UNIVERSITY OF CAPE COAST

COLLAGE OF AGRICULTURE AND NATURAL SCIENCES

SCHOOL OF PHYSICAL SCIENCE

DEPARTMENT OF COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

CSC 499 PROJECT WORK

IoT IRRIGATION SYSTEM

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1 BACKGROUND:

Agriculture is done in every country from ages. Agriculture is the science and art of cultivating plants. Agriculture was the key development in the rise of sedentary human civilization. Agriculture is done manually from ages. As the world is trending into new technologies and implementations it is a necessary goal to trend up with agriculture also. IOT plays a very important role in smart agriculture. IOT sensors are capable of providing information about agriculture fields. We have proposed an IOT irrigation agriculture system using automation. This IOT based Agriculture monitoring system makes use of wireless sensor networks that collects data from different sensors deployed at various nodes and sends it through the wireless protocol. This smart agriculture using IOT system is powered by ESP 32 it consists of Water Proof Temperature sensor, Moisture sensor, PH sensor, flow rate senor, relay and mini water pump. When the IOT based irrigation agriculture monitoring system starts, it check soil moisture, temperature and PH value of the soil. Base on these sensor readings, it automatically pump the water to moist the irrigation. It also updates a web interface with the various readings and sends an email alert about the levels whenever abnormalities occur. Sensors sense the level of moisture if it goes down, it automatically starts the water pump. The PH level to know when to applied fertilizer or not and the flow rate sensor to know the amount of water that is been used for the irrigation system as time goes on. This is LCD display which display the reading as well. The water pump can also be started manually using the web interface as well stopping it.

1.1 Soil Moisture:

Soil moisture is the water stored in the soil. It affected by precipitation, temperature, soil characteristics, and more. These same factors help determine the type of biome present, and the suitability of land for growing crops. The health of our crops relies upon an adequate supply of moisture and soil nutrients, among other things. As moisture availability declines, the normal function and growth of plants are disrupted, and crop yields are reduced. And, as our climate changes, moisture availability is becoming more variable.

1.2 Soil Temperature:

Soil temperature is the factor that drives germination, blooming, composting, and a variety of other processes. Learning how to check soil temperature will help the home gardener know when to start sowing seeds. Knowledge of what is soil temperature also helps define when to transplant and how to begin a compost bin. Determining current soil temperatures is easy and will help you grow a more bountiful and beautiful garden. So what is soil temperature? Soil temperature is simply the measurement of the warmth in the soil. Ideal soil temperatures for planting most plants are 65 to 75 F. (18 to 24 C.). Nighttime and daytime soil temperatures are both important.

1.3 Soil PH:

Soil is a measure of the acidity and alkalinity in soils. pH levels range from 0 to 14, with 7 being neutral, below 7 acidic and above 7 alkaline. The optimal pH range for most plants is between 5.5 and 7.0; however, many plants have adapted to thrive at pH values outside this range. Because pH levels control many chemical processes that take place in the soil – specifically, plant nutrient availability – it is vital to maintain proper levels for your plants to reach their full yield potential.

1.4 Humidity:

Humidity is the concentration of water vapour present in air. Water vapour, the gaseous state of water, is generally invisible to the human eye. Humidity indicates the likelihood for precipitation, dew, or fog to be present. The amount of water vapour needed to achieve saturation increases as the temperature increases. As the temperature of a parcel of air decreases it will eventually reach the saturation point without adding or losing water mass. The amount of water vapour contained within a parcel of air can vary significantly. For example, a parcel of air near saturation may contain 28 grams of water per cubic metre of air at 30C, but only 8 grams of water per cubic metre of air at 8C. Three primary measurements of humidity are widely employed: absolute, relative and specific. Absolute humidity describes the water content of air and

is expressed in either grams per cubic metre or grams per kilogram. Relative humidity, expressed as a percentage, indicates a present state of absolute humidity relative to a maximum humidity given the same temperature. Specific humidity is the ratio of water vapor mass to total moist air parcel mass. Humidity plays an important role for surface life. For animal life dependent on perspiration (sweating) to regulate internal body temperature, high humidity impairs heat exchange efficiency by reducing the rate of moisture evaporation from skin surfaces. This effect can be calculated using a heat index table, also known as a humidex.

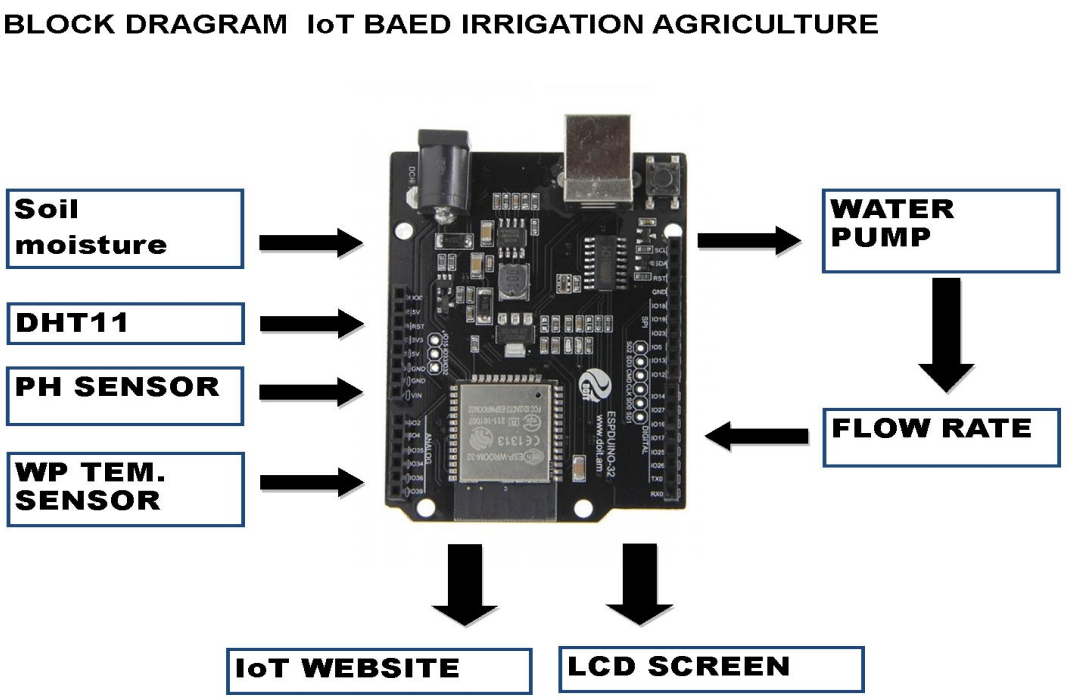
2 PROBLEM STATEMENT:

A nursery bed is a prepared plot of land for raising seedlings. It acts as a temporary home for young plants until they are eventually planted in a main garden. Therefore, when seedlings are planted on the nursery bed, a farm has to the farm every day to water the seedling and knows how the seedlings are doing. This then becomes a challenge for farmers who have a large scale of farm and have many other farms to work on. He or she may spend a lot time on the nursery bed in the morning and the end forgetting other activities on the farm. In other case, He may need to employ more hands which at the end add more cost to his/her

farm input.

3 PROPOSED SOLUTION:

Based on the problem statement above, we proposed an IoT irrigation System for managing the nursery bed. This System is made up of hardware and software which automatically reads values of soil moisture, soil temperature, soil PH level and automatically starts water pump to pump water to water the nursery bed. The system sends reading to a web and mobile interface which the farm can monitor what is happening on his farm anywhere as well as an LCD screen to display the readings. The farmer can also press a button in order to start pumping the water or stop pumping it as well know the cost of water used in his farm. The system automatically sends an email when abnormalities occur in the readings of the sensor values in the farm to alert the farmer. This system is expected to save time and give the farmer more time to work on activities on his/her farm or even monitor what is going on in his farm as well as to know the cost of water used in raising a nursery bed in order to account for his lost or gain.



4 AIM:

Design and develop an IoT Irrigation System that can track senors reading of a nursery bed and automatically or manually start a water pump to water the bed as well track abnormalities on the bed and sends an email.

5 OBJECTIVES OR PURPOSE OF STUDY:

At the end of this study and project, we are expecting the system to help the farmer in the following ways:

1. Monitor soil moisture, soil temperature and soil PH level and humidity of his/her farm anywhere he or she is.
2. Automatically or manually starts the watering pump to water the bed anywhere he/she .
3. Receive an email alert about abnormalities on his nursery bed for possible action.

4. The System is also expected to save the farmer enough time for other activities on his/ her farm.
5. Know the cost of water used in preparing his/her seedlings for planting.
6. Maintain a database of sensors reading for data analysis and projections as well as used the database in AI to predict the amount of used to use on the similar seedlings preparation.

6 SIGNIFICANCE OF STUDY:

This System is expected to help the farmer to monitor activities on his/her nursery bed based on readings from sensors and automatically or manually start a watery pump to water his/her nursery bed anywhere. The system also come with a database that help the farmer to perform data analysis and projections as well know the cost of amount of water used in raising the bed. The database can also be used together with AI to predict the cost of water and the time of similar seedling raising. This system is also expected to save the farmer enough time for other activities on his farm especially when the farmer is into large scare farming. This will then making farming more productive and efficient.

7 ORGANIZATION OF STUDY: