A Review of Automatic Irrigation System Based on Internet of Things

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Abstract— With advancement of automation technology, life is getting simpler in all aspects. Rapid growth in the number of users of internet over the past decade has made internet a part of life and IoT is the latest internet technology. Internet of Things (loT) is extension of current internet to provide communication, connection, and internetworking between various devices or physical objects also known as "Things". A general concept for the ability of network devices to sense and collect data from the world around us, and then share that data across the Internet where it can be processed and utilized for various interesting purposes is termed as IoT. It comprises of smart machines interacting and communicating with other objects, environments, machines and infrastructures. Proper irrigation management is crucial for prime yields and to avoid stress from excess or inadequacy of water. In every current post, we have a tendency to cite some of our favorite commercial IoT applications. And today, we wish to focus on some of the most compelling IoT applications in every other enterprise--Agriculture.

Key words: Internet of Things, Automation Technology

I. INTRODUCTION

The Internet of Things (IoT) is transforming the agriculture industry and enabling farmers to contend with the enormous challenges they face. The industry must overcome increasing water shortages, limited availability of lands, difficult to manage costs, while meeting the increasing consumption needs all around the world that is expected to grow up to 70% by 2050.

Agriculture IoT is turning into one of the fastest growing fields (pun meant) in most of the IoT applications. Today, quite ever, farmers want to effectively make use of and preserve their sources. That's where the requirement for statistics comes in, and M2M communiqué has created the perseverance with collection of that statistics easy. Look at any 5 wireless sensors in agriculture and farming that region unit is using, it is plausible to get the functional facts they've been lacking out on. On this undertaking, we tend to locate unit victimization internet of things (IoT). It implies that each one of the accrued records can ship to GR-Kaede board and it sends to internet portal (on-line view) through wireless. This observance can be finished through any devices like cell, Tab, Laptops and desktops. This is the research for the motivation of the farmers operating within the farm lands are only hooked in to the rains and bore wells for irrigation of their land.

India's major supply of financial gain is from agriculture sector and seventieth of farmers and general folks rely upon the agriculture. In Republic of India most of the irrigation systems square measure operated manually. These antique techniques square measure replaced with semi-automated and automatic techniques. The on the market ancient techniques square measure like ditch irrigation, terraced irrigation, drip irrigation, system.

The global irrigation situation is classified by redouble demand for higher agricultural productivity, poor performance and decreased accessibility of water for agriculture. These issues are befittingly corrected if we have a tendency to use machine-controlled system for irrigation. Automating farm or nursery irrigation permits farmers to use the correct quantity of water at the correct time, regardless of the provision of labor to show valves on and off. Additionally, farmer's mistreatment automation instrumentation is able to scale back runoff from over watering saturated soils, avoid irrigating at the incorrect time of day, which will improve crop performance by making certain adequate water and nutrients once required. Those valves are also simply automated by mistreatment controllers. Automating farm or nursery irrigation permits farmers to use the correct quantity of water at the correct time, no matter the provision of labor to show valves on and off. They lack in an exceedingly featured mobile application developed for users with acceptable user interface. It solely permits the user to observe and maintain the moisture level remotely in no matter of time.

Water, one among the good natural resources ought to be used in correct kind. However, an enormous quantity of water is being wasted throughout standard of living attributable to lack of management. Our projected system guarantees to accumulate a decent quantity of usable water daily. This observance and dominant system uses standard of living device like portable computer or itinerant. Attributable to the actual fact of dominant remotely we tend to introduce a helpful wireless machine-driven dominant system.

In the field of soil environmental watching, period of time watching the temperature and moisture level of soil will properly guide agricultural production and improve crop. Automatic agricultural systems are a unit convenient, particularly for people who travel. If put in and programmed properly, automatic agricultural systems will even save North American nation cash and facilitate in conservation. Dead field grass and plants have to be compelled to get replaced, which is high-priced. However, the savings from automatic agricultural systems will transcend that.

Bulk of the prevailing systems hire micro-processor based structures. Those systems offer several technological advantages but are unaffordable, cumbersome, hard to hold and less general by using the technologically unskilled people within the rural state of affairs.

The goal of this thesis is to design a simple, smooth to install method to reveal and imply the extent of soil moisture this is constantly managed in an effort to acquire maximum plant increase and simultaneously optimize the available irrigation resources. An easy Op-amp based comparator circuit is used coupled with relay units which control the water pumps. The usage of effortlessly to be had components reduces the manufacturing and preservation prices. This makes the proposed device to be a cheap,

suitable and a low preservation answer for packages, mainly in rural areas and for small scale agriculturists.

Generally, most of the irrigation systems square measure operated by hand one. These ancient techniques square measure being is replaced with semi-automated and automatic techniques prompt an automatic conception of irrigation to use the water expeditiously and effectively automatic Drip Irrigation system is enforced either supported the soil moisture level or supported the user input via IOT commanding systems. Former methodology is associate degree isolated irrigation system wherever the farmer doesn't update with the irrigation standing and later lags in sensible utilization of water thanks to user command while not considering the condition of soil. From that ever growing demand of the population, trendy techniques square measure introduced to manage the system.

A. Motivation

Nowadays IoT is everywhere in the world to make the smarter world. Due to IoT we can see many smart devices around us. Many people, including me, have a view that cities and the world itself will be overlaid with sensing and actuation, many embedded in "things" creating what is referred to as a smart world. For example, today many buildings, home automation, cars, taxis, and traffic lights already have sensors for saving energy and have devices to try and improve safety and transportation. Smart phones with sensors for running many useful apps are being used by people. Industrial plants and healthcare services are connected to the Internet and also rely on increased home sensing to support remote medicine and wellness.

Global sensing and actuation utility connected to the Internet is one of the possibility. Electricity and water are two utilities that can be used for a myriad of purposes. IoT will be seen as a critical, integrated infrastructure upon which many applications and services can run but never as an individual system.Sensing and actuation using an IoT platform will become a necessity.

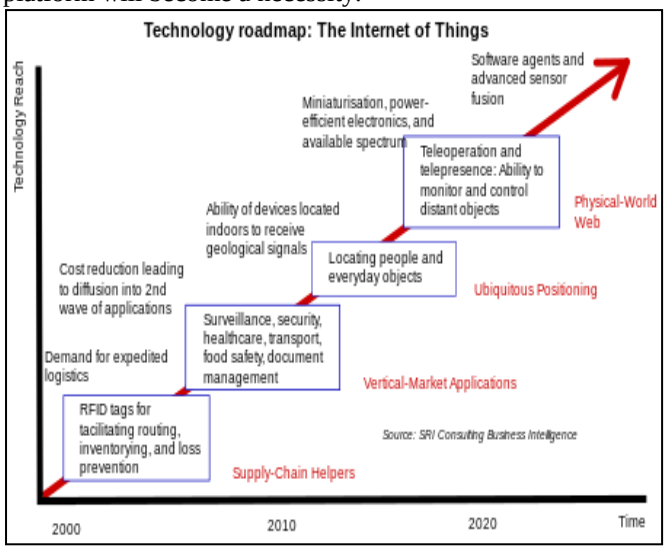

Fig. 1: Advancement in IoT

Some applications such as digitizing daily life activities will be personalized, others such as efficient, delay-free transportation will be city-wide, and rest will be worldwide such as global delivery systems. Perhaps there will be no traffic lights and even 3D transportation vehicles in the cities.

These can be applied to people, things, information, and places, and therefore the so called "Internet of Things" will be succeeded by the "Internet of Everything. The most important and fundamental characteristics of the IoT are as follows:

- Interconnectivity: anything can be interconnected with the global information and communication infrastructure as use of IoT is considered.
- Things-related services: The IoT is capable of providing thing-related services within the constraints of things, such as privacy protection and semantic consistency between physical things and their associated virtual things. Both the technologies in physical world and information world will change in order to provide thing-related services within the constraints of things.
- Heterogeneity: The devices in the IoT are based on different hardware platforms and networks and thus known as heterogeneous. This helps them to interact with other devices or service platforms through different networks.
- Dynamic changes: The state of devices change dynamically. For example sleeping and waking up, connected and/or disconnected as well as the context of devices including location and speed. Moreover, the number of devices can change dynamically.
- Enormous scale: The number of devices that need to be managed and that communicate with each other will be at least an order of magnitude larger than the devices connected to the current Internet. The ratio of communication triggered by devices as compared to communication triggered by humans will noticeably shift towards device-triggered communication. Even more critical will be the management of the data generated and their interpretation for application purposes. This relates to semantics of data, as well as efficient data handling.

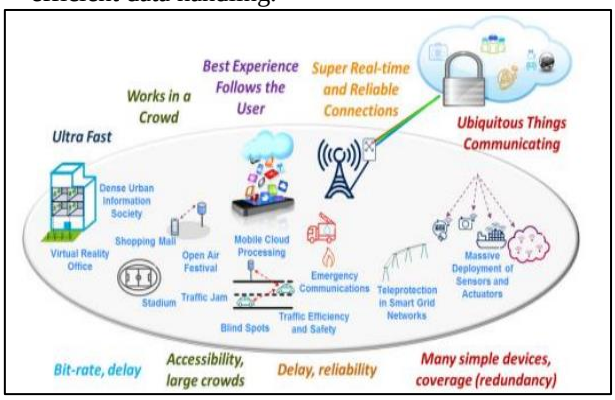

Fig. 2: Application of IoT

II. LITERATURE REVIEW

Karan Kansara, et al. (2015), the paper entitled "Sensor based automated Irrigation System with IOT: A Technical Review", India's major supply of financial gain is from agriculture sector and seventieth of farmers and general individuals rely upon the agriculture. In India most of the irrigation systems area unit operated manually. These unstylish techniques area unit replaced with semi-automated and automatic techniques. The obtainable ancient techniques area unit like ditch irrigation, terraced irrigation, drip irrigation, system.

Technology	Main MCU System	Monitoring Station	Modules Interfaced	Tools	Programming Code
Zigbee	JN5121	PC	RS232	Keil IDE	Java, Interactive C
Internet	Intel 80C196KC	PC	None	Keil IDE	C51
Bluetooth	Atmega64	PC	TDK Blu2i	AVR Studio	C
Bluetooth	Atmega168	Mobile	Bluegiga WT11	AVR Studio, Symbian OS	Interactive C, Pythan
Bluetooth	AVR Atmega32	Mobile	CBOEMSPA 312	AVR studio, Eclipse 3.2.2	C, Java
RF	PIC18F452	PC	Sony Ericsson GM47	ValCon	Visual C Net 2008 editor

Table 1: Some of Existing Remote Monitoring and Control System

The world irrigation state of affairs is classified by raised demand for higher agricultural productivity, poor performance and attenuate accessibility of water for agriculture. These issues are befittingly corrected if we tend to use automatic system for irrigation.[1]

N Kabilan, et al. (2015), the paper entitled "Surveillance and steering of irrigation system in cloud using Wireless Sensor Network and Wi-Fi module", Internet of Things (IoT) has become very hip within the field of communication. IoT can become a reality over ensuing few years, with fast and wide spread good devices are going to be ready to execute severally per the modification in their surroundings. The utilization IoT techniques to spot and channelize the irrigation strategic area unit mentioned during this work. So as to develop an automatic technique to investigate the water needed by the plants at a specific time, an info is formed. The info contains coaching samples associated with the soil sort, wet content, temperature, plant leaf condition and therefore the humidness level and therefore the quantity of water flow needed for resulting set of options. Disagreement|completely different} variety of soils and plants differ in water content needed. The info is build victimization the options extracted from the pictures of the soil and therefore the plants. The color of the plants and therefore the soil pictures may be retrieved victimization Fisher's linear discriminant analysis (LDA), The Fisher's LDA approach is employed to project the plant and soil RGB pictures into the info to retrieve the color indicating the wet level. The RGB pictures area unit required to be analyzed accurately to work out the water demand. However, color process has nice benefits for its simplicity, robustness, power and potency. The graph cut based mostly phaseation may be forced to segment the regions accurately and victimization this system the water content within the leaf and therefore the soil covering the plants may be differentiated. The process of the pictures ought to be performed by differentiating the plant and soil segments. A completely unique classification algorithmic rule known as transductive support vector machine (TSVM) is employed for classification and quantification. Thus, the specified irrigation level of the plants may be determined and therefore the method might be distributed in associate economical manner.[2]

Purnima, et al. (2013), the paper entitled "Design of Remote Monitoring and Control System with Automatic Irrigation System using GSM-Bluetooth", In past few years, automatic irrigation system has seen a rising in terms of technology. Nowadays cost-saving technology, labor-saving area unit the addressing key problems in irrigation. This paper provides a review of those systems supported existing technologies and additionally proposes a cost-effective and generic automatic irrigation system supported wireless sensors with GSM-Bluetooth for irrigation system controller and remote observation system. This method has less complicated options designed with the target of low price and effective with less power consumption exploitation sensors for remote observation and dominant devices that area unit controlled via SMS employing a GSM module. These system brings a change to management of field resources wherever they developed a software package stack referred to as golem is employed for mobile devices that embrace Associate in Nursing software, middleware and key applications. The SDK provides the tools and Apes necessary to start developing applications on the golem platform exploitation the Java programming language. Mobile phones have nearly become Associate in Nursing integral a part of USA serving multiple desires of humans. This application makes use of the GPRS feature of mobile phone as an answer for irrigation system. These systems lined lower vary of agriculture land and not economically cheap. The System Supports excess quantity of water within the land and uses GSM to send message. Associate in Nursing app is being used they need used a technique to beat underneath irrigation, over irrigation that causes leach and loss of nutrient content of soil they need additionally secure that Microcontroller used will increase System Life and lower the power Consumption. There system is simply restricted to the automation of irrigation system and lacks in further standard features. [3]

Sl No.	Soil Moisture level Rain Moisture level	Output of the sensor circuit (in Volts)	Output of the main pump controlling circuit (in Volts)
1	below lower level	2.375	0
2	increasing but below higher level	3.262	0
3	more than higher level	5.265	10
4	decreasing but higher than lower level	4.372	10

Table 2: Sensor Simulated Levels

A Bluetooth module is additionally interfaced with the most microcontroller chip. This Bluetooth module eliminates the usage charges by human action with the appliances via Bluetooth once the appliance is in a very restricted area of few meters. The system informs user regarding any abnormal conditions like less wet content and temperature rise, even concentration of greenhouse emission via SMS from the GSM module or by Bluetooth module to the farmer's mobile and actions area unit taken consequently by the farmer. In future, the farmer is going to be able to monitor and management the parameter by GSM and Bluetooth technologies.[3]

III. DESCRIPTION OF PROPOSED WORK

The design using different parameters are proposed for Automatic Irrigation System. The system can monitor the status of moisture content in the soil and send the details about all parameter on network automatically. Users can monitor and control the module on an active web page. This system finds wide applications in area where physical presence is not possible all the time. The system offers a

complete low cost, powerful and user friendly way of real time monitoring and remote control of irrigation to the farmers.

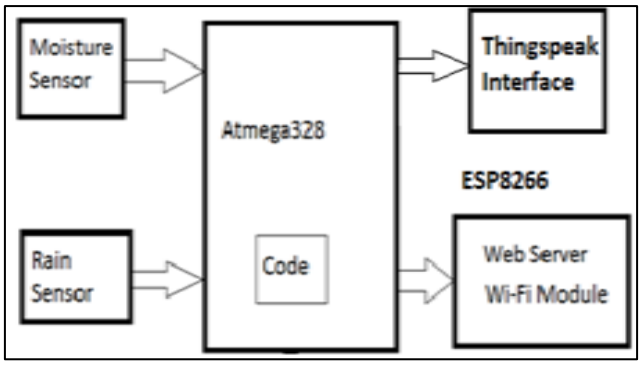

Fig. 3: Block Diagram of the proposed system

Embedded system for computerized irrigation of an agriculture subject gives an ability solution to assist web page- precise irrigation control that permits producers to maximize their productivity whilst saving the water.

IV. Conlusion

As we saw in literature section the scope of Internet of Things on current era is high. We also saw what Automatic Irrigation System is and the issues that still need to be solved. So in this paper basically we study about internet of things and its application to in agriculture. Measuring soil moisture is critical in agriculture to help farmers manipulate their irrigation systems more successfully. No longer only are farmers able to generally use much less water to grow a crop, they're able to growth yields and the satisfactory of the crop by using better management of soil moisture at some point of vital plant growth degrees.

This project presents the design and implementation of an interactive Irrigation monitoring system with the control, communication and web-enabled measurement and control systems. The web based monitor and automatic control of equipment is forming a trend in this automation field. In existing systems, cost is effective, as we know most of systems are using GPRS system which is expensive as compared to wi-fi concept. Still we do not get the desired results. In this section we primarily focus on the use of loT for the advance, energy efficient and self learning irrigation system. The main objective is to design and implement cost effective and smart system.

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