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Arduino Based Smart Drip Irrigation System Using Internet of Things

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Abstract:
Nowadays water scarcity is a big concern for farming. This project helps the farmers to irrigate the farmland in an efficient manner with automated irrigation system based on soil humidity. Humidity sensor is used to find the soil humidity and based on this microcontroller drives the solenoid valve. Irrigation status is updated to the server or localhost using Personal Computer. Java platform is used here for getting information via serial communication from microcontroller and to update in the server. In addition for better cropping system, fertilizers required for the crops, best crops to cultivate for the particular climatic and soil conditions are updated to server at regular basis by monitoring soil PH level, Temperature level of the field area etc., By using PC host, crop is continuously monitored. Also LCD is used to display the PH, temperature and moisture level. This will improve the cultivation method and leads to better productivity.

Keywords: Smart irrigation system, PH Sensor, Humidity Sensor, IoT, Android

I. INTRODUCTION

Generally most of the irrigation systems are manually operated one. These traditional techniques are being is replaced with semi-automated and automated techniques suggested an automated concept of irrigation to use the water efficiently and effectively Automated Drip Irrigation system is implemented either based on the soil humidity or based on the user input via SMS commanding systems. Former method is an isolated irrigation system where the farmer doesn't updated with the irrigation status and later lags in smart utilization of water due to user command without considering the condition of soil. From that ever growing requirement of the population, modern techniques are introduced to control the system.

To give proper attention to the land located far away from the human settlement, supervisory automatic control systems like multi-terminal control systems are used since in many processes, factors like soil, salinity, irrigation, temperature, light intensity, etc. needs repeated tasks and have to work in abnormal environmental conditions of the soil and to overcome the flaws in the existing system here we are irrigating the land based on the soil humidity and at the same time the status of the irrigation is updated wirelessly to Server via serial Communication. With this farmers are intimated about fertilizers required for the crops for better yield at various conditions by measuring soil nature and the better crop cultivation based on the climatic conditions. That leads to flexibility in monitoring the irrigation system at anywhere provided with internet. The server side data can be retrieve via the internet to access it for easy to handle the devices and now a day's internet is also necessity for all human beings then only it will become a booming to continuous monitoring and controlling of irrigation system

II. SYSTEM DEVELOPMENT

The system is developed for smart irrigation is on two ways A) System Hardware B) System Software

A. System Hardware

Fig 1.shows the block diagram of smart irrigation system with IoT. Farmers start to utilize various monitoring and controlled system in order to increase the yield with help of automation of anagricultural parameters like temperature, humidity, soil moisture, carbon dioxide, light detection, soil pH, *etc*. are monitored andcontrolled of systems which can help the farmers to improve the yield

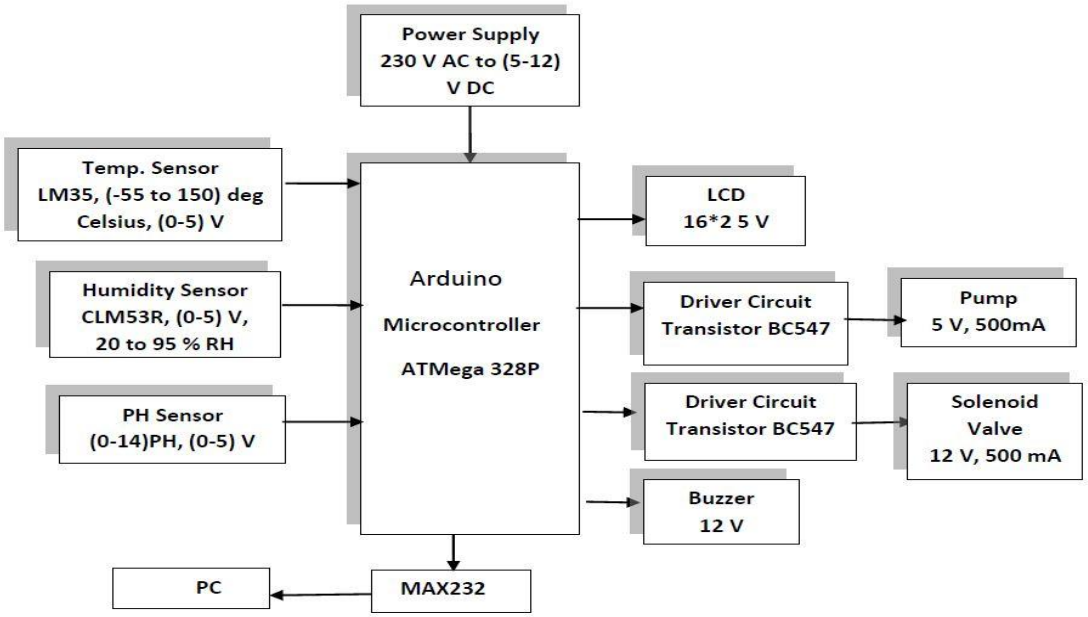

Fig. 1 Block Diagram of Smart Drip Irrigation System

A.1 Sensors

There are different sensors are used to controlling the process of irrigation system. Different sensors used are Temperature, PH, Humidity are all measured and checked with the previous data stored in a system. According to the comparator of the system automation process of pump and solenoid valve is opened for needed.

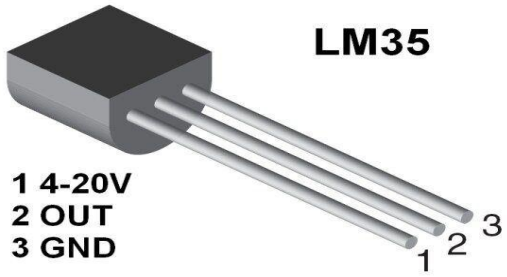

Fig.2 Temperature sensor unit (LM35)

Temperature range is exceeded the certain range motor started and thatrange is upto 30°C.LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius(temperature). It has an advantage over linear temperature sensors calibrated in degree Kelvin, its output to obtain convenient Centigrade scaling. It is rated to operate over a -55° to +150°C temperature range.

Humidity is a measure in percentage, of the vapor in the air compared to the total amount of vapor that could be held in the air at a given temperature of the system. SY-HS-220 is used to measure humidity in Figure 3. It operates on DC 5 V of supply which can be easily. Its operating temperature range is 0 - 60°C. The device tracts the humidity range from 30 - 90% which is more regularly find out inside the cropping land.Humidity sensor are used for measuring moisture content in the atmosphere. It rely on measurements of temperature, pressure, mass etc. There are different sensors avail are capacitive, resistive, thermal, gravimetric.

PH Sensors are used to measure the nutrient content in the soil required for irrigation. The other thing is that correct amount of nutrient is supplied to the soil.

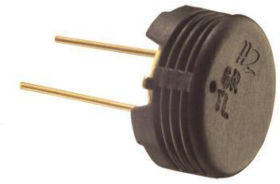

Fig.3 Humidity Sensor

A.2 Driver Circuit

A Driver circuit is an circuit of electrical or electronic component used to control another circuit or component, such as a HPT(High-power transistor), liquid crystal display (LCD), and so on to regulate the current flow through the circuit or other factors.The driver circuit which comes under the hardware component level diagram.

A.3 Arduino Controller

Arduino is an open-source computer hardware and software company, project and user community. It also designs and manufactures**µc** based kits for building digital

devices and interactive objects that can sense and control objects with many devices.

The main reason for choosing this device arduino uno is that controller board based on the ATmega328 consistsof 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button and Flash Memory 32 KB of which 0.5 KB used by boot loader SRAM 2 KB EEPROM 1 KB Clock Speed 16 MHz.

From usb to serial communication data can be updated by using an webserver of common database.Internet of Things (IoT), describes a world in which objects that form part of our everyday lives can communicate through various networks, including the Internet and server.

The Server is an common database centre have all datas in it.From that we can update it from whatever devices you need to access it like android and etc.

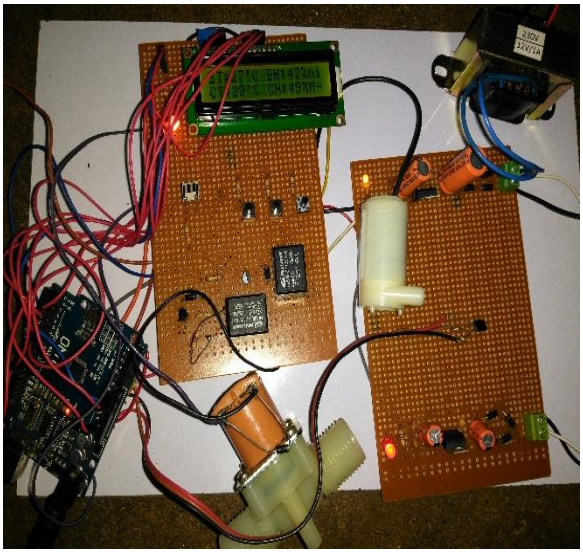

Fig.4 Irrigation output

The Internet of Things (IoT) is the network of physical objects that can be embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data.

Itallows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration between the physical world and computer-based systems, and resulting in improved efficiency, accuracy and economic benefit with continuous storage an retrieve.

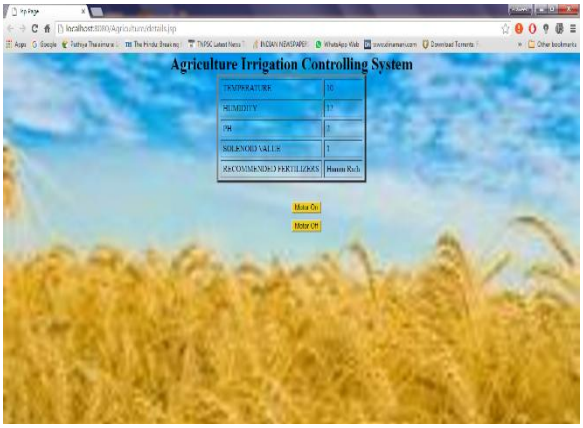

Fig.5 Data display in web

B.System Software

System software for data reading and controlling the various devices is written in Assembly language of the code and to store the data in server of mysql and directly send it to the IoT channel by writing code using java language.

Then for further easy access data is also displayed in the Android apps also because it is an booming process now.

Execution of the software program the channel is sequentially scannedchannel 1 data of corresponding channel is read, if it is high, it sends the high signal to the relay whichswitches the motor to 230 V power. Then motor becomes ON, at the same time arduino sends data signal to the motor 1 which opens the valve of sector number 1 and water starts flowing through the valve to the plants of sector through the root.

The process remains in the same state till the data of the same channel does not change, if the data is not high, then system scans the next channel and the process repeats as last continuouslly.

III. EXPERIMENTAL ANALYSIS

When the system is off process shutdown otherwise it will goes beyond the certain limit buzzer will on according to the humidity, temperature and other sensing elements.Likewise it will displayed it on the LCD display to check and controll the process.

This analysis done without manpower by automatically buzzer will on and it will improve the efficient use of energy saving.

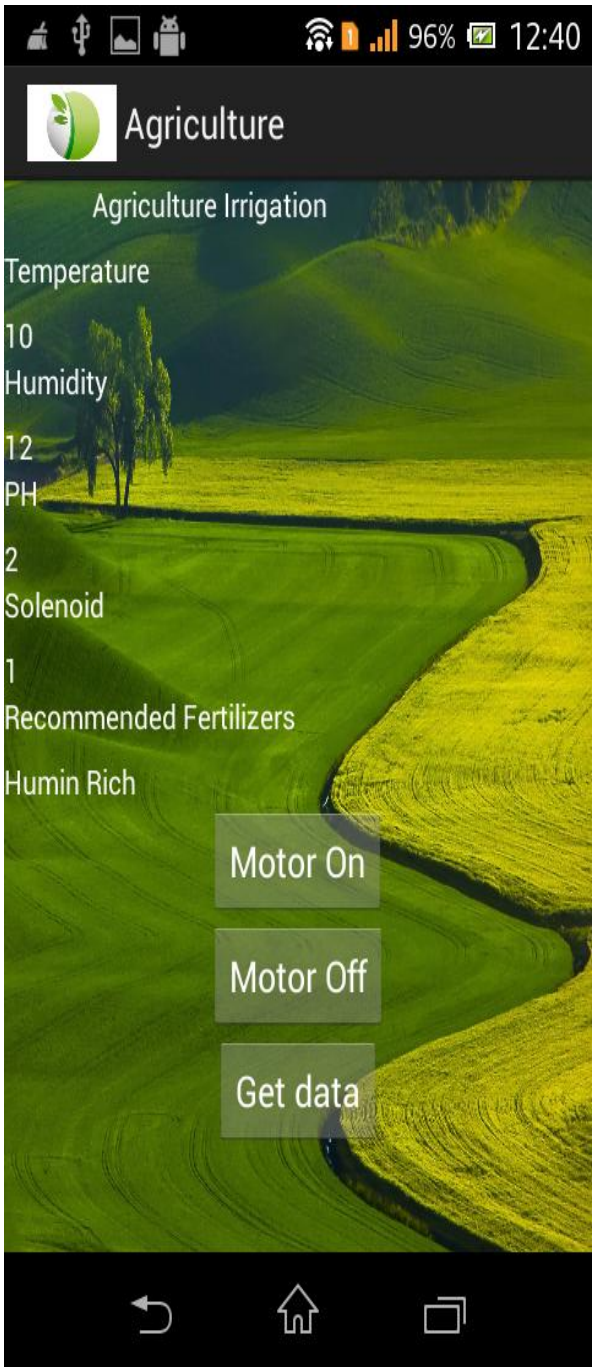

Fig.8 Data displayed in app

IV. CONCLUSION

From the data we conclude that irrigation process is done better than before to yield the proper production done before and usage of water level is limited howmuch that system neededonly.Due to the regular updates to the server we can get proper knowledge to the system can work perfectly for indefinite time period, even in certain abnormal circumstances and increase the production rate also.It will also reduce the human factor,energy,and power.Due to server updates farmers can know about crop field nature and everything at anywhere.Here we can use android device asa scope to access data instaed of computer(PC) and very clearly.

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