Automatic Irrigation System- Cloud Computing

Ashik Teja[1], Gopi Krishna[2], Sumanth[3], Kowshik Reddy[4]
[1, 2, 3, 4]Dept of CSE
[1, 2, 3, 4] SRMIST

Abstract- *The project is designed to develop an Automatic irrigation system which controls pump motor by the data stored in the cloud. On sensing the moisture content of the soil. In the agriculture field, the maintanence of irrigation is important. The advantage of this method is to reduce the human intervention and still ensure proper irrigation. The project uses an 8051 series micro controller which is programmed to receive the input signal of varying moisture condition of the soil through the sensing arrangement. This is achieved by using an op-amp as comparator which acts as interface between the sensing arrangement and the micro controller. Once the controller receives the signals, it generates an output that drives a relay for operating the water pump an LCD display this also interfaced to the microcontroller to display status of soil and water pump. Embedded system interfaced with GSM module. The interface and communication are via SMS on GSM network. The proposed system is about the usage the cloud computing technique irrigation. By this the values can be store and reuse the data. The data stored in cloud is helped to detect the crops which are perfect to the particular field. The cloud is connected to the system and it takes the values automatically. These values are used for further cultivation process.*

Keywords- Arduino micro controller, motor pump, servo, cloud database, LCD display

I. INTRODUCTION

The title of the project is AUTOMATIC IRRIGATION SYSTEM. In present system, in the field of agriculture farmers are facing mssssssajor problems in watering their crops. They have no proper idea about moisture level. Due to irrigation there might be some possible wastages.it may be water wastages, wastages of crops etc. In order to solve this issue we introduce an automatic irrigation system with cloud data based. By using this system it will possible to reduce such wastages.so that better utilization of resources can be made possible. It shows the basic switching mechanism of motor using sensors by sensing moisture present in soil.

The AUTOMATIC IRRIGATION SYSTEM works according to moisture level. For sensing the moisture level the system needs a sensor called Moisture level sensor. In field the condition of soil is different but it pumps water according to the soil conditions. The system stops pumping motor automatically when the moisture level is equalizes to system level. The technique used in system is GSM and SMS technology and Cloud Computing. The system can store the all data terms such as moisture level and percentage of water in cloud by the help of cloud computing. All these items can be further used in same field to improve the working system. India is more agricultural based. The GSM and SMS technologies are used to inform the level of moisture to user through SMS services. There is no statistics formations in existing system. By the help of cloud we see the statistics of how field responding to the system and which crop is best for the particular field. The microcontroller used in the system is Arduino microcontroller. It works based on Arduino software which is predefined and installed in the system. The pump and motor are used to pump the water into the field when the level of moisture is less than the required level. Then automatic irrigation system starts working. The another important tool for this system is moisture sensor. The sensor is injected in the field.

II. RELATED WORK

Soil Moisture Sensor: The moisture sensor [2-5] is buried in the ground at required depth. The working of the moisture sensor is basic and uncomplicated. The moisture sensor generally conveys the moisture level. The moisture level change is proportional to the amount of current flowing through the soil.

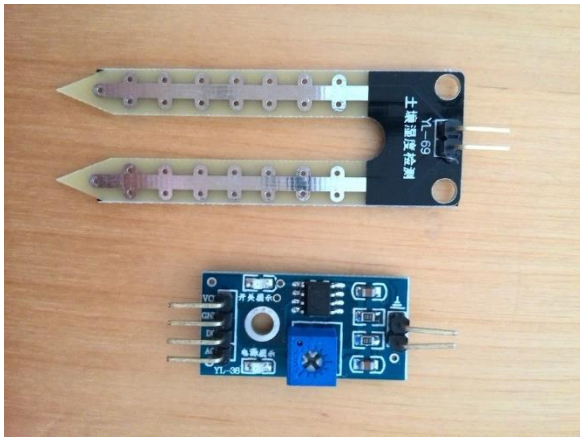

Fig 1: Soil Moisture Sensor

If the moisture level is less than what field required then automatically water pumped through motor pump.

Arduino Micro Controller

The proposed hardware contains of Arduino Uno microcontroller. The Uno is based on microcontroller board based on the ATmega328P. It includes 14 digital input/output

Fig 2: Arduino Micro controller

pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal and a USB connector .Sensors for the soil moisture, temperature(LM32), and water level are used. A Step-down transformer can be used to reduce the voltage to 12 volt. Capacitors are for the stabilization voltage and power flow. ULN 2804 is an array of seven NPN Darlington transistors used for the relay circuits. Relay circuit is also used to control the drip motor and the other AC devices. A Server is for receiving the values using Wifi and controlling the overall application. On the user's side an android phone can be used for monitoring purpose as well as for controlling the application.

Water pump

The water pump is used to supply water for a particular task artificially. It is electronically controlled by interfacing it to a microcontroller. It can also be triggered ON/OFF by sending signals as required. The process of supplying water artificially is known as pumping. There are many types of water pumps used. This project involves the use of a small water pump which is connected to a H-Bridge.

The pumping of water is the basic practical technique and it is far more practical than scooping it up with one's hands or lifting it in a hand-held bucket. This is for the water is drawn from a fresh source, moved to a needed location, purified, or used for irrigation, sewage treatment and for evacuating water from an undesirable location. Not based on the result instead, the energy required to pump water is an extremely demanding component of water consumption. All other techniques or processes depend or benefit either from water descending from a higher elevation.

Servo Motor

The motor is used to pump the water to the motor pump. If the cloud connection is active then it works according to the previous values which are stored in the database. All these values are reused and motor will be switched off/on according to the stored values

A servo is a rotary actuator that allows the precise control of angular position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback A servomotor is just a regular motor which is installed with sensor typically to measure angular position during operation. A servomotor is a one of the specific type of motor and rotary encoder combination that forms a servomechanism. This assembly may in turn form part of another servo mechanism Stepper motors are not considered as servomotors, although they too are used to construct larger servomechanisms.

Fig 3: servo motor

Stepper motors have the inherent angular positioning and owing to their construction, and this is generally used in an open-loop manner, without an encoder. Servomotors are used for the both high-end and low-end applications, and the mid-range is generally handled by the stepper motors. Most servomotors which are under this name, are precision industrial components. However the very cheap radio control servo, because it combines a free-running motor and the simple position sensor with an embedded controller, also qualifies as a servomotor.

The connection all these elements as allocated as particular order as shown in figure. The connection of whole system without connection of cloud computing is:

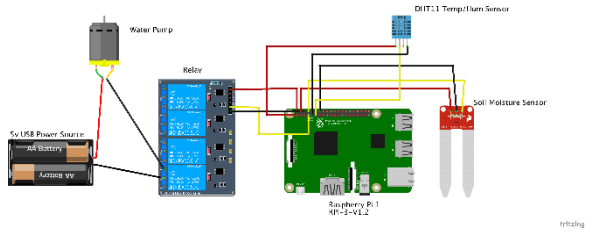

Fig: 4 Connection of all elements of automatic irrigation system

III. IMPLEMENTATION

The proposed system is that connection of cloud to the automatic irrigation system. All the data terms such as moisture level, amount of water required, amount of power required etc all these terms will be stored in the cloud database and these values are used as input to the automatic irrigation system while the same is going for cultivation again. For this we need a cloud database .In cloud there will be two databases are availed one is for present storage of data terms all these are again stored in backup database. If any problem occurs to the present database then backup will be available for the cultivation process. All the data values statistics will be displayed in LCD by that the strangers/unknown persons who don't know about the proper cultivation for the particular field it will be useful.

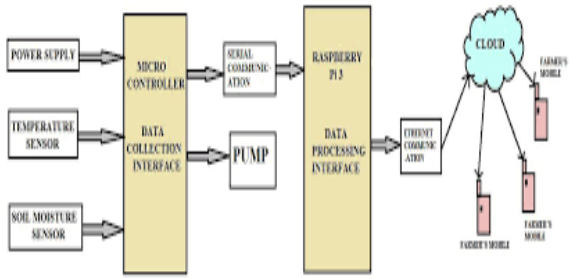

Fig 4: Automatic irrigation system connection with cloud

There is both manual and automatic if no need of cloud storage then we can go through manual mode.

GSM Module:

Arduino board is connected to GSM modem in which transmitter of Arduino is connected to the receiver of GSM modem and receiver of Arduino is connected to the transmitter of GSM modem. GSM modem is working simply like a mobile phone when we can send SMS the number of GSM modem can be operated according to the coding which we have done in the microcontroller. Since it is 28 pin IC and Arduino has 13-digital pins and 6 analog pins, so these pins are also used for further operation. With its digital pin driver circuit is connected, driver circuit is made of different components and it can used to drive the motor/water pump which can be on/off with these circuit and by sending SMS we can know the humidity by the humidity sensor and status of field motor.

GSM/GPRS Modem-RS232 is built with Dual Band GSM/GPRS engine- SIM900A, works on frequencies 900/ 1800 MHz. The Modem is coming with the RS232 interface, which allows you connect to PC as well as microcontroller with RS232 Chip (MAX232). The rate of baud is configurable from 9600-115200 through AT command. The GSM/GPRS Modem is having internal TCP/IP stack to enable you to connect with the internet via GPRS. It is suitable for SMS, Voice and DATA transfer application in M2M interface. The onboard regulated Power supply allows us to connect with wide range unregulated power supply. Using this modem, the system can send SMS, Read SMS, attend the incoming calls and internet etc through simple AT commands.

IV. DESIGNING TECHNIQUES

HARDWARE:-

Arduino micro-controller [ATMEGA 328], Servo motor, Soil Moisture sensor, Water pump.

SOFTWARE:-

SQL,DM,CLOUD COMPUTING, Arduino software

V. FUTURE SCOPE

GSM modules are added for sending the SMS to the concerned person in case of any problem. The other parameters such as ambient temperature, light intensity &and humidity can also be measured. Pesticides and fertilizers can

also be added into water automatically. The proposed system consist of less hardware as compared to the previous model hence it is compact as compared to the previous system. It is more cost efficient, this claim is made on the fact that the proposed system does not need the heavy and expensive hardware for implementation. This type of automated irrigation system consumes 40-50% less water as compared to the traditional system Ideal growth condition is been provided when small amount of water is been applied over large amount of time. This type of automatic irrigation system extends watering time for plants, and provides ideal growth condition. It saves time and timer delay as per the environmental condition can also be added to automatic watering system. This automatic irrigation system can be adjusted and modified according to the changing conditions of environment. It is simple to operate and it starts by designing the map of your garden and marking the location of planting or cultivating.

VI. CONCLUSION

The primary application of this project is for farmers and gardeners who do not have enough time to water their Crops/plants. It also covers those farmers who are wasting water during irrigation of crops. The project can be extended to greenhouses where manual supervision is far and the few in between. The principle is extended to create fully automated gardens and farmlands. By Combining with the principle of rain water harvesting, it could lead to the huge water savings if it is applied in the right manner. The agricultural lands which are having severe shortage of rainfall, this model can be helpful and successful. It achieved great results when applied with different types of soil. It is developed with integrated features of all the hardware components used. Presence of each and every module has been reasoned out and placed carefully, thus contributing to the best working of the unit.

REFERENCE

[1] A.Klute (ed.), 1986: Methods of Soil Analysis, Part 1: Physical and Mineralogical Methods. American Society of Agronomy, Madison, Wisconsin, United States of America, 1188 pp.

[2] J.H.Knight, 1992: Sensitivity of time domain reflectometry measurements to lateral variations in soil water content. The Water Resources Research, 28, pp. 2345–2352.

[3] Magagi, R.D., Y.H.Kerr, 1997. Retrieval of soil vegatation and moisture characteristics by use of ERS-1 wind scatterometer over arid and semi-arid areas. Journal of Hydrology 361-384, 188-189.

[4] H.P.Marthaler, W.Vogelsanger, F. Richard and J.P. Wierenga, 1983: A pressure transducer for field tensiometers and Soil Science Society of America Journal, 47, pp. 624–627.

[5] Attema, Evert, Pierre Bargellini, Peter Edwards, Guido Levrini, SveinLokas, Ludwig Moeller, Betlem Rosich-Tell, et al 2007.The radar mission for GMES operational land and sea services,Sentinal-1. ESA Bulletin 10-17[131].

[6] Bircher, S., Skou, N., Jensen, K.H., Walker, J.P., & L.Rasmussen (2011). A soil moisture and temperature network for SMOS validation in Denmark. Earth Syst. Sci. Discuss., 8, 9961-10006

[7] Design and construction of automatic power changeover system, by Jonathan Gana Kolo.

[8] The 8051 Micro controller and Embedded Systems, by Muhammad Ali Mazidi.

[9] Microprocessor Architecture, Programming & Applications, by Ramesh S. Gaonkar

[10] Fundamentals Of Microprocessors and Microcomputers, by B.Ram.