IOT CENTERED IRRIGATION CONTROL SYSTEM

Vishal B. Pattanashetty[1],Rajat Patil[2] ,Bhaskar Pujar[3], Pavan joshi[4],Babasaheb kale[5]
[12345]Depratment of Instrumentation Technology,
B.V.Bhoomaraddi College of Engineering & Technology, Vidyanagar, Hubli,Karnataka,
Email: vishalbps@bvb.edu[1],rajatpatil888@gmail.com[2], bp3921@gmail.com[3],
joshi.pavan14@gmail.com[4],babasaheb.kale.93@gmail.com[5]

ABSTRACT

Human beings rest on on extensive range of agriculture yields in nearly all parts of life. Maximum nations in the world require limited water capitals. Improper utilization of the water capitals is facing the danger of overheating. In order to meritoriously reduce the impact of poor water resources on nation's economy, since modern agricultural crop growing methodologies, existing engineering technologies and effective use of controlling skills appropriate consumption of water resources can be accomplished. Current research and implementation efforts are mostly oriented toward a traditional scenario with stationary sensors and single static sink that collect information from sensors where the sink is directly connected to the user or manager. The goal of this project is to present a fault tolerant, reliable, low latency and energy aware IOT based irrigation control system. Rendering to the elementary principles of Internet, with sensor technology, this project proposes precision agriculture irrigation systems based on the internet of things (IOT) technology, and focuses on reliable network architecture and software process control of the precision irrigation system. Primary tests revealed this structure is rational and realistic. This is also an approach for the advancement of irrigation process. With the advent of technology, the world around us is getting automated. Automatic systems are being chosen over manual structures, as they are energy efficient and minimize the need for tedious manual labor.

Keywords: IOT; IOT Irrigation control; MyMQTT;

I. INTRODUCTION:

With agriculture being the primary economic sector of India and other developing countries, it is essential to automate it in order to increase efficiency. A typical farm requires a lot of labor. Automation can proficiently moderate the amount of manual labor, and make farming easier and faster, leading to more agricultural growth. Automation is the use of machines, control systems and information technologies to optimize productivity in the production of goods and delivery of services. Automation is the answer to

India‘s pursuit for being a world-class industrial competitor. The Indian farms are slowly beginning to feel the stimulus for the instrumentation, control and automation industry. Indian automation is advancing at a fast pace, yet it is one area that can never be achieved and admired – it is something that needs constant innovation and identification of trends in technology, and the innovations that thrust the implementation of automation in other countries. India, as one of the world‘s fastest growing economies based on agriculture and farming, has not taken to technology at a rather quick pace.

Internet of things and agricultural irrigation: India is known for the small farms. In India most of the crops depends upon rain. Near about 45% of the land irrigated. And almost half i.e. 55% of total population of India depends on agriculture .Comparing this with US; it is about 2% due of heavy mechanization of agriculture. The fact about Indian agriculture is that, though it is one of the biggest producers of agricultural products, other side it has very low farm productivity. Hence to increase the productivity is today‘s need and Precision agriculture may provide a way to do it. Precision agriculture (PA), as the name implies, refers to the application of precise and corrects amounts of inputs like water, fertilizers, pesticides etc. at the correct time to the crop for increasing its productivity and maximizing its yields. PA originated in the US and European countries.

Gartner, the world‘s leading information technology research and advisory company, said, in December 2013, that IoT will grow to 26 billion units in 2020, resulting in 1.9$ trillion in global economic value-add through sales into diverse end markets. Hence the statement we can conclude that the IoT is evolving and that it will generate billions of dollars in the upcoming years. Similarly, Cisco also said that it will create, from 2013 to 2022, a 14.4$ Trillion of value at stake for companies and industry.Since we are talking about connecting everything to the Internet, there is an unimaginable amount of business opportunities involved. Industry, logistics and health are some of the sectors in which IoT is involved Because of this we can connect small objects or devices to the Internet, a whole new paradigm will emerge creating a big impact in people‘s lives.

Intelligently connected appliances to the Internet, health-related devices collecting important data and wearable are just an example, and they are all trending. They will, definitely, deliver and improve our quality of life, making everything easier, practical, smarter and reliable. However, there is much work to be done in order for IoT to succeed and truly emerge: standards are needed to provide interoperability, security and confidentiality to protect individuals‘ data must be implemented and scalability must also be possible.

Without these parameters, IoT won‘t succeed and all we will ever have small ―islands‖ of IoT, not communicating with each other and that truly is not Internet of Things.

II. OBJECTIVE

1. This project will use the Mega development board with an Internet connection to remotely operate a home irrigation system.
2. This project will be split into two phases. The first phase will be a simple implementation where a homeowner can remotely start watering using any one of the irrigation zones. An irrigation zone typically consists of two or more pop-up sprinkler heads.
3. The second phase will report back soil moisture content using an Mega web page so the homeowner can determine if immediate irrigation is needed.

III. MOTIVATION

According to statistics, agriculture uses 85% of available freshwater resources worldwide, and this percentage will continue to be dominant in water consumption because of population growth and increased food demand. There is an urgent need to create strategies based on science and technology for sustainable use of water, including technical, agronomic, managerial, and institutional improvements. Agricultural irrigation based on Internet technology is based on crop water requirement rules. By using Internet technology and sensor network technology to control water saving irrigation of farmland and to maximize the scientific use of water, not only can greatly improve the utilization of water, and can increase water productivity.

IV. GOAL OF THE PROJECT

1. Monitoring Irrigation for multiple zone of a farmland.
2. To display the soil moisture content on the web page using moisture sensors.
3. To display the multiple zone on the web page.
4. To remotely control the water supply, through web page using internet.
5. To provide a provision for owner to water a specific zone of the farm.

V. DESIGN METHODOLOGY

Our project uses home‘s installed irrigation system as the initial platform. It has several zones that are controlled by a controller installed in the basement. System block diagram, which shows the basic system components.

This system is relatively uncomplicated wherein the controller operates water solenoids connected to individual zones. Only one zone in this system can be activated as home water supply volume will not support operating more than one zone.

The figure 1. shows the IoT system.

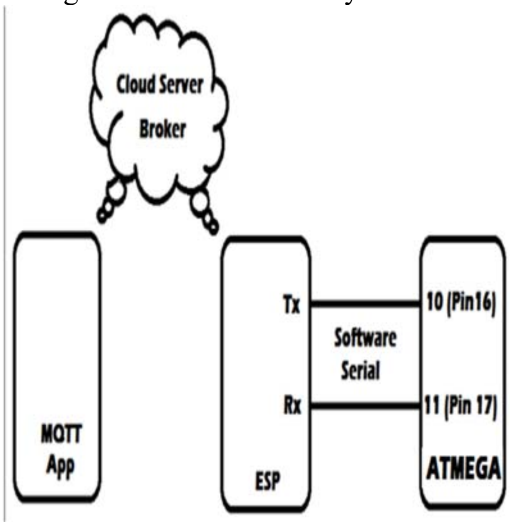

Fig 1: IoT system

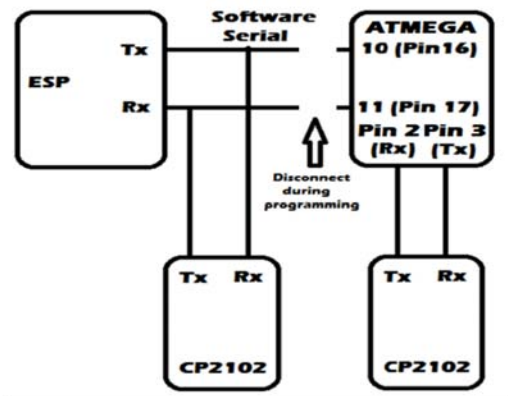

Fig 2: IoT system with CP 2102

Setting up WiFi Software Client

1. Open the App ―MyMQTT‖
a. Go to Settings:
i. In the Broker URL type ―starling.exploreembedded.com‖ (Other open source MQTT broker URLs: test.mosquitto.org, broker.hivemq.com.)
1. If u are using alternate broker URLs. please ensure that the ESP sketch also reflects these changes, since it is a hardware client and needs to connect to the same broker and topic as the software client) ii. No need to reset Port (Default:1883)
iii. No need to set Username and password (optional.. if you want to improve security) iv. Tap on Save (If everything is correct then broker URL and Port should be displayed on top... Tap on Connect if needed)

b. Go to Subscribe, and choose a unique topic for syncing your hardware and software clients: Eg: ece20 (ECE Team 20) c. Go to Publish:
i. Type the topic you just subscribed to... eg: it 20
ii. Type the Message.. eg: status,relay11 or relay00 iii. If everything is correct the Message is published, which can be seen by your App as well as all the Clients who have subscribed to this Topic.
d. Go to Dashboard: Your message will be displayed here. (Check in Apps of other Clients, and exchange messages.)
e. Once your entire IoT system is set up, the hardware client will receive these messages and act accordingly (eg. Turn on/off light, publish the status of sensor etc..)

Setting up wifi hardware client

1. Program the bvb_IOT_demo.ino sketch into ESP8266 (Follow different steps for different types of ESP8266 modules as shown later below)
2. After the programming is done, connect ESP to ATmega using Tx Rx as shown below
3. Open the Serial Monitor by clicking on the icon in the Arduino IDE, **4.** When your ESP starts up, it sets it up in Station mode and tries to connect to a previously saved Access Point
5. If this is unsuccessful (or no previous network saved) it moves the ESP into Access Point mode and spins up a DNS and WebServer (default IP: **192.168.4.1**)
6. Using any wifi enabled device with a browser (computer, phone, tablet) connect to the newly created Access Point (Any other mobile Hot Spot, since Cyberroam will not work if u choose ―BVB Wireless‖). This step essentially connects your Hardware Client to the internet through Hot Spot.
7. Choose one of the access points scanned, enter password, click save
8. ESP will try to connect. If successful, it relinquishes control back to your app. If not, reconnect to AP and reconfigure.
9. The Seial Monitor will display the following messages on success:

a. "NW_connecting_to_Starling_Server"
b. "NW_Conected"
c. "NW_subscribe_successful" Relay:
The inputs are all FET driven, which lessens the current drive requirements from the

Uno‘s GPIO pins. There are also LED indicators on each of the digital inputs, which makes it very easy to determine the status of every channel relay. Just be aware that the LEDs light on the GPIO LOW level, not HIGH level and will be on for all inactivated channels. Finally, connections to individual relay contacts are done using the screw terminal strips located at the bottom edge of the relay module. Each contact type is also silkscreened onto the board, which helps with making the connections to the irrigation solenoid terminal strip.

You must determine the Uno‘s IP address and change the IP address in the program code to match the actual address. You will not be able to connect with the web server if you fail to make this change. The user interface is quite simple, consisting of a series of ―radio‖ buttons that select any one or none of the irrigation zones.

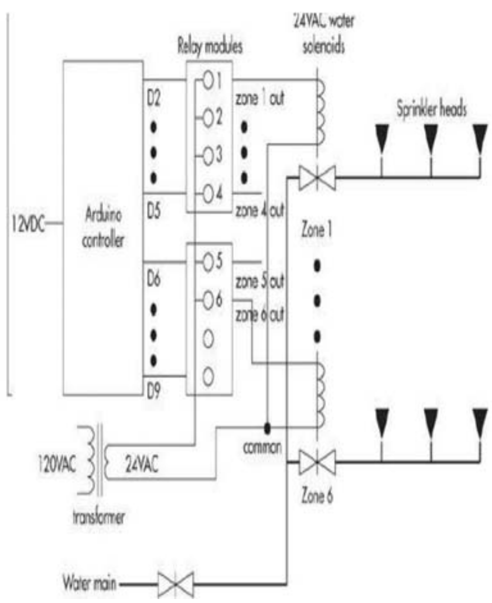

Fig 3: Implementation circuit diagram

Work flow:

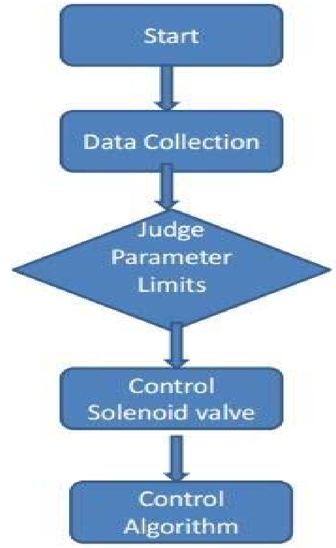

Fig 4: Irrigation Control flow chart

VI. CONCLUSION

From the point of view of working at remote place the developed IOT based irrigation system can work constantly for indefinite time period, even in certain abnormal circumstances. If the plants get water at the proper time then it helps to increase the production from 25 to 30 %. This system can be used to irrigate very large areas as it only needs to divide the whole land into number of sectors and single microcontroller can control the whole process. It saves human energy, time, cost, etc.

REFERENCE:

[1] K. Ashton, That __Internet of Things‘‘ thing, RFiD Journal (2009).
[2] H. Sundmaeker, P. Guillemin, P. Friess, S. Woelfflé, Vision and challenges for realising the Internet of Things, Cluster of European Research Projects on the Internet of Things— CERP IoT, 2010.
[3] J. Buckley (Ed.), The Internet of Things: From RFID to the Next-Generation Pervasive Networked Systems, Auerbach Publications, New York, 2006.
[4] Pattanashetty, Vishal B., and Nalini Iyer. SMART DRIVING ASSISTANCE USING ZIGBEE. No. 2015-28-0105. SAE Technical Paper, 2015.