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Solar Powered ML & IOT Based Agriculture Automation

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Abstract— In India, Agriculture sector is one of the most important Growing sectors. Automation of farming suggests monitoring and controlling of various parameters which could be helpful in increasing productivity. This paper review Solar Powered ML & IOT Based Agriculture Automation. The main purpose of this project is to improve efficiency of agriculture sector. IoT helps us in many fields among which agriculture is one of the primary ones. With the help of IoT along with Machine Learning in the field of agriculture, we can increase the efficiency of crop production. The propose system consists of raspberry pi, various sensors, solar panel and a motor. Raspberry pi is the main controlling unit which can control whole system operation. System is equipped with solar panel which provide power to the system. The weather is one of the highest natural barriers in all parts of our lives in the world, we need to look at the weather including temperature, rain, humidity and etc. To improve productivity of agriculture we have to analyze data by using ML algorithm.

Keywords— Solar panel, Raspberry pi, IOT, ThingSpeak, Smart Agriculture, ML.

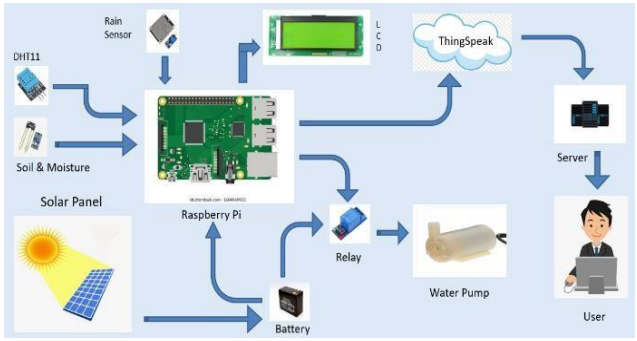
I. INTRODUCTION

In India agriculture plays major role in economy of country. India ranks second worldwide in farm output. Almost 70% of Indian population relies on agriculture for their sustenance. We live in a world where everything can be controlled and operated automatically, but there are still a few important sectors in our country where automation has not been adopted or not been put to a full-fledged use. One such field is agriculture. In this project, we have designed a system uses a hardware which provides an effective and efficient solution to be defined problem in Indian farming system. One of the advantages of this system is, it saves electrical energy by turning off the motor when there is no water in the pump. This is one of such projects that solely concentrates on making the farming process more efficient and accurate by analyzing the different conditions of a farmland. This project not only helps in easing the farmers' jobs and making their life better but also helps in saving variety of environmental resources.

In this paper we propose a raspberry pi based smart agriculture using thingSpeak to reduce the man power required in the agriculture field. In this project we can deploy various wireless sensor using IOT for measuring the various environment parameters. Raspberry pi is the main controlling device that can send all the collected data to ThingSpeak cloud and also receive controlling action from ThingSpeak service. ThingSpeak is open-source IOT platform which enables a farmer to visualize data instantly and remotely. So, they can control various parameters from a remote location. ML is a new way of computing intelligence using machine. Its observed that there are various researches have been done for smart agriculture in IOT and ML individually. In this project we review those solutions and propose how ML and IOT blend for better and precision agriculture.

II. PROPOSED SYSTEM

The proposed system shown below fig.1, consist of Raspberry pi, Solar panel, DHT11, soil moisture sensor, rain sensor, pump motor. In this project, a solar panel is used. Using this solar panel first we will generate solar energy and further it will use to power the system.



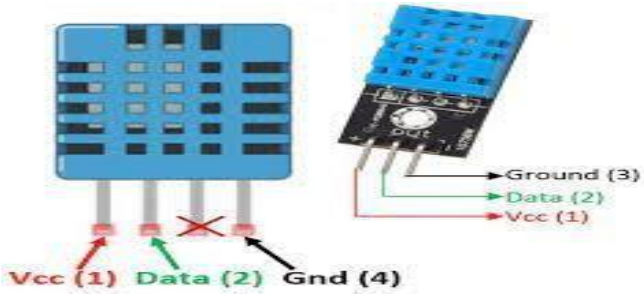
Using a low-cost various sensor, we can measure various environment parameters. This collected or sensed different data is transmitted on server through IOT using ThingSpeak cloud service. ThingSpeak is an IOT analytics platform service that allows farmers to analyses visualise live data streams collected in the cloud.

III. COMPONENTS

1] Raspberry pi :

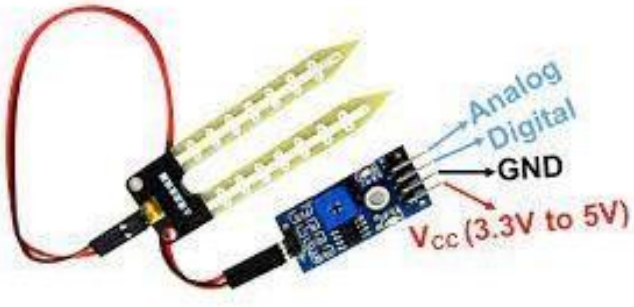
The Raspberry Pi 3 Model B is the third generation Raspberry Pi. This powerful credit-card sized single board computer can be used for many applications and supersedes the original Raspberry Pi Model B+ and Raspberry Pi 2 Model B. Whilst maintaining the popular board format the Raspberry Pi 3 Model B brings you a more powerful processer, 10x faster than the first generation Raspberry Pi. Additionally it adds wireless LAN & Bluetooth connectivity making it the ideal solution for powerful connected designs.

2] DHT11 :



DHT11 is a low-cost digital sensor for sensing temperature and humidity. This sensor can be easily interfaced with any micro-controller such as Arduino, Raspberry Pi etc… to measure humidity and temperature instantaneously. DHT11 humidity and temperature sensor is available as a sensor and as a module. The difference between this sensor and module is the pull-up resistor and a power-on LED. DHT11 is a relative humidity sensor. To measure the surrounding air this sensor uses a thermistor and a capacitive humidity sensor. Humidity is the measure of water vapour present in the air. The level of humidity in air affects various physical, chemical and biological processes. In industrial applications, humidity can affect the business cost of the products, health and safety of the employees. So, in semiconductor industries and control system industries measurement of humidity is very important. Humidity measurement determines the amount of moisture present in the gas that can be a mixture of water vapour, nitrogen, argon or pure gas etc. Humidity sensors are of two types based on their measurement units. They are a relative humidity sensor and Absolute humidity sensor. DHT11 is a digital temperature and humidity sensor.

3] Soil Moisture :



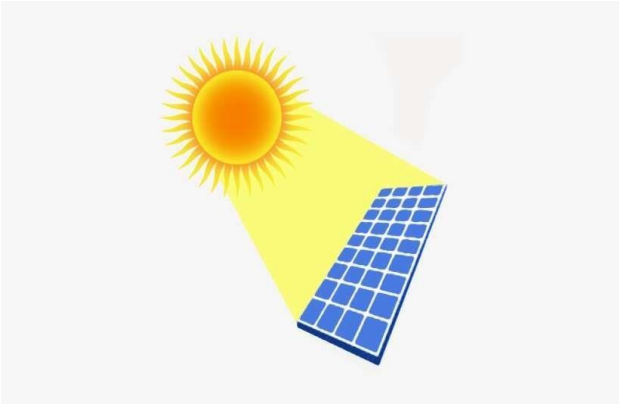
The soil moisture sensor is one kind of sensor used to gauge the volumetric content of water within the soil. As the straight gravimetric dimension of soil moisture needs eliminating, drying, as well as sample weighting. These sensors measure the volumetric water content not directly with the help of some other rules of soil like dielectric constant, electrical resistance, otherwise interaction with neutrons, and replacement of the moisture content. The relation among the calculated property as well as moisture of soil should be adjusted & may change based on ecological factors like temperature, type of soil, otherwise electric conductivity. The microwave emission which is reflected can be influenced by the moisture of soil as well as mainly used in agriculture and remote sensing within hydrology.

4] Rain Sensor :

A sensor that is used to notice the water drops or rainfall is known as a rain sensor. This kind of sensor works like a switch. This sensor includes two parts like sensing pad and a sensor module. Whenever rain falls on the surface of a sensing pad then the sensor module reads the data from the sensor pad

to process and convert it into an analog or digital output. So, the output generated by this sensor is analog (AO) and digital (DO).

5] Solar Panel :



Solar panels are those devices which are used to absorb the sun's rays and convert them into electricity or heat. Description: A solar panel is actually a collection of solar (or photovoltaic) cells, which can be used to generate electricity through photovoltaic effect. ... Solar panels wear out extremely slow.

6] Relay Module :

A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. Magnetic latching relays are useful in applications when interrupted power should not affect the circuits that the relay is controlling.

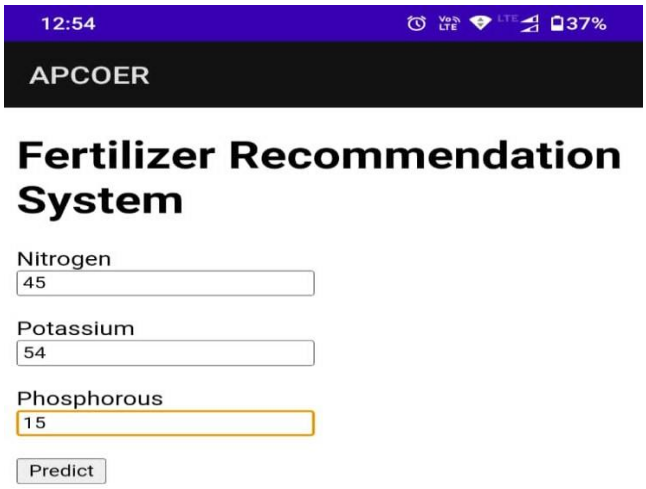
WORKING

In this system, solar panel will generate energy with the help of sunlight and stores that energy into the battery. DHT11, soil moisture, and the rain sensor is connected to Raspberry pi. After giving power supply this sensor will give inputs to the raspberry pi. Raspberry pi will collect all the input data and stores that data on the ThingSpeak server. According to the input given by soil moisture sensor, if the soil is dry, the raspberry pi will switch on the water pump with the help of relay module. As the soil gets wet, the water pump will automatically turn off. In this way, this system works.

IV. RESULTS

Hardware Part

ThingSpeak Server



Fertilizer Recommendation System Output

V. CONCLUSIONS

This proposed system is very beneficial for government and farmer also. Due to use of solar, government finds a solution over energy crisis. Using this solar, farmer able to manage wastage of water and also reducing human intervention. This system is implemented by considering low cost, reliability, alternate source of electric power and automatic control. The model always ensures the sufficient level of water in the field avoiding the under-irrigation and over-irrigation. To overcome necessity of electricity and ease the irrigation system for our farmers, the propose model can be suitable alternative.

FUTURE SCOPE

In the todays 21st century, as technology is developing day by day , so with more features develop in IoT these systems can be made efficient ,more stable, much faster with accuracy and will cost less. In the coming future, this system can be and must be adopted by agricultural farmers.

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