyright, and has not been taken from the work of others save and to the extent that such work has been cited and acknowledged within the text of my work.

**Signed:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Registration No.:** \_\_\_\_\_\_\_\_\_\_\_

**Date:** Day, xx Month Year.

ABSTRACT

Our project is a smart farming system that reads several agricultural sensors including a camera and feeds the data to a backend server. The server then saves the received data in a database for future reference and renders it to a website on which the farm owner can monitor his farm health. The owner will be notified if pests are detected using a computer vision model. The Farm will also have a timed watering system and a filtration system that will enable water reuse to limit water wastage.

We start off by introducing the problem definition that we aim to solve. Then, we discuss the motivation behind solving this particular problem and what goals we aim to achieve.

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# LIST OF ACRONYMS/ABBREVIATIONS

|  |  |
| --- | --- |
| ARM | Advanced RISC Machine |
| RISC | Reduced Instruction Set Computer |
| MCU | Microcontroller Unit |
| MCAL | Microcontroller Abstraction Layer |
| HAL | Hardware Abstraction Layer |
| RTOS | Real-Time Operating System |
| IOT | Internet Of Things |
| SW | Software |

# Problem statement

The agriculture in Egypt has some problems that need to be solved. The agriculture sector in Egypt represents about 14.7% of the national product. There are about 8.5 million people that work in that sector which represents 27% of the Egyptian work force as stated by Mohamed Marzok the minister of agriculture of Egypt. Some of the problems we aim to solve are:

1. No convenient way to easily monitor the current state of the farm to check on its health.
2. Huge amount of effort done and time taken to regularly water the crops.
3. Waste of water in irrigation process.
4. Late discovery of pests or crops infection.
5. Lack of sunlight.

The previous problems cause lower crops production and quality.

# Project Motivations and goals

## Motivations

This system:

Enables owners to monitor their farm easily without effort and from the comfort of their home.

1. Automates the irrigation process.
2. Filters used water to limit wastage.
3. Detects any pests or crop infections.
4. Ensures higher crops production and quality.

## Goals

Our goal is to build a robust correct low-cost smart farming system that uses low power. And hopefully it will become popular and help the agriculture sector in Egypt.

# Project potential

As Electrical Engineers we design electrical systems from scratch that must meet some specifications. We are also used to analysing already-built ones to learn from them and expand on it. We usually implement these systems using circuity either analog or digital. To build this specific project using nothing but circuity and hardware to achieve the functionality is not practical cost-wise and would take a lot of time.

So, in this project we chose to follow the second path which is to not implement the entire system from the ground up but analyse an already built digital system – in our case it’s an ARM based MCU- and understand the internal working of it then all that is left to do is to build on top of the already existing low-level system to realize a higher-level one.

This project aims to build a complex real-time system that has many inputs, outputs and functionalities. These functionalities need to communicate and synchronise with each other to realize a correct working real-time system.

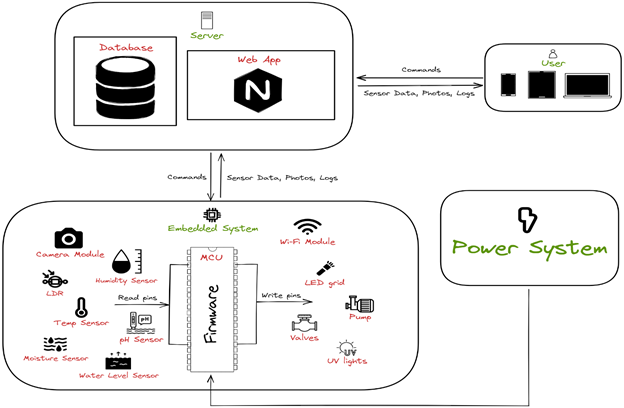


Figure 1- System Block Diagram

# Bill of materials

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Description** | **Seller** | **Price** |
| nucleo64-f446RE | STM ARM based Microcontroller. | ST | 900 |
| OV7670 | Camera module | ram | 175 |
| ESP-01S – ESP8266 | Wi-Fi Module | ram | 75 |
| Soil Moisture Sensor | - | fut-electronics | 60 |
| (DHT11) Module "KY-015" | Humidity&Temperature Sensor | ram | 45 |
| Cds Photoresistor (LDR) 12mm | Light sensor | ram | 8 |
| Water Level Sensor & Liquid Water Droplet Depth Detection | - | ram | 25 |
| UV LEDs (5 mm Size) | - | ram | 30 |
| Water Pump – MINI – DC 3-6V 120L/H | - | ram | 85 |
| Water Pump – Hose 6x8mm – PVC Clear Vinyl Tubing / 1 Meter | - | ram | 20 |
| Mini Solenoid Valve Normally Closed Air/Water 12VDC | - | the board | 300 |
| Farm frame expenses (wood&glass) | - | - | 500 |
| Total |  |  | 2223 L. E |

Table 1 - Bill Of Material

# Sponsors and funding support

|  |  |
| --- | --- |
| **Company** | **Response** |
| Valeo | Not Yet |
| Coretech Innovations | Not Yet |
| Si-Vision | Not Yet |

Table 2 - Sponsors

# Timeline and execution Plan

|  |  |  |  |
| --- | --- | --- | --- |
| **Task** | **Start Data** | **End Date** | **Members** |
| Hardware Selection | 01-Oct | 20-Oct | Mahmoud, Mazen & Musa |
| ARM MCAL Drivers | 01-Oct | 30-Nov | Mahmoud & Mazen |
| HAL Drivers (Agricultural Sensors) | 20-Oct | 30-Nov | Musa |
| Camera Module Driver | 01-Dec | 15-Dec | Mahmoud, Mazen & Musa |
| WIFI Module Driver | 15-Dec | 30-Dec | Mahmoud & Mazen |
| Application Implementation | 01-Feb | 15-Mar | Musa |
| Hardware integration / Testing | 01-Mar | 15-Apr | Mahmoud, Mazen & Musa |
| SW Implementation With RTOS | 01-Apr | 30-Apr | Mahmoud & Mazen |

Table 3 - Embedded System Module

|  |  |  |  |
| --- | --- | --- | --- |
| **Task** | **Start Data** | **End Date** | **Member** |
| Essential CS topics | 01-Oct | 11-Jan | Omar |
| Essential web technologies | 01-Nov | 30-Dec | Omar |
| IOT essentials | 01-Feb | 28-Feb | Omar |
| Essential Cloud technologies | 01-Mar | 30-Mar | Omar |
| Connection With MCU | 01-Apr | 30-Apr | Mahmoud, Mazen & Musa |

Table 4 - Web Module

|  |  |  |  |
| --- | --- | --- | --- |
| **Task** | **Start Data** | **End Date** | **Member** |
| Collect Dataset | 15-Oct | 30-Nov | Mohamed Abdelaleem |
| Manipulate Data | 01-Dec | 15-Dec | Mohamed Abdelaleem |
| Extract The Features | 15-Dec | 30-Dec | Mohamed Abdelaleem |
| Create The Model | 15-Feb | 30-Mar | Mohamed Abdelaleem |
| Feed Data into Model and Maintain the Model | 01-Apr | 30-Apr | Mohamed Abdelaleem |

Table 5 - Computer Vision Module

|  |  |  |  |
| --- | --- | --- | --- |
| **Task** | **Start Data** | **End Date** | **Members** |
| Farm Model Structure | 01-Dec | 31-Dec | Mahmoud, Mazen & Musa |
| Water System | 01-Dec | 31-Dec | Mahmoud, Mazen & Musa |
| Filtration System | 01-Dec | 31-Dec | Mahmoud, Mazen & Musa |
| Lighting System | 01-Feb | 28-Feb | Mahmoud, Mazen & Musa |
| Power Supply System | 01-Feb | 28-Feb | Mahmoud, Mazen & Musa |
| Overall System Integration | 01-Mar | 31-May | Mahmoud, Mazen & Musa |

Table 6 - Farm Integration Module

# References

1. **ST.** STM32 Cortex®-M4 MCUs and MPUs programming manual. *ST.* [Online] 3 2020. [Cited: 1 10 2022.] https://www.st.com/.

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5. **OmniVision.** *OV7670 CMOS VGA (640x480) CameraChip DataSheet.* s.l. : OmniVision, 2006.