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Automatic Irrigation System Based On Sensor and PH Detection of Soil Using Image Processing

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Abstract--- *The population of India has reached beyond 1.3billion and the rate of population is increasing with each passing days, and if it continues to next 2530 years, there will be a severe problem regarding food production, so it is necessary to develop as well as improve the agricultural sector. The farmers are currently suffering from water scarcity. Main goal of this paper is to provide an automatic irrigation system that saves the time, money, and power of the farmers. The traditional techniques of farmland irrigation require manual intervention and efforts. Human intervention in the agricultural fields easily minimized with the application of automated irrigation technology. Moisture sensors installed in the field. Each time there is a change in soil water content these sensors sense the shift and gives the micro-controller an interrupt signal. The soil is considered as one of the most precious natural resources whose soil pH properties used to define degree of 'acidity' or 'basicity' that affects the availability of nutrients and ultimately the growth of plants. The mobile camera used to capture the images and the pH value of the soil is determined after analysing the captured image. The crops or plants proposed after the analysis of the captured image, which is grown in the agricultural field. Because of the soil, pH quality identification, the chances of the crops from being spoiled decreases to an optimum level.*

Index Terms--- *GPRS, GSM*

I INTRODUCTION

Commonly, the existing irrigation system that is in use is manually operated. Those systems are replaced by the automated and semi-Automated techniques that suggests an automated irrigation concept to make efficient and effective use of the water. Sensor-operated automatic irrigation system [1] is reliant on the soil moisture sensor, which determines level of the moisture present in the soil and sends the generated signal to a Raspberry pi. In addition, the crops are irrigated accordingly to the command signal produced by the Raspberry pi. The micro-controller role is being played by the Raspberry pi that controls the irrigation of the crops grown in the agricultural fields. This Raspberry pi compares the values of the moisture sensor with a predefined moisture level with the predefined levels of moisture that is already stored in the system. The Raspberry pi turns the irrigation system ON/OFF based on the relative values obtained from the sensors. The Raspberry pi also performs calculation of the pH value of the soil. In order to describe the 'acidity' or 'basicity' level, the term pH is used. The micro-controller

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uses pi camera to capture the images of soil and after calculation of the pH values, crops that can be probably grown in the field are suggested to the farmers [2].

I.I. Project's Motivation

The population of India has reached beyond 1.3 billion and the rate of the population is increasing day by day, so in the next 25-30 years there will be severe problems regarding the food production, and it is therefore required to make technological advancement in the field of agriculture in order to stop starvation and malnutrition in the coming years. Currently the farmers are suffering from lack of rain and water scarcity.

This paper's main objective is to design an automated irrigation system that saves the farmer's time, money and power. Human intervention is required for traditional farmland irrigation techniques. The human intervention can be minimized with the application of the automated irrigation technology in growing crops.

I.II. Literature Survey

Rain Gun Irrigation System mentioned the use of automatic microcontroller-based rain gun irrigation system where the irrigation occurs only when there is an intense water requirement that in turn saves a large amount of water [3][4]. This system brings a shift to field resource management where a proprietary software stack called 'Android' that is used in mobile devices including an operating system, middleware and main applications. The 'Android SDK' lays the necessary tools and 'APIs' to start developing applications using the Java programming language on the android platform. Mobile devices have now become an integral part of us delivering people's multiple needs. This application uses the mobile phone's GPRS feature as irrigation control system's solution. The system offers excess water in the land and uses GSM to send messages and an android app used to overcome under irrigation. The over irrigation causes leaching and loss of soil nutrient content [5][6].

II PROBLEM STATEMENT

This paper's main goal is to offer an automated irrigation system, which helps in saving the farmer's time, money and energy. Human intervention can easily minimize with the application of the automated irrigation technology. Whenever any alteration in the water content of soil is observed, the moisture sensors detect the alteration and the change and send the micro-controller a relative signal.

Three sensors of soil moisture is inter-connected from top to bottom with one another [7], i.e. first level (top sensor), second level (middle sensor), third level (deep sensor) [8]. These are dipped inside the soil. The moisture sensors detect the moisture in possibly three ways:

- The irrigation system will stay off, if the top sensor detects moisture.
- The system will be off if the top sensor did not detect moisture, but the second level sensor detects it.
- However, if both the top sensors have not detected moisture then irrigation will begin for a period of time, even if the third level sensor senses some moisture.

The data of this moisture, i.e. notifications will be redirected to the cloud implementing IOT that is accessible via a website [9]. The system will send data to the cloud continuously. Upon usage of a Bluetooth installed in an android app, all the information can also be easily accessed if there is no internet connectivity. The farmer can use the android application i.e. semi-automatic system in order to control irrigation system to produce crops on a larger scale.

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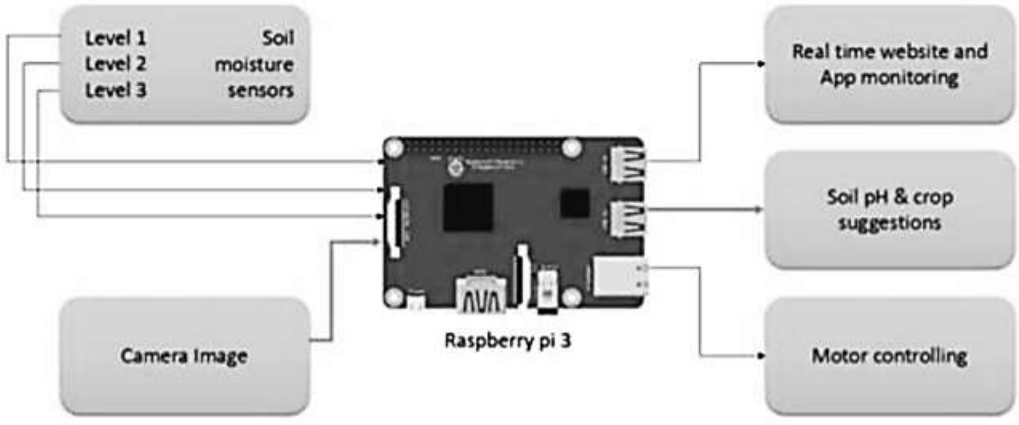

Fig. 1: System Architecture

II.I. Technology: Innovation

The soil is regarded as one of the most precious natural resources whose soil pH characteristics is used to define the level of 'acidity' or 'basicity' that influences the availability of nutrients and eventually the growth of plants. The Pi camera is employed to capture images and the pH value of the soil is calculated after analysing and evaluating the captured image and then the crops or plants are proposed which can be grown in that specific area. The second system provides farmers with that specific type of the crops that are grown in their specific field [10]

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III OUTCOMES

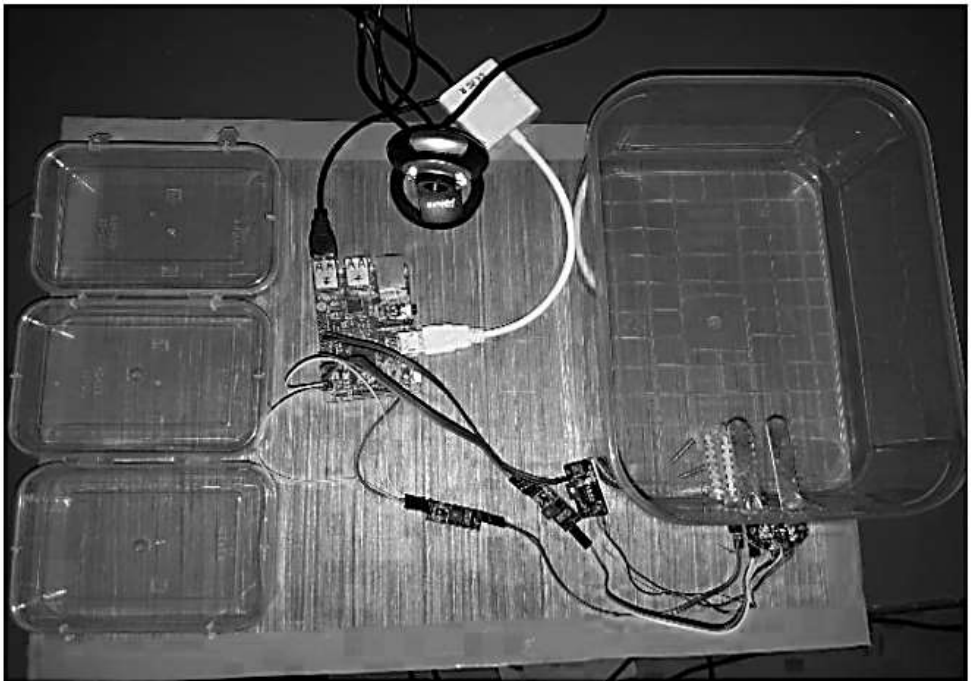

Fig. 2: Working Model

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Fig. 3: Capturing Image of Soil

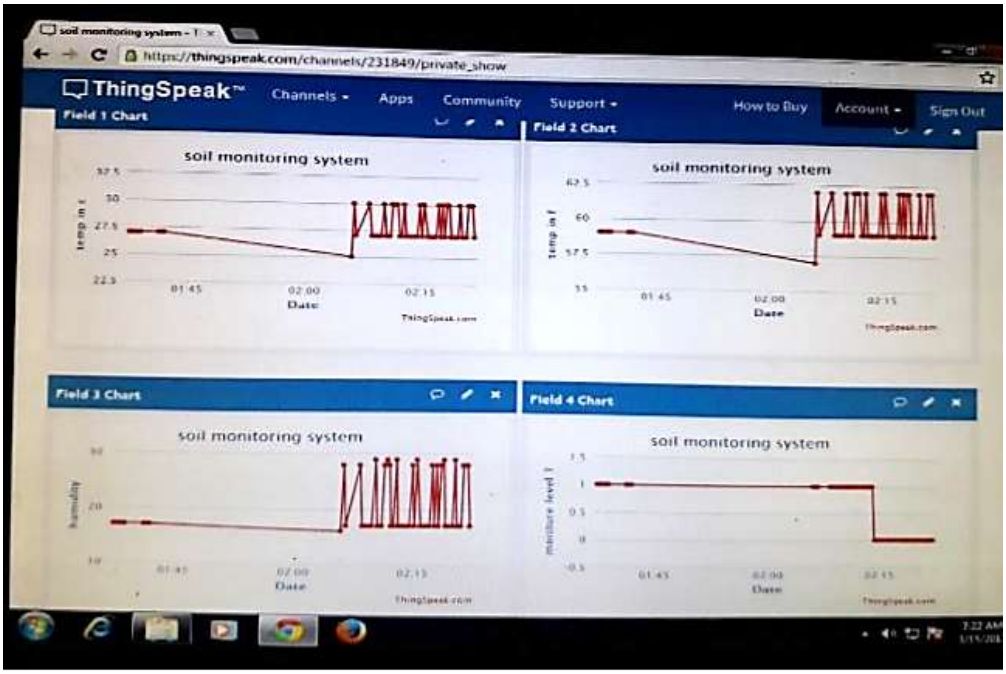

Fig. 4: Real Time Data Upload

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IV CONCLUSIONS

The conventional systems consume greater amount of water and results in wastage of a lot of water. Upon installing the automated irrigation system and determination of the pH value, it conserves time and confirms sensible use of the water and the farmers get to know about the crops that are in the field at the earliest. This system operates in areas where there is no standard electricity supply. The system reduces human intervention and manual labour, so the farmer needs less energy and least effort is required for irrigating fields. In the near future, it will be possible to add modules such as artificial intelligence (AI) for automatically studying the pattern of watering crops and plants in order to cop up with the demands of the growing population.

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