LOW LEVEL DESIGN AND IMPLEMENTATION DOCUMENT

Smart Crop Monitoring and Plant Disease Detection

UE17CS490A – Capstone Project Phase – 2

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January - May 2021

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TABLE OF CONTENTS

1. Introduction

1.1. Overview

IOT has bought many many latest agricultural benefits like efficient water management and many more.The proposed mode consists of sensors like soil moisture,humidity and temperature sensors and a motor representing a water pump.

1.2. Purpose

In this project we are going to deal with various sensors and detection of leaf disease which will help us to give the better productivity of the crop with the use of temperature,humidity,soil moisture,image sensors e.t.c.

1.3. Scope

The scope is to develop and implement the project. The main purpose is to help farmers stay connected to the farms and thus helps in easy monitoring and controlling of the farm activities.

2. Design Constraints, Assumptions, and Dependencies

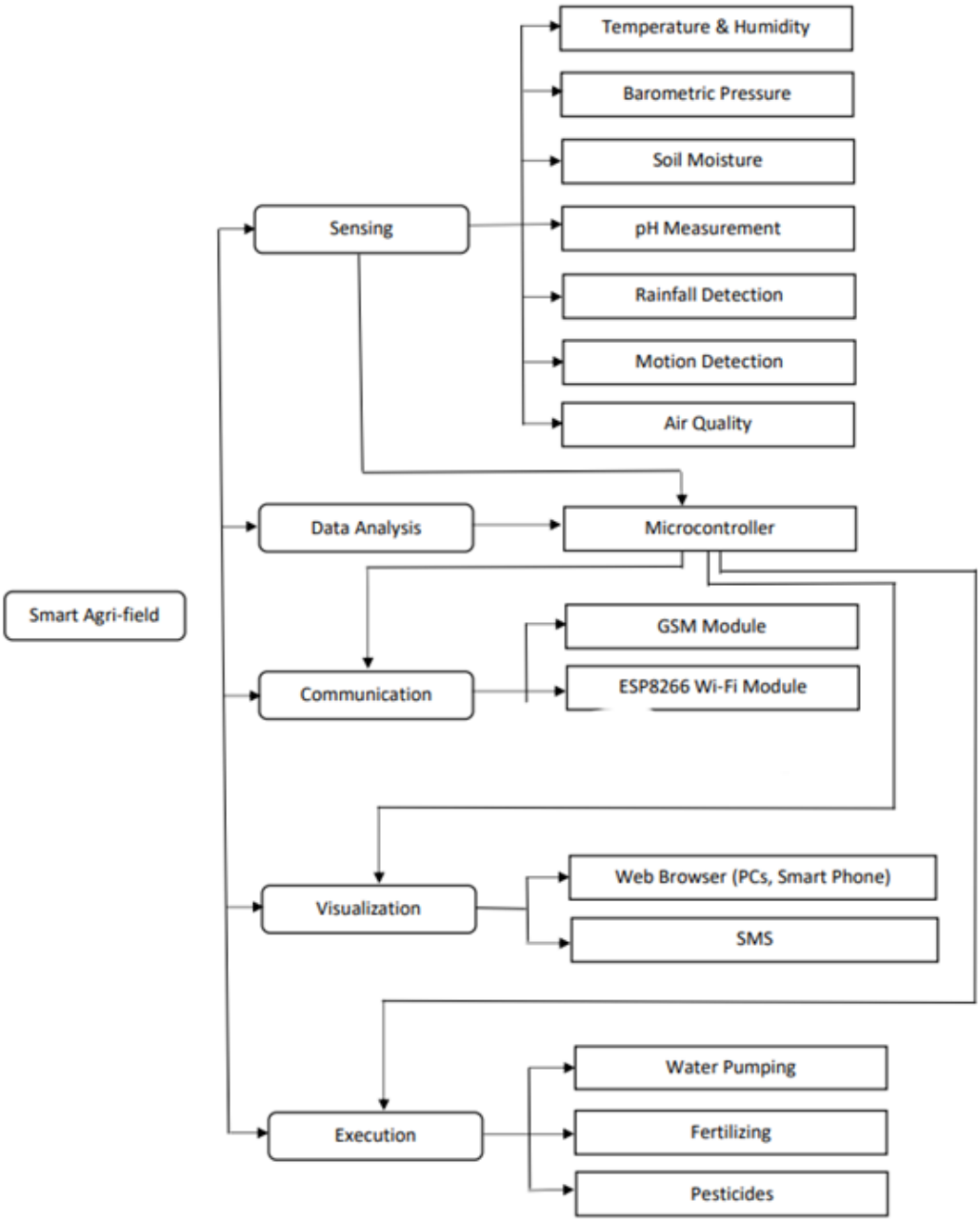
Building the system using Sensors,Actuators and ESP32 implementation of network equipment.Communication between the central and wireless sensor nodes communicatio.Sensor data is collected into sheets,various databases,cloud storage.

There are many factors other than just observing ecological conditions,yield productivity for assessment of harvest,factors like monitoring soil conditions,movement like outsider invasion into the field or motion of undesired objects are some which might also have effect of productivity.

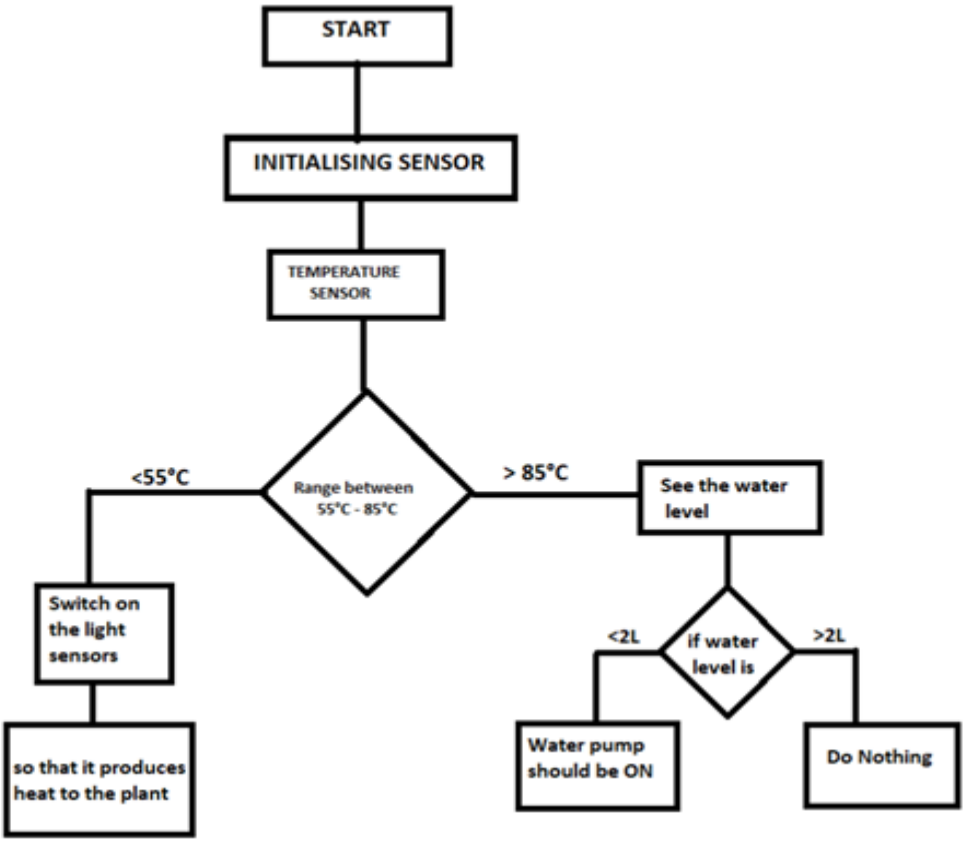
3. Design Description

The project is an combination of both hardware and software. In software part Google firebase,MIT app,MATLAB has been used. Where as in hardware part sensors and water motor has been used. The class diagram shows the image processing that is software implementation. And the flow chart the complete flow of the project.

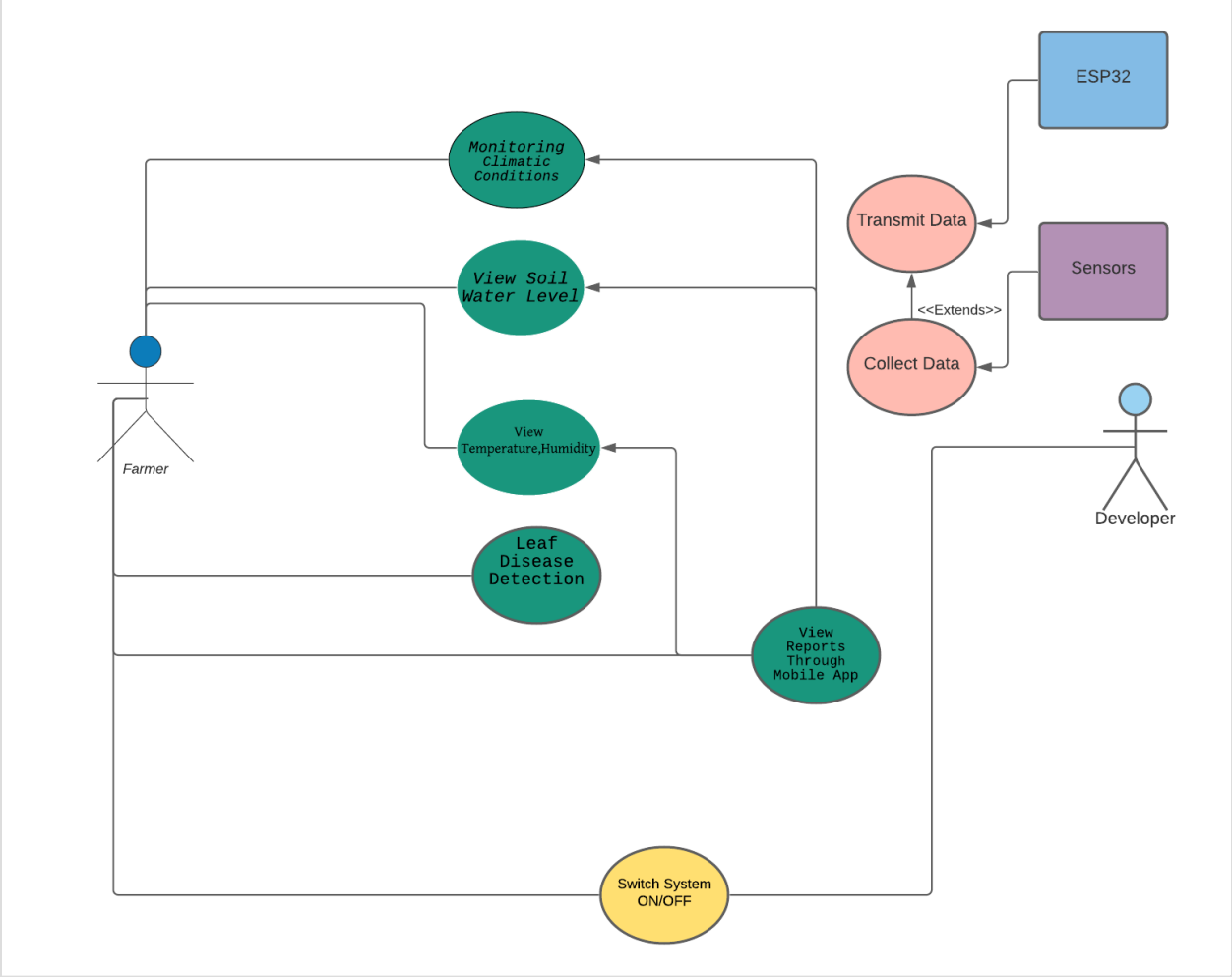
3.1. Master Class Diagram


Smart Agri-field
Sensing
Temperature & Humidity
Barometric Pressure
Soil Moisture
pH Measurement
Rainfall Detection
Motion Detection
Air Quality
Data Analysis
Microcontroller
Communication
GSM Module
ESP8266 Wi-Fi Module
Visualization
Web Browser (PCs, Smart Phone)
SMS
Execution
Water Pumping
Fertilizing
Pesticides

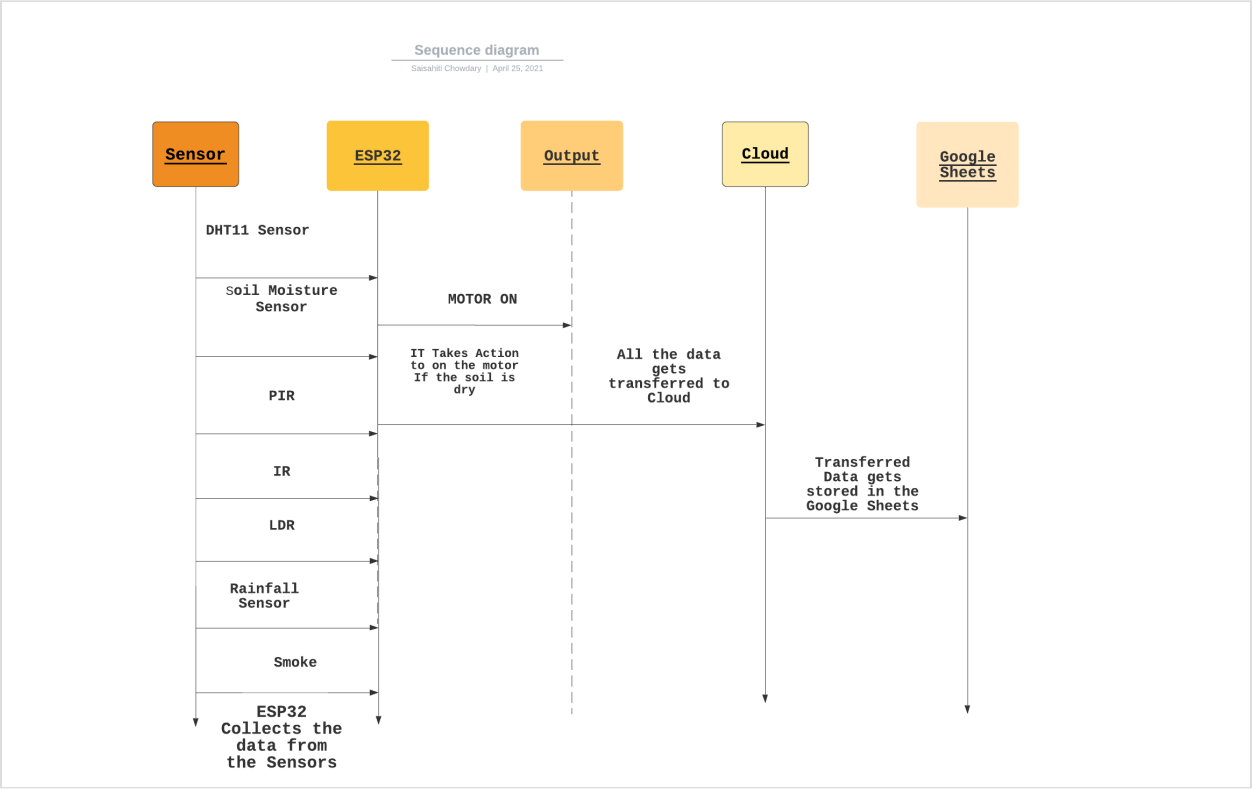
3.2. Flowchart



3.3 Use Case Diagram



3.4 Sequence Diagram



4 Proposed Methodology / Approach

The proposed system consist of monitoring of crops, displaying the data in the cloud,storing the data in google sheets, MIT app for updating the status of the particular crop in the mobile by using an app, MATLAB is used for the image processing and machine learning techniques is used for the classification of the leaf diseases and spraying the pesticides.For monitoring of crops we have used 8-9 sensors they are soil moisture sensor, Rainfall detection sensor,PIR sensor,IR sensor,Smoke sensor,LDR sensor,Barometric sensor,Temperature and humidity sensor. All these sensors are connected to ESP32.GSM module is used to send messages to the user.The cloud platform we have used is Google firebase.We can visualize the collected data in Google sheets.MATLAB is used for image processing. We have used KNN and SVM algorithm to find the accuracy

4.1 Algorithm and Pseudocode

ML algorithms are used for the classification of the leaf disease. we are using 2 algorithms for the classification to check the accuracy

KNN:

The k-nearest neighbours(KNN) algorithm is a simple, supervised machine learning algorithm that can be used to solve both classification and regression problems.It is easy to implement and understand.

Algorithm of KNN

Select the number K of the neighbour

Calculate the euclidean distance of K number of neighbours

Take the K nearest neighbours as per the calculated Euclidean distance

Among these k neighbours count the number of the data points in each category

Assign the new data points to that category for which the number of the neighbour is maximum

SVM:

The binary classifier which makes use of the hyper plane which is also called as the decision boundary between two of the classes is called as Support Vector Machine(SVM).

Algorithm of SVM

Import the dataset

Explore the data to figure out what they look like

Pre-process the data

Split the data into attributes and labels

Divide the data into training and testing sets

Train the SVM algorithm

Result:

The KNN is more accurate than SVM as we got KNN as 98% and SVM as 96%.

Appendix A: Definitions, Acronyms and Abbreviations

- IOT : Internet Of Things
- PIR : Passive Infrared Sensors
- IR : Infrared Radiation Sensor
- LDR : Light Dependent Resistor Sensor
- GSM : Global System for Mobile Communication
- MIT App : Massachusetts Institute of Technology
- MAT LAB : Matrix Laboratory
- RGB : Red Green Blue Image
- ML : Machine Learning Techniques
- SVM : Support Vector Machine
- KNN : K – Nearest Neighbours
- ESP : Encapsulating Security Payload

Appendix B: References

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- https://ieeexplore.ieee.org/document/9016770 : 2018

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- Low-Cost 3D-Printed Wireless Soil Moisture Sensor - IEEE Conference Publication : 2018

Appendix C: Record of Change History

#	Date	Document Version No.	Change Description	Reason for Change
1.	**14/12/2020**	**report 1**	AWS to google firebase	we felt google firebase is easier than AWS
2.				
3.				