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A Smart Agriculture IoT-Based NPK Deficiency Detection System

V.Elakiya[1] R.Shashini[2] K.Shahanas Banu[3] K.S.Elakkiya[4] R.Abirami[5]

Assistant Professor[1,2,3,4],

CK College of Engineering and Technology, Cuddalore,

ABSTRACT

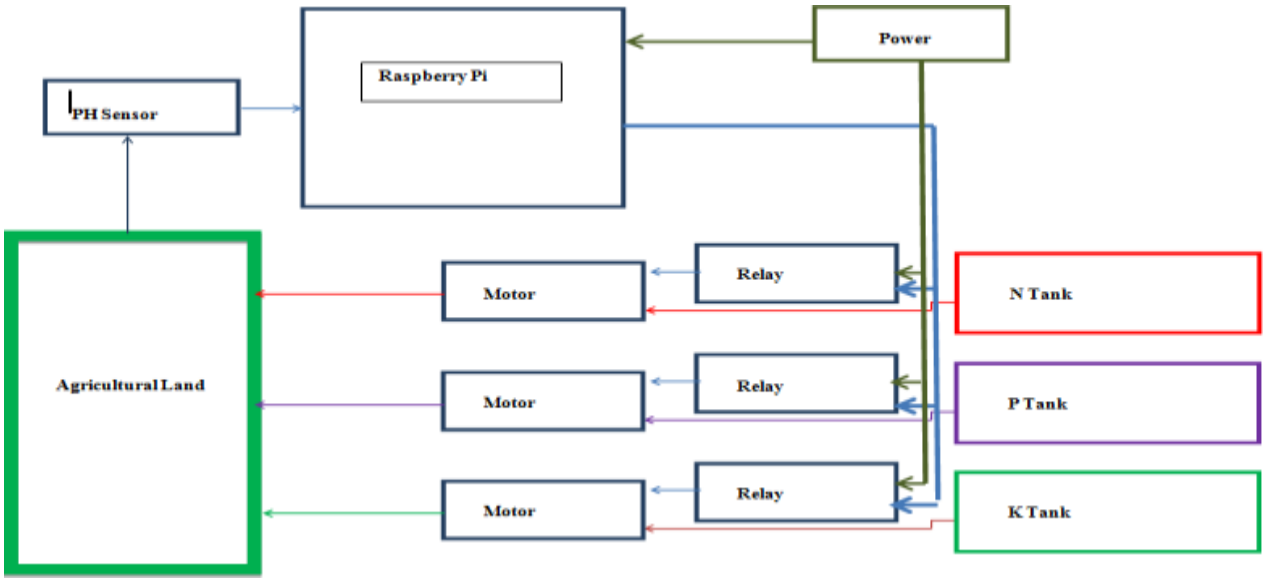
Increased crop yields are a direct result of technological advances in agriculture. As the conceptual model for crop growth at various stages matures, smart agriculture becomes a reality. Constant farming might threaten agriculture's long-term viability if soil nutrients aren't monitored and replenished as needed. The development of plants and the efficiency of fertilization are significantly dependent on accurate measurements of soil nutrients. The farmers lost money because cultivation was tough. The project's overarching goal is to minimize fertilizer use and associated agricultural labor. The health of humans and the soil itself are both threatened by excessive fertilizer usage. It may provide a high-level summary of the sensor-based soil-nutrient monitoring system. To improve agricultural yields, the pH sensor is used to measure soil acidity remotely. This work proposes a method for distinguishing between nitrogen (N), phosphorus (P), and potassium (K) shortages in soil, as well as combinations of these elements. In this case, IoT is employed so that farmers can quickly and easily see patterns in the data and act on insights and suggestions.

KEYWORDS: Relay, LCD screen, pH sensor, and Raspberry Pi.

INTRODUCTION:

We use a ph sensor to determine the soil's type and ph level first. The use of pesticides and insecticides should be kept to a minimum to prevent the poisoning of the soil and the preservation of a healthy crop.When fertilizers aren't used properly, crops like fruits and vegetables can't grow to their full potential in terms of size, flavor, quality, or quantity. The soil's biological, chemical, and physical properties all contribute to its ability to provide optimal crop yields. The harvest output rate may be drastically impacted by either over or under supply of fertilizer. The root draws the soil's nutrients and water up into itself.The findings collected by the tests and we recommend the farmer which sort of crop is good for that specific soil using the mobile apps.

ARCHITECTURAL DESIGN



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PROPOSED SYSTEM:

In the existing system there is a only purpose of analysing the soil nutrients.But now innovatively, we are going to estimate the soil nutrients depends on the vegetable's minerals. Though its for to compare the soil's fertility and the vegetable, which have to cultivate in the soil. Even though we have to analyse the energy, fertility, minerals, nutrients of the both objects.To analyse the soil by using pH sensor with the help of raspberry pi .

HARDWARE REQUIREMENTS

RASPBERRY PI

MOISTURE SENSOR

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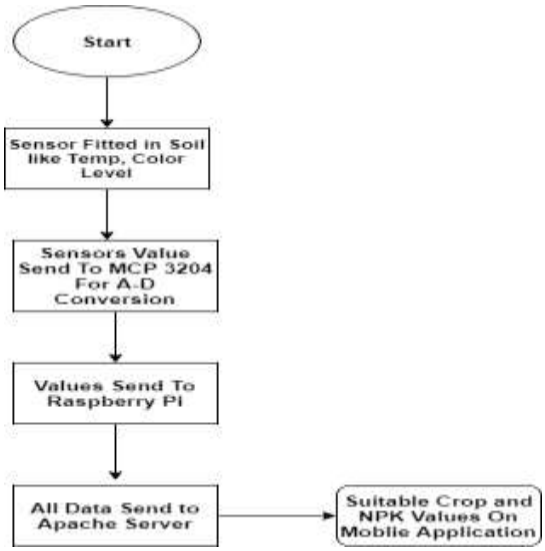
FLOW CHART



NUTRIENT DISPENSE SYSTEM

In the system the macronutrients are measured with the help of pH sensor. The analog input from the pH sensor is converted into digital input and send to the controller called Raspberry Pi. Nutrient dispense system block diagram is shown in the Figure.1. From the pH value the NPK content in the soil can be obtained. Then it is compared with the already stored threshold value and if the obtained value is less than the threshold value then the relay circuit for corresponding nutrient is switched ON. The pump connected to the relay is switched ON by 12V power supply. At the same time the current values of the nutrients are displayed on the LCD display. Finally the digital input value is sent to the farmer using Internet of Things and this can be viewed by the farmer through computer or smart phone. Two 15V transformer will be used in the nutrient dispense process. The main purpose of transformer is 230V power supply is converted into two set of 15V power source with 500mA current. Specification of the transformer are voltage 2*15V, current 1*500mA, rated power 15A. Transformer output power source are connected to bridge rectifier. Bridge rectifier is used to convert ac into dc. During this process some noises occurs and that can be removed with help of capacitor. pH sensor is used to measure the pH value of the soil. pH sensor output signal is analog signal that will be passed to MCP 3028. It converts the analog signal into digital signal. Digital signals are passed to the raspberry pi. Raspberry pi only accept the digital signals. From the input value the NPK values can be obtained. NPK threshold value is already programmed in the raspberry pi kit.NPK values are compared to threshold value, if the NPK values are less than the threshold value relay will be switched ON and message will be displayed on the LCD display.In pH sensor the combined electrode is combination of glass electrode and reference electrode in single entity. The module power of pH sensor is 5V. The pH measuring range is 0-14.Relay, a switching device will be

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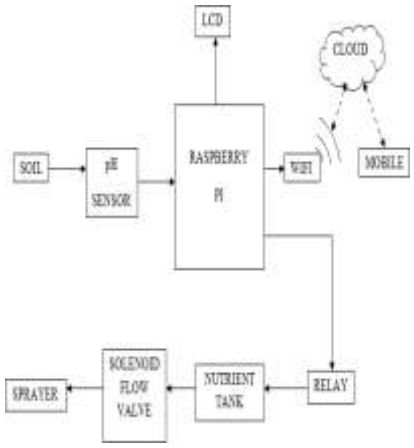

placed between the controller and the nutrient tank. The relay will get switched when it gets input from the controller. It gets small current as input from the Raspberry Pi and controls the nutrient tank. Here 5V SPDT relay is used. It is a high quality Single Pole Double Throw shield relays. It is used in high voltage or high current device. This relay's coil is rated up to 12V, with a minimum switching voltage of 5V. The fertilizers needed to increase nitrogen, phosphorus and potassium content in the soil are mixed with water and then stored in the nutrient tank. Liquid level sensor(UM0022) will detect the level of liquid contained in the nutrient tank and send the information to the controller. It is a kind of liquid level proximity sensor, which use high frequency ultrasonic technology and self triggering continuous measurement. It has high accuracy and good directivity.Solenoid flow value is an electro mechanical actuated value to control the flow of liquid from the nutrient tank to the sprayer. A centrifugal pump will be placed after the nutrient tank to move liquids through the piping system. The fluid enters the pump impeller along or near to the rotating axis and is accelerated by the impeller, flowing radially outward into a diffuser or volute chamber, from where it exits into the downstream piping system. Centrifugal pumps are used for large discharge through smaller heads.

RELATED WORKS

Technology plays an expedient role for the improvement of environment and for achieving the economic goals. This technology is mainly used for increasing the crop production and crop quality as well as to reduce resource wastage and promote stewardship of the environment. The distribution of soil nutrients is mainly affected by natural condition, which plays a major role in the agriculture system [12]. The variability in soils mainly depends on natural conditions. This method permits users to use accessible sensors deprived of sacrificing data integrity, though diminishing the human capitals required. In [22] many nutrients meters cost (Nitrate, Potassium, Phosperous) are given. The main problem of this nutrients meters is that they are not automatic. It needs human intervention for measuring micronutrients/macronutrients. In other hands our proposed system is fully automatic where no human intervention is needed.

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CONCLUSION

Maintaining healthy soil in the face of land and water contamination is as simple as keeping tabs on the soil's NPK concentration. The Internet of Things is used to make this happen. Information collected by sensors is uploaded to the cloud and then sent to the user's mobile device with an accompanying text message. This might lead to a decrease in the number of people working in agriculture. Different types of crops are grown. In order to regulate the plant's hydration, nutrient levels, etc., it is necessary to keep a close eye on the crop at regular intervals. If the soil is deficient in any one nutrient, it may be remedied by introducing the correct solution via the watering system. This area makes use of a smart watering system managed by a Raspberry Pi. In addition to reducing the need for pesticides in the soil, the nutrient dispensing system may shield the ground from issues including soil and water contamination.Soil pH is constantly monitored using the suggested approach. The controller already has the threshold value for the three nutrients. Before being transferred to the Raspberry Pi, the analog value from the pH sensor is transformed to a digital value. After that, we compare the input value to the predetermined limits.

REFERENCE

1. BaljitKaur and Dilip Kumar, Development of Automated Nutrients Composition Control Fertigation System. International Journal of Computer Science, Engineering and Applications, 2013; 3(3): 67-78.
2. P. Navinkarthi, J. Pooja, and R.
3. Merlin Monica, The acnes of recycling precinct are monitoring through wireless platform. IEEE International Conference on Engineering and Technology (ICETECH), IEEE, 2015.
4. P.Navinkarthi, K. Soundarya, S. Swetha, K. Sudhakaran, S.K. Vetrivel, Industrial network constituting pattern for electronic utilizations using smart phones. International Journal of Advanced Science and Engineering Research (IJASER), 2016;1(1).
5. Zhang Feng, Research on Water-Saving Irrigation Automatic Control System Based on Internet of Things. Proceedings of International Conference, Electric Information and Control Engineering, 2011: 2541-2544.

6. Tyler Davis and Yao Liang, Analysis of Power Characteristics for Sap Flow, Soil Moisture, and Soil Water Potential Sensors in Wireless Sensor Networking Systems. IEEE Sensors Journal, 2012;12(6): 1933-1945.6.Graham Wild and Steven Hinckley, Optical Fiber Sensors in Physical Intrusion Detection Systems: A Review. Journal of Latex Class Files, 2012; 11(4): 1-13.7.Hang-Zhou Yang and Harith Ahmad, Optical Fiber Sensing of Salinity and Liquid Level. IEEE Photonics Technology Letters, 2014; 26(17): 174