COLLEGE OF ENGINEERING AND TECHNOLOGYSCHOOL OF ELECTRICAL AND COMPUTER ENGINEERING

DEPARTMENT OF COMPUTER ENGINEERING

PROJECT PROPOSAL ENTITILED: IoT Based Agriculture Monitoring System

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DILLA, ETHIOPIA

DECLARATION

I, Segni Asrat, hereby declare that this proposed has been written by me and any material used during its preparation has been acknowledged in advance.

Name of Student	**Signature**	**Date**
Segni Asrat	_____	_____

ABSTRACT

Agriculture is one of the most important sectors in the world not only for food stuff but also supply raw materials for industries and textile factories. Especially, agriculture plays a great role in Ethiopian economy. Although Ethiopia has a large portion of fertile land, sufficient rainfall, convenient weather, and great potential of labor force, its agriculture system is still underdeveloped and characterized by low productivity. This is due to lack of monitoring soil nutrient level, proper irrigation system, expert knowledge, real-time weather information, and optimal resource management. Therefore, modern agricultural technologies must be implemented to collect real-time data pertaining to the growth of crops in order to improve the efficiency of productivity. In this chapter, we propose an Internet of Things (IoT)-based modern agriculture monitoring system using sensors and arduino. Here, different environmental parameters pertaining to the growth of crops such as soil moisture, humidity, temperature and motion are collected using low-cost IoT sensor nodes. The sensed data is then transmitted to the central control station. Experimental results show that several environmental parameters can be collected and sent to cloud storage system in real time where data to be aggregated, visualized, and further analyzed for informed decision making at a remote.

Table of content

LIST OF FIGURES

LIST OF TABLES

CHAPTER ONE

INTRODUCTION

1.1 Background of study

Agriculture is at the heart of global food production, and its efficiency and sustainability are crucial to meet the growing demands of an ever-increasing population. The integration of the Internet of Things (IoT) into agriculture has ushered in a new era of precision farming and resource management. This introduction provides a concise overview of Agriculture Monitoring using IoT. Agriculture Monitoring using IoT is a technology-driven approach that harnesses IoT devices and sensors to collect real-time data from farms, fields, and agricultural ecosystems. These devices, often deployed across vast expanses of farmland, gather information on a wide range of parameters, including soil moisture, temperature, humidity, weather conditions, crop health, and even livestock management. The data collected by these IoT devices is transmitted to central monitoring systems where it can be analyzed and transformed into actionable insights for farmers. These insights empower farmers to make informed decisions regarding irrigation, fertilization, pest control, and resource allocation, ultimately optimizing crop yields and resource efficiency. The benefits of Agriculture Monitoring using IoT are far-reaching. It allows for precision agriculture, reducing resource wastage and environmental impact, while also contributing to food security by improving yield predictions. Additionally, it aids in early detection of pests, and adverse weather conditions, offering farmers the opportunity to adapt and mitigate potential losses [1].

1.2 Statement of Problem

Agriculture is a critical sector that plays a vital role in ensuring food security and economic growth. However, it faces various challenges, such as climate change, resource scarcity, and the need for sustainable practices. To address these challenges, there is a growing demand for innovative solutions that improve farming efficiency and productivity. This project aims to design and implement an IoT-based Agriculture Monitoring System to assist farmers in making informed decisions and optimizing their farming practices.

Current state of traditional agriculture practices faces several limitation including:-

- ✓ Lack of real-time data
- ✓ Soil health management
- ✓ Resource inefficiency
- ✓ Crop health management are the few.

1.3 Objective of the project

1.3.1 General Objective

The main objective of this study is to design and implement IoT based agriculture monitoring system.

1.3.2 Specific Objectives

The specific objectives of this project are: -

- Real-time Environmental Data Collection
- Crop Health Monitoring
- Remote Monitoring and Control
- Irrigation Management

1.4 Significance of the study

The implementation of an Agriculture Monitoring System using IoT holds significant importance for various stakeholders and the agricultural industry as a whole. Here are some key aspects of its significance:

Improved Crop Yield: Maximizing crop yield is essential for food security and agricultural sustainability. An IoT-based system can help optimize crop conditions, leading to increased yields through efficient resource management and early pest and disease detection.

Resource Efficiency: IoT technology enables precise control and management of resources such as water, energy, and nutrients. This efficiency not only reduces operational costs but also conserves valuable resources, making agriculture more sustainable.

Data-Driven Decision-Making: Access to real-time data and insights empowers farmers to make informed decisions. This increases the likelihood of positive outcomes, minimizes risks, and promotes efficient agricultural practices.

1.5 Scope of the project

The scope of the project is to design and implement an IoT-based Agriculture Monitoring System that addresses the challenges faced by modern agriculture. This system aims to provide a comprehensive solution for farmers, agricultural enterprises, and stakeholders in the agriculture sector. The project's scope encompasses the following key aspects:

Sensor Deployment and Data Collection:

- Installation of a network of sensors to monitor crucial environmental parameters, including soil moisture, temperature, humidity and other relevant factors.
- Sensors will be strategically placed throughout the agricultural area to ensure comprehensive data coverage.

Real-Time Data Transmission:

- Development of a robust communication infrastructure to enable real-time data transmission from sensors to a central server or cloud platform.
- Data will be collected continuously, allowing for immediate access to information.

Mobile Application Development:

- Creation of a mobile application for farmers to access data, receive alerts, and control automation systems.
- The application will be designed to be intuitive and user-friendly, ensuring accessibility for a wide range of users.

Alerting and Notification Systems:

- Implementation of alerting systems to notify farmers of adverse conditions, such as sudden weather changes or critical sensor readings.
- Alerts will be delivered via the mobile application and other communication channels.

CHAPTER TWO

LITRATURE REVIEW

Over year, there are lots of researches written regarding IoT to solve Agriculture related issues. In this paper the author provide a broad introduction to the various applications of IoT in agriculture, including data collection, remote monitoring, and decision support systems [1]. In this paper the author tries to delve into the integration of IoT technologies for precision agriculture, emphasizing the use of sensors, drones, and data analytics to optimize crop management and resource utilization [2]. In this paper soil condition and irrigation management are key components of agriculture monitoring [3]. In this paper the author tries to explain the application of IoT in the context of smart cities, highlighting how IoT technologies can improve urban environments and services [4].

So I have planned to design IoT based agriculture monitoring System using sensors which can tell real-time data about the soil moisture, environment temperature and humidity of the crop area. The project uses Arduino microcontroller for processing the information gathered from the sensors. The device also uses wifi to send data to base or the owner.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

The methodology for implementing the IoT-Based Agriculture Monitoring System project involves a structured approach to ensure its successful development, deployment and maintenance. Below is a general methodology that you can adapt to your specific project needs:

Requirements gathering:

- ✧ Identify the specific needs and requirements of the agriculture stakeholders, including farmers and agricultural experts.
- ✧ Conduct interviews, surveys, and site visits to understand the challenges and opportunities in the target farming environments.

Literature review: referring the old worked projects, books, websites and other reference materials including data-sheet of components to understand how thesystem can work and know about each component.

Data analysis: -the data collected in data collection are carefully analyses and discussed.

Model preparation: design the block diagram of the system.

Algorithm design: design the algorithm for this study.

Implementation, simulation and testing: the designed model should be simulated by the aid of software's.

Documentation: finally, the results find from the simulation and testing would be

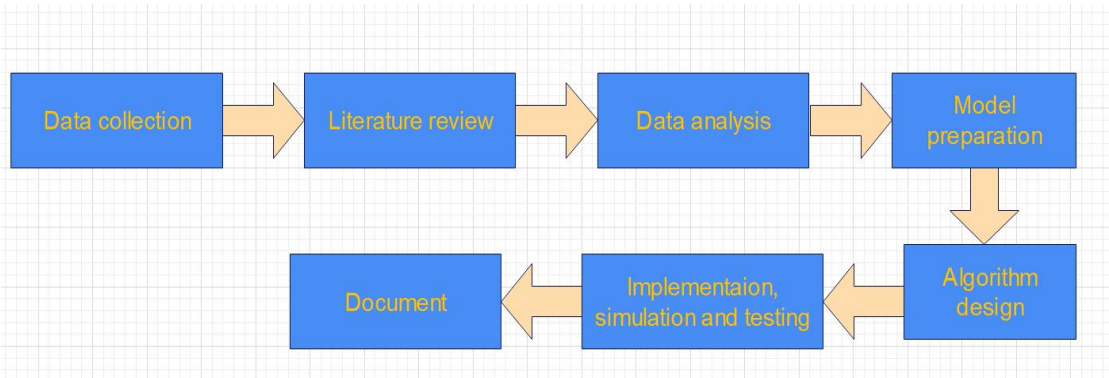

Figure 3.1 Methodology of the project

3.2 Block diagram representation

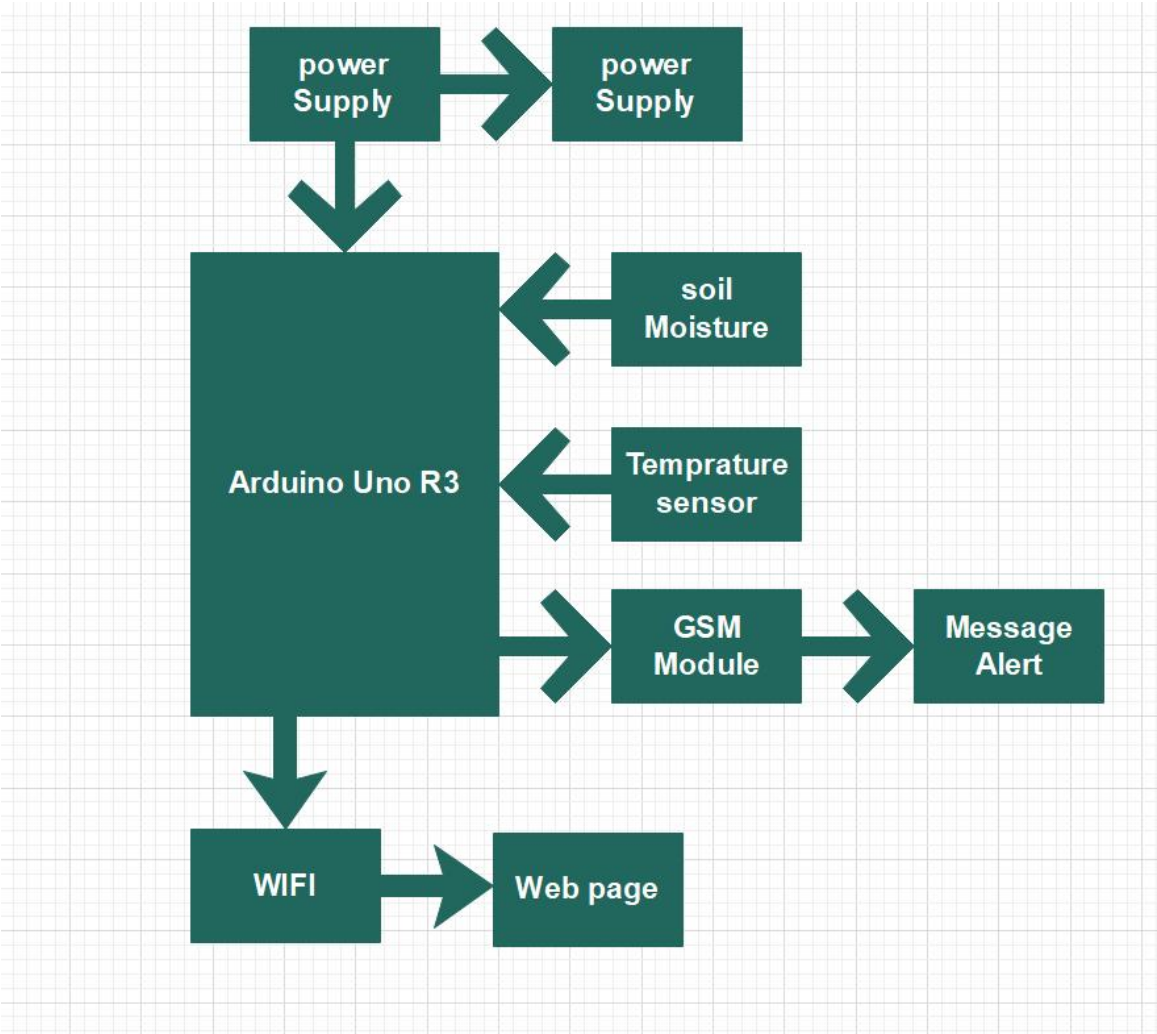

Figure 3.2 Block diagram of the project

3.3 System Requirement

3.3.1 Hardware Requirement

To accomplish the project the essential hardware component have to be used:

- ✧ Arduino Uno
- ✧ Soil Moisture Sensor
- ✧ Resistor
- ✧ Temperature Sensor [TMP36]
- ✧ MCP23008-based, 32 LCD 16 x 2 (I2C)
- ✧ Wifi Module (ESP8266)
- ✧ Jumper wires

3.3.1.1 Arduino Uno

The Arduino Uno is an open-source, single-board microcontroller based on the ATmega328P microcontroller chip. It is one of the most widely used and beginner-friendly boards in the Arduino family. The board features a variety of digital and analog input/output pins that can be easily programmed to control electronic devices, gather sensor data, and interact with the physical world.

Figure 3.3 Arduino UNO

3.3.1.2 Soil Moisture sensor

A soil moisture sensor is an electronic device designed to measure the amount of water content in the soil. It typically consists of a probe or a set of electrodes that are inserted into the ground. The sensor measures the electrical conductivity or capacitance of the soil, which varies with the moisture content.

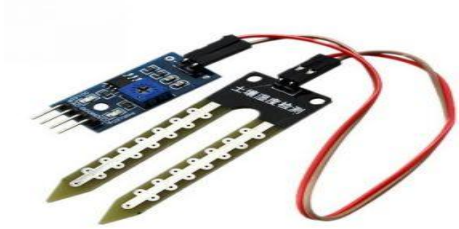

Figure 3.4 Soil moisture sensors

3.3.1.3 Resistors

Resistors are electronic components specifically designed to resist the flow of electrical current. They are used to control the amount of current in a circuit, limit voltage, divide voltage, and protect components from excessive current.

Figure 3.5 Resistors

3.3.1.4 Temperature sensor

A temperature sensor is an electronic device designed to measure and detects the temperature of its environment. It converts temperature-related physical changes, such as electrical resistance or voltage, into a temperature reading that can be easily interpreted.

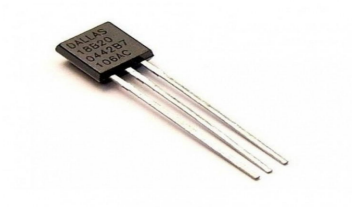

Figure 3.6 Temperature sensor

3.3.1.5 LCD

An LCD is a type of flat-panel display technology that utilizes liquid crystals to control the passage of light and create images or text on a screen. Liquid crystals are a unique state of matter that has properties of both liquids and solids.

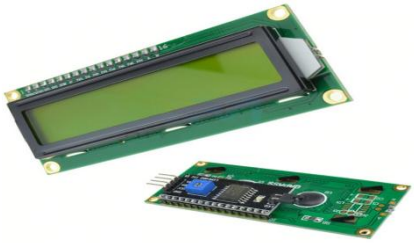

Figure 3.7 LCD

3.3.1.6 Wifi module

It is a compact electronic component that provides wireless network connectivity to devices that wouldn't typically have native Wi-Fi capabilities. Wi-Fi modules are designed to be integrated into various electronic devices, allowing them to connect to Wi-Fi networks for data exchange and internet access. These modules often include Wi-Fi hardware, a microcontroller or processor, and the necessary software to manage network communications. Here's an explanation of Wi-Fi modules and their applications:

Figure 3.8 wifi module

3.3.1.7 Jumper wires

A jumper wire is an electric wire that connects remote electric circuits used for printed circuit boards. Jumper wires come in three versions: Male-to-male jumper, Male-to-female jumper and Female-to-female jumper.

Figure 3.9 jumper wires

3.3.2 Software requirement

The software required for our project are:

- ✧ Arduino IDE
- ✧ Proteous software

CHAPTER FOUR

WORK PLAN AND BUDGET

4.1 Work plan

Table 1: The work plan or time schedule of the proposed project

Tasks	**Months**	**October**		**November**				**December**				**January**	
	Week	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**
Literature reviewing and data collection													
Requirement specification													
Model and analysis													
Simulation													
Hardware Implementation													
System testing													
Documentation													

4.2 Budget

Table 2: The overall budget required to accomplish the proposed project

No	Hardware devices	Quantity	Price per unit(Br)	Total
1	Arduino Uno	1	16,000	16,000
2	Soil moisture sensor	1	900	900
3	Resistors	10	8	80
4	Temperature sensor	1	400	400
5	LCD	1	700	700
6	Wifi module	1	1,150	1,150
7	Jumper wires	2	400	800
	Total			20,030

REFERENCE

1. P.S. Thenkabail and J.G. Lyon, "Advances in hyperspectral remote sensing of vegetation and agricultural croplands," CRC Press, 2010.
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4. A. Zanella, N. Bui, A. Castellani, L. Vangelista, and M. Zorzi, "Internet of Things for smart cities," IEEE Internet of Things Journal, vol. 1, no. 1, pp. 22-32, 2014.