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AGRIOT - Augmented Green Revolution Using IOT

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Abstract: *Internet of Things (IoT) which is a network based on the physical systems which it can be exhibited in the form of a typical embedded system including electronic devices such as sensors. The connectivity of the network which can be enabled by these objects for exchanging and collecting data. Here in this project our main goal is to help the backbone of Indian economy which basically is farming. The technical graduates of India are supposed to help in this regard, hence we have chosen this project namely 'AUGMENTED GREEN REVOLUTION USING IOT'. As the name indicates we have planned to combine many technologies into a single plot, which we are assuming to be a new revolution in green industry.*

First we understood the current agricultural disputes of our local farmers, thereby understanding the possible solutions for it we have tried to solve some of them. The problems which we identified are Irregularity of three phase current, damaging of crops, burning of bore well motor coil due to dry run, loss of crops due to scarcity of water, difficulty of growing multiple crop on the same land, improper irrigation. To overcome all these problems we have undergone sufficient research and obtained all the possible solutions.

I. INTRODUCTION

We often hear that India is an agricultural country. This basically means that agriculture is an important part of our livelihood. In India, agriculture is our primary economic activity and about two-thirds of our population is engaged in the same.

In this project we are planning to bring up a low cost practical solution which can be installed in any farm land. This project will be a one-time investment with maintenance free and false proof, user will be able to monitor his crops any time with his android phone.

In current situation there is no protection for bore well from dry run, and lots of farmers are facing problem from burning of bore well machine coils. Cost and time required for rewinding and re-erection of bore well is high. In rural, supply of three phase current is irregular since most of the bore well machine requires three phase current, farmers have to monitor the field regularly. To overcome this difficulty we are centralizing the bore well system and connecting it with the farmers mobile using IOT.

In drip irrigation farmers usually never get 100% efficient yield due to imbalance of water in the field and not able to grow variety of crops in a single field. To overcome this we are using Matrix irrigation methodology where sensors placed at each matrix point sense water level for particular crop and supplies according to it.

- A. Protection for the crops from predators using AI Based electric fence and Ultrasonic sound.
- B. Atmospheric water condensation using Peltier module
- C. Centralized bore well water irrigation
- D. Matrix water dripping irrigation

II. PROPOSED WORK

A. Protection For The Crops From Predators Using Ai Based Electric Fence

Night vision cameras are installed across the individual fields which are programmed to identify the size and nature of the intruding body. Critical value of current is set to each size of body such that the current is not lethal for its life. Upon identifying the object the critical value of current is energised to the electric fence. In case of the body is found to be in the nature of human a warning is given with help of speaker and current supplied to the fence is of small amount. Along with this, the current supplied is in such a way that there is a fraction of ideal time where the individual can get away from fence though they get electrified. Speakers are used to propagate particular frequency of sound for unique predator along with which a broad spectrum of insect repellent sound is played continuously so that the harmful insects can be restricted off the fields.

B. Atmospheric Water Condensation Using Peltier Module

Peltier Module is a device which transfer heat from one surface to other hence the comb heat sink gets extremely cooled mean while the other side of the module gets extremely heated. To avoid burn out we are using an exhaust fan on the hot side of the Peltier module to dissipate heat. Moisture passed through the comb heat sink start to condense due to low temperature and starts to form water droplets. Before getting freeze due to the weightage water in the comb structure it starts dripping and gets collected in the storage area.

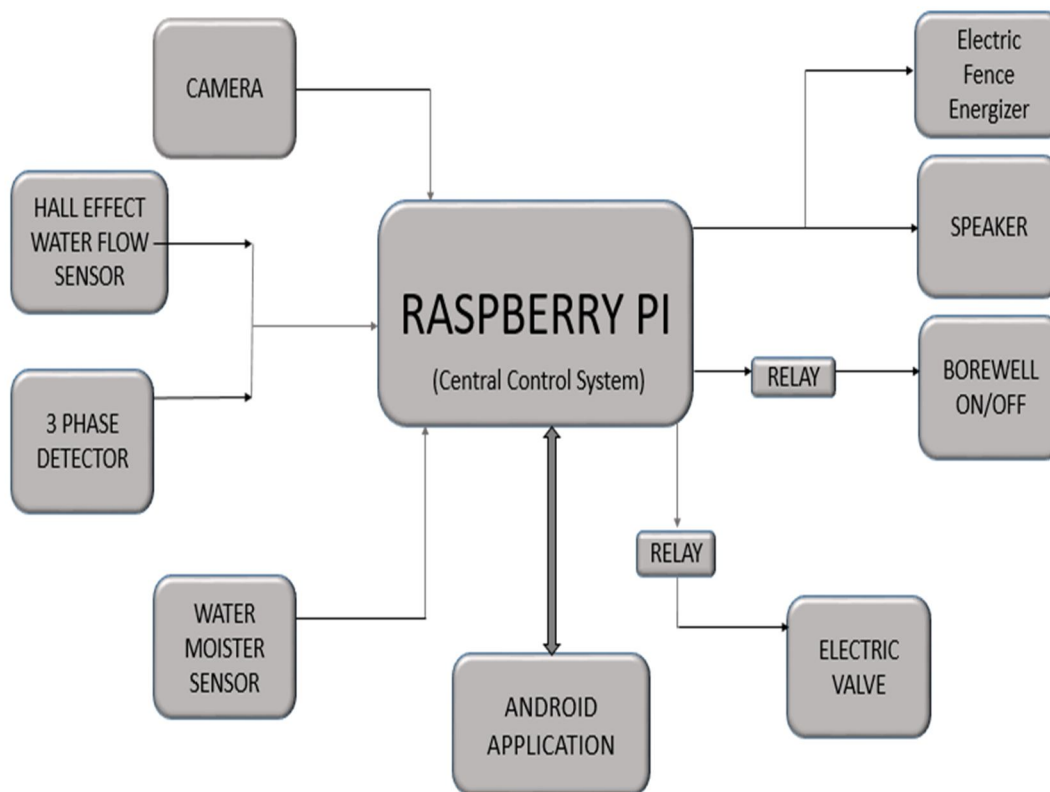
C. Centralized Bore Well Water Irrigation

To avoid dry run in bore well we are installing a hall effect sensor in its outlet. Hall effect water flow sensor is a device in which a turbine with magnets keep rotating based on the tangential force exerted on the turbine by the water flowing through it, the rotation of the turbine is directly proportional to the amount of water flowing through to the pipe according to the Bernoulli’s principle. The Hall Effect sensor present in it keeps on counting the number of rotation of the turbine by counting the number of change in magnetic field. Here the hall effect water flow sensor keep on monitoring the water level in the pipe and once the water extinguish it gives signal to the controlling unit thereby the controlling unit switch off the bore well machine and notifies the farmer. Usually three phase current is not regularly supplied by the government to the villages hence we are using a three phase detector interphase with the control unit. Controlling unit is connected to the android application such that the farmer is able to access the whole system by using his phone remotely.

D. Matrix Water Dripping Irrigation

It is difficult to grow different crop in the same field due to specific water requirement for particular crop. Some crops requires more water while others require less. To overcome this, a matrix type of water supply is implemented where each plant has its own matrix point thereby supplying the required water for the particular plant using water level sensors and an electronic valve.

III. BLOCK DIAGRAM



IV. COMPONENTS USED

A. Raspberry pi

The Raspberry Pi is a low cost, miniaturised computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python.

The SD card inserted into the slot on the board acts as the hard drive for the Raspberry Pi. It is powered by USB and the video output can be hooked up to a traditional RCA TV set, a more modern monitor, or even a TV using the HDMI port

B. Raspberry pi Camera

It is used to detect the objects. The Raspberry Pi 5MP camera board is a custom designed camera board that is equipped with a flexible ribbon cable, making it compatible with Raspberry Pi.

C. Soil Moisture Sensor

Based on the conductivity of the two electrodes, the soil moisture sensors senses the amount of water retensity of a soil.

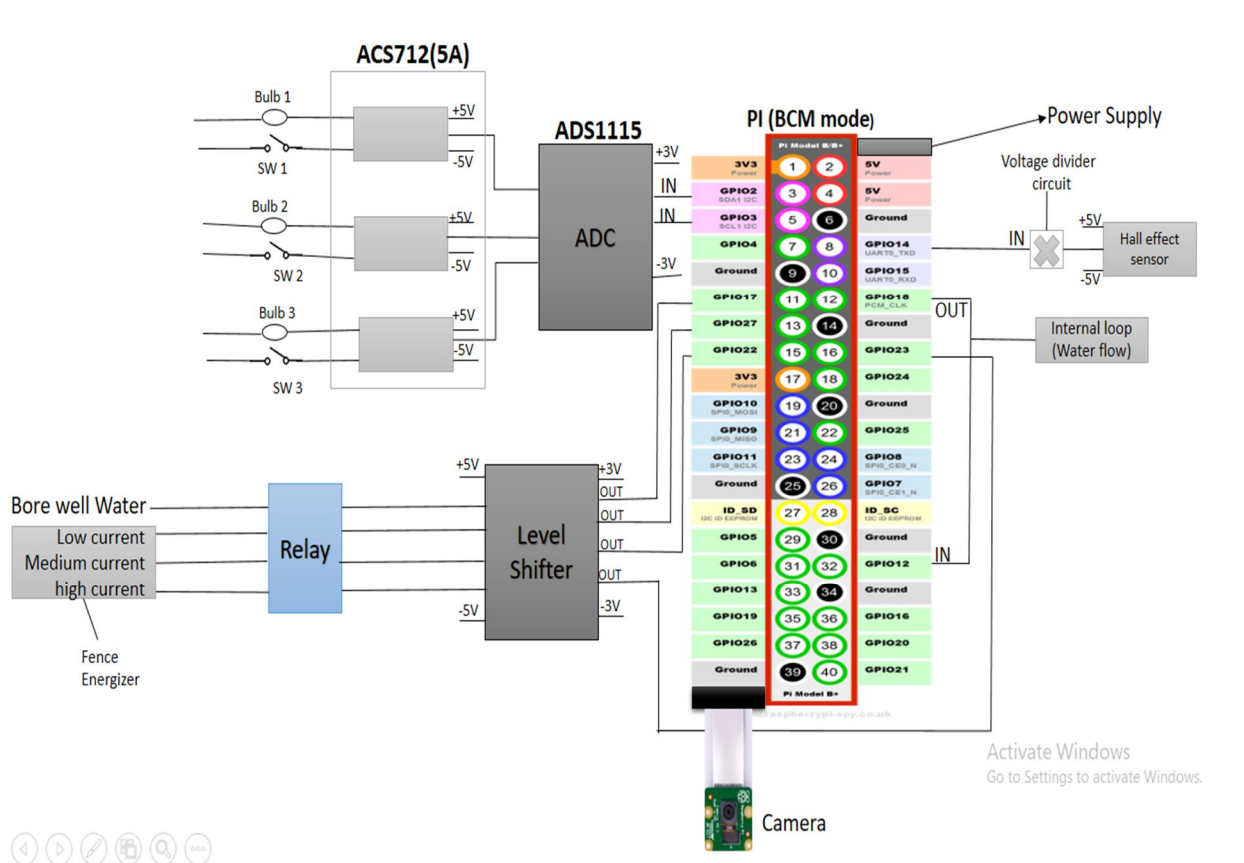
D. Hall Effect Water Flow Sensor

Hall Effect sensors work by measuring the changing voltage when the device is placed in a magnetic field. In other words, once a Hall Effect sensor detects that it is now in a magnetic field, it is able to sense the position of objects.

E. Electric Fence Energiser

The pulse travels through the conductors and pressurizes the fence with excess electrons. That pressure is measured in volts. When an animal touches the fence, excess electrons enter it and travel through the animal to the soil.

V. SYSTEM IMPLEMENTATION



Activate Windows
Go to Settings to activate Windows.

A. Protection of Crops using AI Based Electric Fence

We are able to train raspberry pi to identify particular objects and have categorised them into few types based on the size of the objects. If the identified objects is in the nature of human, a warning is given to the intruder and minimum current is given across the electric fence which is of safe range and also alerts the farmer through the android application. Similarly in case of animals, depending on their category or size particular safe range of current is energized through the fence which is surrounded across the agricultural land. Along with this process each of the animals are scared away using required audio files through the speakers. For example crackers sound for elephants, lion sound to scare animals like cow, sheep, horse etc. By using our Android application farmers can also monitor their field remotely by using camera as CCTV.

B. Centralised Bore Well Irrigation

For the detection of three phase current by using ADC, we have connected 3 current sensing sensors with the help of a simple load such that each of them detects individual phase of electrical current, whenever there is a sudden change in the output of current sensing sensors from the required value we have directed the raspberry pi to alert the android application. In case there is a fault in three phase current we have shown indication in the android application and have disabled the bore well switch.

In case of availability of three phase current, if the farmer switches ON the bore well remotely, then raspberry pi with the help of a relay jumps the ON switch in the bore well panel and start monitoring the flow of water in the Hall Effect sensor. After a few seconds of start of the bore well, if there is a reduction of water level in the Hall Effect water flow sensor, the raspberry pi alerts the user and switches OFF the bore well

C. Atmospheric Water Condensation using Peltier module

Atmosphere is also a great source of water which humans has not yet explored completely. Here we are trying to extract atmospheric water using Peltier effect. Moisturised air is sucked in using an inlet fan which is passed through the comb structured customised heat sink mounted to a Peltier module, later used air is passed out using an outlet fan. Peltier Module is a device which transfer heat from one surface to other hence the comb heat sink gets extremely cooled mean while the other side of the module gets extremely heated. To avoid burn out we are using an exhaust fan on the hot side of the Peltier module to dissipate heat. Moisture passed through the comb heat sink start to condense due to low temperature and starts to form water droplets. Before getting freeze due to the weightage water in the comb structure it starts dripping and gets collected in the storage area. On approximation a single Peltier module can collect 2-3 litres of water a day, analysing the factor here we are trying to improvise the water collection capacity by changing the material and structure of the heat sink

D. Matrix Water Dripping Irrigation

Here our main goal is to reduce the wastage of water from improper usage in the field of agriculture. Most of the water used is being wasted due to irrigating unwanted land. Hence we are planning to use drip irrigation to control the water flow limited based on the requirement.

VI. ANDROID APPLICATION



AGRIOT is the android application created for the sake of farmers who can easily operate in a simplified manner. A login ID and a password is created for each user as shown in picture in order to operate their agricultural land automatically in a simplified manner. Whenever there is a sudden change in the output of current sensing sensors from the required value, Changes can be made accordingly, In case there is a fault in three phase current we have shown indication in the android application and also disable the bore well switch. Water status icon indicates the presence or absence of water in the bore well pipe. In case there is no water flowing then the bore well will be turned off.

CCTV option is used by the user to monitor around the agricultural land and can protect their field from intruders, animals and can also energise the fence by a required current using the application.

VII. EXPECTED RESULTS

The expected results are as follows

- A. Automatic Identification of the objects mainly humans, animals and provide the required amount of electric current through the fence around the fields in a safe manner.
- B. Monitor and control water from the bore well remotely and protect it from dry run.
- C. Matrix type of water dripping irrigation system to grow multiple crops on a single plot and automatic supply of water to them based on the water content of the soil using soil moisture sensors.
- D. Increase the conversion of atmosphere moisture into water droplets of a Peltier module water moisture condenser.

VIII. OBTAINED RESULTS

We are able to train raspberry pi to identify particular objects and have categorised them into few types based on the size of the objects. If the identified objects is in the nature of human, a warning is given to the intruder and minimum current is given across the electric fence which is of safe range and also alerts the farmer through the android application. Similarly in case of animals, depending on their category or size particular safe range of current is energized through the fence which is surrounded across the agricultural land. Along with this process each of the animals are scared away using required audio files through the speakers. For example crackers sound for elephants, lion sound to scare animals like cow, sheep, horse etc. By using our Android application farmers can also monitor their field remotely by using camera as CCTV.



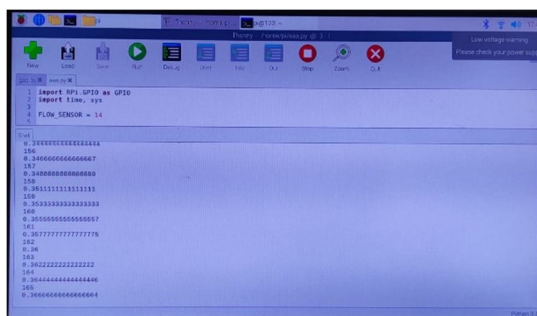
Hall Effect water flow sensor



Three phase current Loads

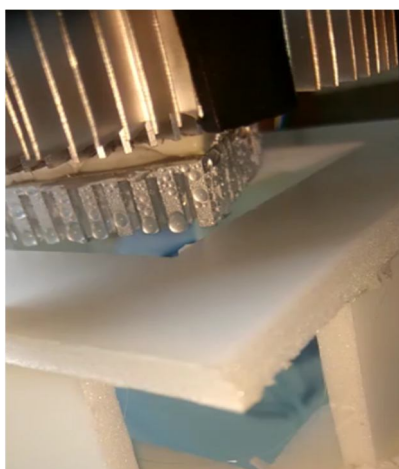
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Reading of water flow sensor

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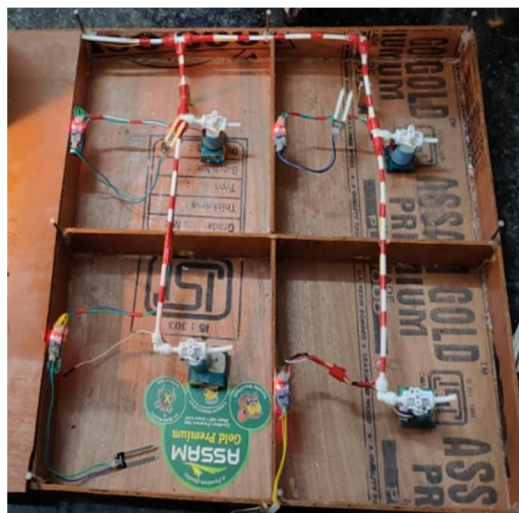


Water condensation using Peltier module

In case of matrix type of water drip irrigation we have used a soil water moisture sensor and a relay individual to each of the point in matrix to create a logical circuit which can be used to open a solenoid valve to control the water flow at that particular point. The water sensitivity of the moisture sensor can be changed using the potentiometer present in it on required basis for a given season.

IX. APPLICATIONS

- A. This Project can be implemented on a large variety of agricultural farm lands like irrespective of small land, large land, Horticulture land, dry land or land with high moisture areas.
- B. It can also be implemented in gardens or clinical research farm lands.
- C. Implementing this in High cost crops like sandalwood will give a great security to them.
- D. If government mandate this project with few updates, it can decrease a large amount of water wastage and it will be a new revolution for future scope.



Matrix type water irrigation system





X. CONCLUSION

The system should be able to protect crops from predators and maintain the agricultural farm land with ideal water requirements with minimal water wastage with the help of android application by using compact equipment which is simple in design and low cost.

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