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Smart irrigation system using machine learning

Vishal Saraswat, Ananth Rama Raju M, Rohit Gandhi, Rajath Raj guru A

School of Engineering and Technology, Jain University, Bangalore, Karnataka, India.

Abstract: - The main goal of this project is to design an automation system to manage the irrigation system in the farm lands and make sure that there is equal amount of water to all the crops across the whole field. This project would prove be better than manual operation, as it difficult to operate due to possible human negligence and higher maintained and staff cost. Generally, the farmers be contingent on the rain to water their crops, then once there is no rain they water their crops with available water resource. This requires manual checking of the fields and switching on/off the motor. This leads in wastage of time and energy. The farmers need to check their farms regularly in order to determine if sufficient amount of water is given to the farms. The introduction of automatic irrigation helps the farmers to water the plants and also save the water resource without any human interpretation. This project aims to help to help farmers in managing the irrigation system and reduce the water wastage.

Key Words— ***Irrigation system, Farm land, Water resource, Automatic irrigation, Water Wastage.***

I. INTRODUCTION

- The key purpose of the project is to suggest a model that automates the irrigation process and monitors and controls the course without any human clarification that results in growth of production of crops and saves water resource.
- In this project we will be handling smart irrigation process through soil moisture sensor which detects the moisture level in the soil.
- This detected values from the sensor is stored in the database on daily bases.
- We use Logistic Regression algorithm to predict weather the motor should be on / off.
- The database and the prediction of the logistic regression takes place inside the cloud.

II. LITERATURE SURVEY

- Soil moisture checking using machine learning enabled Arduino sensors with neural networks for refining soil management for farmers and forecast seasonal rainfall for planning future harvest.
- A machine learning based soil moisture monitoring on Losant platform.
- Machine learning enabled plant soil moisture monitoring using wireless sensor networks.
- Mobile integrated smart irrigation management and monitoring system using IOT.

III. MATERIALS & METHODS

A. ARDUINO UNO

Arduino is a model platform (open-source) based on an easy-to-use hardware and software. It consists of a circuit board, which can be instructed (referred to as a microcontroller) and a ready-to-wear software called Arduino IDE, which is cast-off to write and upload the computer code to the physical board.

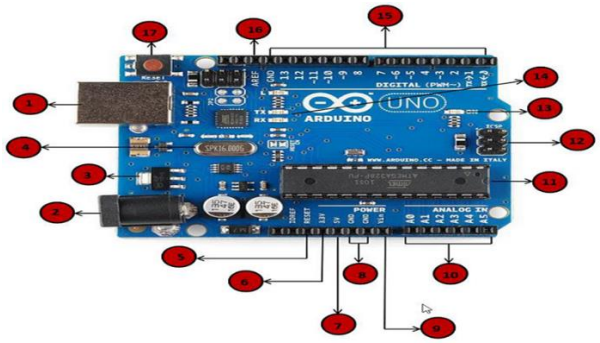

Fig.1. Arduino IDE

B. Humidity Sensor

The DHT-is a digital-output, relative moisture, and high temperature sensor. It uses a capacitive humidity sensor and a thermistor to measure the nearby air, and directs a digital signal on the data pin.

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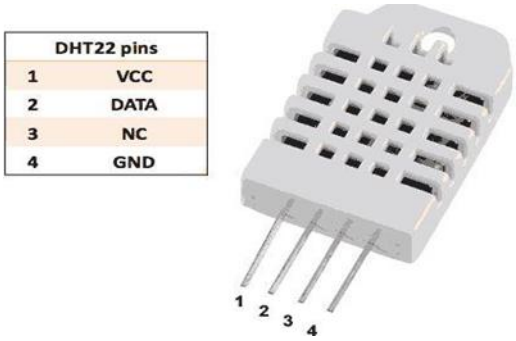

Fig.2. Humidity sensor

C. *pH Sensor*

PH is an amount of acidity or alkalinity of a solution, the pH scale ranges from 0 to 14. The pH indicates the attentiveness of hydrogen [H] + ions present in certain solutions. It can precisely be counted by a sensor that events the potential change between two electrodes: a reference electrode (silver / silver chloride) and a crystal electrode that is subtle to hydrogen ion. This is what form the probe. We also consume to use an electronic circuit to disorder the signal appropriately and we can use this sensor with a micro-controller, such as Arduino.

Fig.3. pH sensor

IV. METHOD AND IMPLEMENTATION

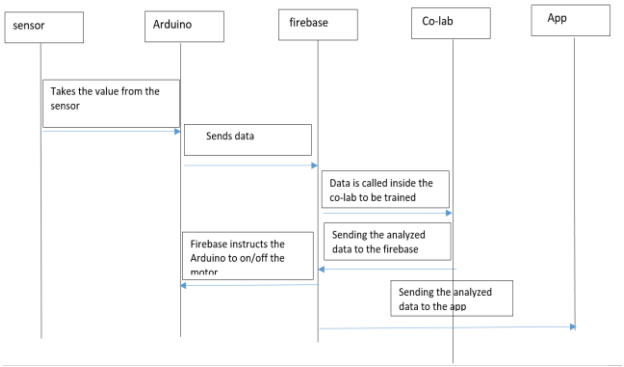

Fig 4. Data Flow diagram

- Soil moisture sensor which detects the moisture level in the soil.
- The detected values from the sensor goes to the firebase and this values are stored in the firebase
- Values in the firebase is called in the google co-lab where logistic regression algorithm predicts
- **Logistic Regression** algorithm predict weather the motor should be on / off.
- This prediction is sent back to the firebase and the firebase instructs the Arduino board through wifi module to switch off/on the motor.
- Firebase is also connected to the android app, so that famer gets the update from the app.

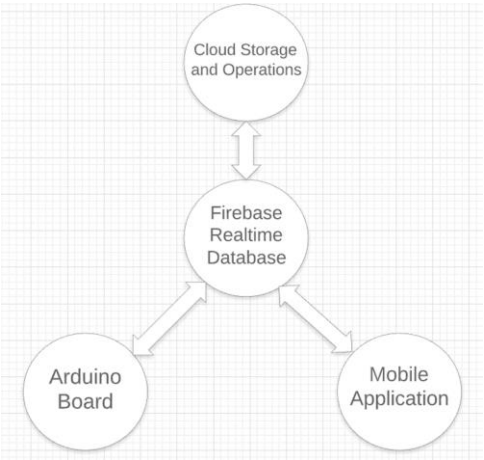

Fig. 5. Implementation

- The detected values from the sensor goes to the firebase and this values are stored in the firebase
- Values in the firebase is called in the google co-lab where logistic regression algorithm predicts
- Logistic Regression algorithm predict weather the motor should be on / off.
- This prediction is sent back to the firebase and the firebase instructs the Arduino board through wifi module to switch off/on the motor.

Hardware Implementation:

- Soil moisture sensor which detects the moisture level in the soil.
- The detected values from the sensor goes to the firebase and this values are stored in the firebase

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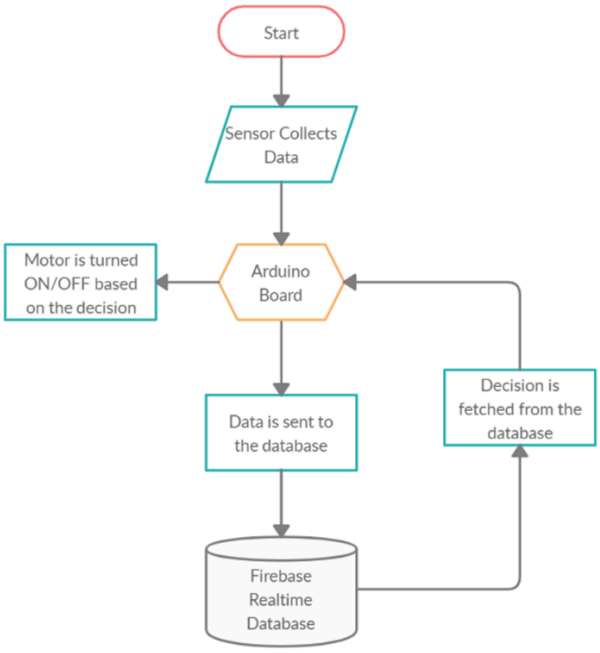

Fig.6. Hardware Implementation

- Values in the firebase is called in the google co-lab where logistic regression algorithm predicts
- **Logistic Regression** algorithm predict weather the motor should be on / off.
- Predicted values are updated in the database
- Data gets updated in the database through Arduino board.
- This prediction is sent back to the firebase and the firebase instructs the Arduino board through wifi module to switch off/on the motor.
- Firebase is also connected to the android app, so that famer gets the update from the app.

V. RESULT AND DISCUSSION

The above figure is the app screen where the famer can see the moisture level in the soil and the amount of rainfall.

If the admin control button is enabled, then the user can on or off the motor using the motor button. if admin control button is disabled machine learning algorithm (logistic regression) will decide should the motor be on or off.

The layout of the App looks like:

VI. CONCLUSION

Thus the "Smart Irrigation system based on soil moisture using Arduino" has been designed and tested successfully. It has been developed by integrated features of all the hardware components used. The system has been tested to function mechanically. The moisture sensors measure the dampness level (water content) of the dissimilar plants. If the dampness level goes below the desired and limited level, the moisture sensor sends the signal to the Arduino board which triggers the Water Pump to turn ON and supply the water to individual plant. When the wanted moisture level is reached, the system halts on its own and the water Pump is turned OFF. Thus, the functionality of the entire system has been tested thoroughly and it is said to purpose successfully.

VII. FUTURE SCOPE

The current model is implemented using Arduino board, where all the sensors are connected to the Arduino board using physical wires. In future, the physical connections can be replaced using any networking protocols such as ZigBee, Bluetooth connections from Arduino board to sensors. Machines in the field also can be linked to Arduino board where entire machines in the field like tractors etc., can be monitored from the Arduino board system. Things like fuel monitoring in vehicles and condition of the fuel. Some of the common problems like pesticides can be identified using

image sensors and algorithms to find them which helps in identifying if there are any pesticides in the field. Increasing technology makes the work easier farmers can monitor the farm and need not visit the farm very regular.

VIII. ACKNOWLEDGEMENT

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