International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 03 Issue: 12 | DEC -2016 www.irjet.net p-ISSN: 2395-0072

SMART IRRIGATION SYSTEM FOR AGRICULTURAL LAND

NANDHAKUMAR T, VIDHYA S, JENITA SHINY S.

Sri Krishna College of Engineering and Technology, Kuniamuthur, Coimbatore-641008.

Department of Electrical and Electronics Engineering.

Abstract - *The aim of this paper is to develop a smart irrigation system for agricultural land. Since Irrigation plays a vital role in agriculture. There are so many traditional methods are practiced in agriculture which causes so many environmental impacts such as change in quality and quantity of water and also change in quality of soil. This in turn reduces the production. Hence it is necessary to design a system which effectively manages the water required for irrigation and also eliminates the leaching of nutrients from the soil. The objective of this paper is to design an irrigation system which helps the farmer to irrigate the land at right time even residing at his home. This system uses sensors to monitor soil moisture and indicates the user for the need of irrigation using the mobile app and the farmers can irrigate the land using automatic irrigation system through remote control application. In this system, the user sends the message through GSM to the microcontroller which performs the user defined operation. Hence this system efficiently performs water and soil management using automation.*

1.INTRODUCTION *(Size 11 , cambria font)*

Efficient irrigation plays a vital role in production and profitability in agriculture. Hence it is necessary to practice proper irrigation techniques, improved water management systems. Irrigation system is broadly classified as SURFACE IRRIGATION, GROUND WATER IRRIGATION. As far as surface irrigation system is considered efficient water management is the first and foremost criteria to be considered. If the water is not properly managed, then it leads to water logging at the head part and scarcity at the tail ends. Hence the system is properly designed to make sure the usage of water is in proper way. When ground water irrigation system is considered equity is the main issue. If equity lags either ground water level goes down or salinity increases which damages the soil structure. In any of the above case, if the water level exceeds the soil moisture which may results in leaching soil nutrients. This scenario will ultimately reduce yields. The remedy for this problem is to monitor the soil moisture and introducing the automatic irrigation system which in turn reduces water usage and maximize the efficiency. This system is implemented by using soil moisture meter equipped with Bluetooth device to transmit information to the receiver. And the irrigation is done by the remote control application using smart phones for the induction motor pump. One of the common approach of remote monitoring is by using internet connectivity and wireless sensors. A system consists of microcontroller, radio-transceiver and set of sensors. This system uses cellular network which use dedicated GSM modem for AT command interface. This modem sends the working condition of the motor to the user as messages. This helps the user to control the motor using missed calls. Hence by using this system irrigation is done efficiently.

SOIL MOISTURE METER:

In this system, Field Scout TDR 300 Soil Moisture Meter is used. It has two volumetric water content modes, one is volumetric water content mode; and the other mode is irrigation mode. In volumetric water content mode, the meter converts the measured electrical signal into percent soil moisture content. In irrigation mode, the meter displays the relative water content corresponding user defined upper and lower soil moisture reference level. The meter displays the amount of water needed to bring the soil moisture content to the reference level. This reference is programmed to the meter by using the accompanied software. Instantaneous readings of root zone soil moisture are displayed.

BLUETOOTH ENABLED METER:

The soil moisture meter is connected to the Field Scout Bluetooth device. The readings are sent to the smartphone via Bluetooth connected to the meter.

MOBILE APP:

The Field Scout Mobile app is developed for this purpose to instantly collects and display data on the smart phone from the Bluetooth device. Hence the meter detects the soil moisture using its modes, and send the data via Bluetooth to the user and the readings are visualized in real time and it eliminates the need for a computer, cable, GPS receiver, etc. This app also emails the relevant information to the user. Using this Bluetooth enabled meter with mobile app the irrigation can be done to the land even if the farmers are away from the field.

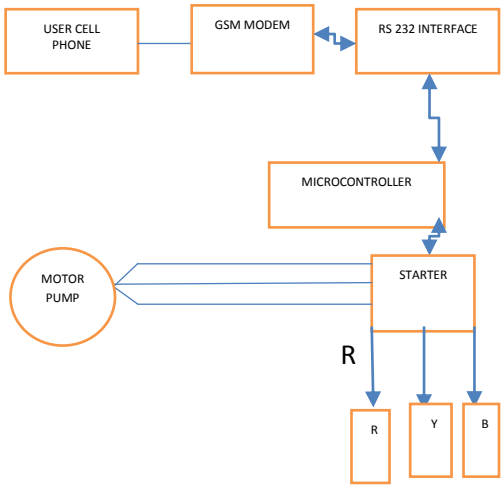
WORKING:

The sensor of the meter is inserted into the agricultural land and it detects the soil moisture level at every instant. The readings are displayed and is sent to the user via Bluetooth. The mobile app designed for this purpose reads the data sent by the meter via Bluetooth and indicates by an alarm if the moisture level goes below the reference level, then the farmer can irrigate the field until the app indicates reference level. If the reference level is reached, the app indicates the user hence the irrigation is stopped. Using this method leaching of soil nutrients can be avoided which in turn increase the yield. Also the water usage is done properly by allowing required water to the field.

AUTOMATIC IRRIGATION SYSTEM:

In order to make the irrigation system automatic, remote control application is used to control induction motor pump which is used for irrigating water to the land. It can be implemented by sending messages and missed calls from smart phones. A remote control application to control the motor using the mobile is to reduce the risk of farmers. The microcontroller controls the operation of the starter based on the information from the sensors. The GSM is connected to the microcontroller through the RS-232 interface. The user can control the starter using missed calls when needed or when abnormal conditions exist.

SYSTEM BLOCK DIAGRAM:



CELL PHONE APPROACH:

The missed calls are received from the user mobile to perform specific task. Based on the received signals and sensor conditions, the signals are sent to the microcontroller toswitch ON/OFF the motor through the starter using the relays. The relay is controlled by the ports. The GSM modem communicates with the user mobile phone to intimate the condition obtained for the micro[illegible] BLUETOOTH DEVICE [illegible]e serial port adapter works in data and A[illegible]d needs to be properly configured. During power ON condition, serial port adapter is initially in data mode and sending "///" characters within 3 seconds, the device is moved into AT mode for configuration. If match is found, it starts data communication between microcontroller and GSM. AT commands are sent by sending text strings 'A', 'T', along with specified command strings through serial port to cell phone and are executed on receipt of carriage

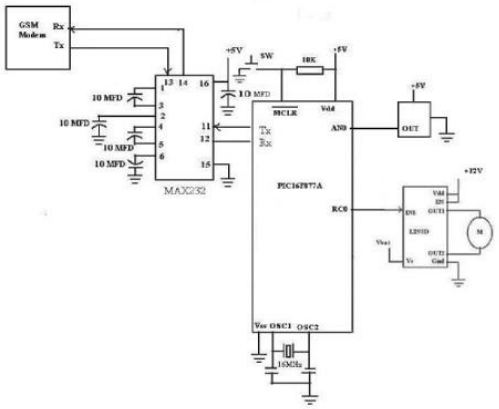
return. The result codes are sent by cell phone to system to indicate the status after execution of command.

WORKING:

The user sends message to the microcontroller to switch ON the motor and the GSM communicates between the user and the microcontroller. The motor is switched ON according to the user message and the land gets irrigated. By this system, user can irrigate the land at any time and also if the farmer is far from the field, he can irrigate using his phone through remote control operation. Hence the irrigation is done at the right time which increases the production.

MICROCONTROLLER SYSTEM:

Using microcontroller system various operations can be performed like detecting temperature, voltage, humidity to control the occurrence of fault in motors due to the above mentioned parameters. If there is any change in these parameters, the corresponding sensors connected to the microcontroller indicate the user through GSM and the user can switch OFF the motor. To perform the various operations of sensing the temperature, voltage and humidity, sensors are connected to the microcontroller. The analog signals from the sensors are converted into digital signals using the analog to digital converter. These sensors ensure the indication of catastrophic events like burning of motor due to any faults like over-current, bearing breakage, insulation failure etc., so that preventive measures are carried out at substantially lower cost. PIC16F877A microcontroller is used in this system. The diagram is shown below.



In the above diagram, port A is configured for analog inputs. AN0 is connected to the temperature sensor, pin RC0 is responsible for the connection of the motor. MAX232 converts 12V DC into 5V DC and vice versa is connected to port C. The transmitter and receiver is connected to 11th and 12th pin of MAX232.

SENSORS:

TEMPERATURE SENSOR:

The LM35 sensor is used to measure temperature connected to microcontroller. This temperature sensor which is used to measure temperature with electrical output proportional to the temperature. Two temperature sensors are used to ensure the reliabilityof the system. One temperature is mounted on the body of the motor and the other sensor is mounted at a suitable location to measure the ambient temperature. Whenever temperature difference between these two sensors exceeds the specified safety limit, signal is sent to the user to switch OFF the motor.

DC VOLTAGE SENSOR:

DC voltage sensors monitor input voltages ranging from 3 to 500 volts DC with a trip point accuracy of up to 1% in this application. Using electronic circuits to detect, monitor and sense DC voltage, dc voltage sensors, monitors and voltage sensing relays can open or close the circuit when a certain pre-set over or under voltage condition occurs or the DC voltage falls outside the specified voltage level. When the voltage level decreases beyond the level, the motor gets OFF

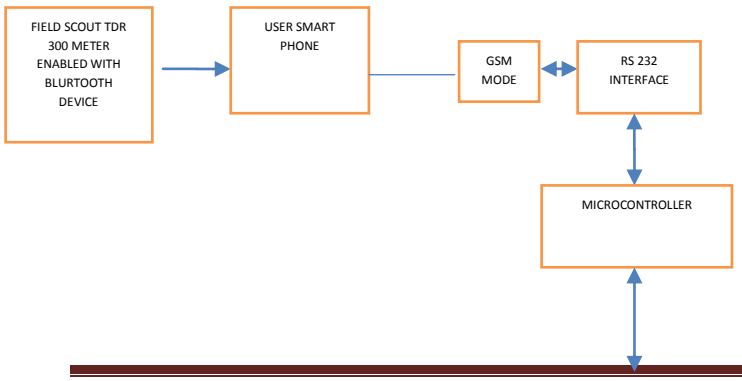
automatically and the signal is sent to the user about the problem.

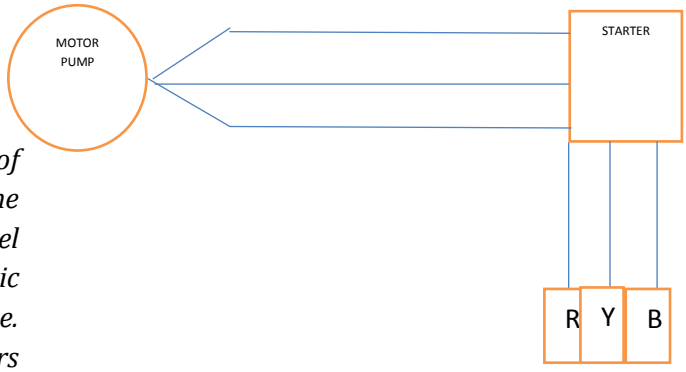
LIQUID LEVEL SENSOR:

Liquid level sensor is used to check the flow of liquid in the pipe. The water flow gets stopped, when the fault occurs in the motor. This sensor detects liquid level in a transparent or non-transparent pipe by electrostatic capacity and is not influenced by the color of the pipe. Hence this system ensures the protection of motors against overloads, overheating and phase imbalances.

SOIL MOISTURE METER AND AUTOMATIC IRRIGATION PUMP:

By the combination of these two systems, irrigation can be done efficiently. Soil moisture meter detects the soil moisture and indicates the farmer about the moisture level of the soil. If the moisture level goes below the reference, a signal is sent to the farmer indicating the need of irrigation. Then the farmer can switch ON the motor by sending messages to the microcontroller through GSM and the land gets irrigated. If the soil moisture reaches the reference level, then the soil moisture meter indicates via Bluetooth device to stop the irrigation. Then the user sends a message to switch OFF the motor. Also, if there is an occurrence of faults during the irrigation, the microcontroller signals the user about the fault and the user can switch OFF the motor and the fault is corrected. Hence the farmer can irrigate the land using remote control application. This system provides remedy to the over irrigation, leaching of nutrients from the soil. It also ensures the proper management of water for irrigation.





CONCLUSION:

Reduction in labor cost, prevention of unwanted water spillage, prevention of leaching nutrients from the soil, minimization of occurrences of motor faults and intimation to the user about the faults and completion of task are the advantages of this system. The system proves to be a great boon to the farmers whose pump sets are located far from the field and also for those who are away from the fields engaged in some other work like purchasing fertilizers, this system helps them to irrigate at right time. Due to the capability of remote control using mobile phones and intimation about any abnormal conditions, this system seems to be efficient.

REFERENCES:

[1] O. M. Grant, M. J. Davies, H. Longbottom, and C. J. Atkinson, "Irrigation scheduling and irrigation systems: Optimising irrigation efficiency for container ornamental shrubs," Irrigation Sci., vol. 27, no. 2, pp. 139–153, Jan. 2009.

[2] Md. Wasi-ur-Rahman, Mohammad Tanvir Rahman, TareqHasan Khan and S.M. LutfulKabir,(2009)"Design of an Intelligent SMS based Remote Metering System",Proceedings of the IEEE International Conference on Information and Automation pp. 1040-1043.

[3] ChandankumarSahu, PramiteeBehera, "A Low Cost Smart Irrigation Control System", IEEE Sponsored 2nd International Conference on Electronics and Communication System (ICECS 2015)

[4] R.Hussain, J.Sehgal, A.Gangwar, M.Riyag"Control of irrigation automatically by using wireless sensor network" International journal of soft computing and engineering, vol.3, issue 1, march 2013, pp.48t 324-328.

[5] N. P. Jawarkar, Vasif Ahmed, S. A. Ladhake and R. D. Thakare, "Micro-controller Based Remote Monitoring using Mobile through spoken commands," Journal of Networks, vol 3, No.2, pp 58-63, Feb 2008.