Wireless Irrigation System via Phone Call & SMS

Kandasamy Varatharajalu, J.Ramprabu

Abstract: In India, Agriculture is the most imperative occupation. India is the second biggest nation as far as aggregate arable land. More than 60 percent of India's property territory is arable. Today there are different types of farm irrigation systems currently in use. And they are included in the four main categories of flood, sprinkler, drip and micro irrigation. From this, the most water-aware of water system frameworks is dribble water system. The water is conveyed specifically onto the root arrangement of the plant. So 90% of farmers follow drip irrigation system to water their crops, this makes farmers need to go to their farm for a particular interval of time and switch motor and gate valves manually. As well as, the crops need fertilizers periodically. During night time, farmers might get injuries and burns due to electric shock while switching the motor. Innovation has assumed a major job in building up the rural business. The item will be conveyed from the homestead to the shopper in time when it's still crisp, so the innovation has transformed cultivating into a genuine business. This spares the agriculturist cash and time. Each rancher utilizes this innovation in their own particular manner. Some utilization it to make manures, others utilize it to advertise their items, and others utilize it in production. This paper mainly based on remotely operated watering system for agricultural farms using GSM, so that farmers can do their watering from their home itself. This paper introduces the integration of water source level with motor and gate valve (solenoid valve) switching via SMS and phone call, which help the farmers to manage the watering far away from their farm.

Keywords: GSM (Global System for Mobile communication), Solenoid valve, AT Commands, SMS (Short Message Service).

I. INTRODUCTION

GSM remains for Global System for portable interchanges. It is created by ETSI (European Telecommunications Standards Institute) to portray the conventions utilized by cell phones particularly for second-age advanced cell systems . GSM systems work in various distinctive bearer recurrence. In some different nations, infrequently 400 MHz and 450 MHz recurrence groups are relegated on the grounds that they were recently utilized for original frameworks. Most 3G organizes in Europe work in the 2100 MHz recurrence band. In India, 2G mobile systems working in the 800 MHz or 1900 MHz groups. 3G mobile systems working in the 2K MHz and 4G mobile systems working in the 2200-2300 MHz.

II. LITERATURE SURVEY

The associations between the two mobiles are finished utilizing GSM. The GSM module and microcontroller are associated utilizing MAX232. Sensors are interfaced to the microcontroller and control moves are made by exchanging the engine ON/OFF contingent on the ranch conditions [2].

Dampness substance of the dirt is a noteworthy part deciding plant's development, particularly in water system frameworks [3]. Short Message Service utilizes GSM methods to exchange information from removed places, for example, from one region to the region of a similar city or another city [4]. A GSM is an excellent sort of modem which recognizes a SIM card and works over a participation to an adaptable head, much the equivalent as wireless [5]. Controlling the water system framework from a remote area which makes the portable innovation keeps the client refreshed. The measure of water evaporate is computed utilizing Penman-Monteith Formula [7]. A remote information correspondence framework can give dynamic portability and cost free migration. Radio recurrence (RF) innovation gives various chances to utilize remote flag correspondence in rural frameworks and is generally embraced in customer remote correspondence items [9]-[11].

III. OBJECTIVE

A. Automation of irrigation field to motor ON/OFF and gate valves open and close.
B. To make irrigation, eventhough the farmers are not in their farm.
C. Increase farmers income by engaging themselves in other agricultural jobs
D. Reduce the transportation cost of the farmers.

IV. WORKING METHODOLOGY

Heart of the project is microcontroller which is controlling the entire device. The wireless technology that used is GSM which transfers data from one place to another. Here, two GSMs are used because the distance between the water source and the crop field are too long. Every mobile phone have DTMF decoder which is used for the selection of number in the keypad during the voice call.

Retrieval Number B10821282S18/18©BEIESP
Journal Website: www.ijeat.org

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Published By:
Blue Eyes Intelligence Engineering
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The sensor will acquire the data from its surrounding that is the different types of sensors used in the module will sense and gather the data with current status from the respective module. Sensor (HCSR04) is ultrasonic used to quantify the utilization level of the water source. The electromechanically solenoid valve control the flow electrically with the help of solenoid.

A. Gsm

As shown in figure 1, GSM monitors the level of the water source and also controls the switching of the Motor and Solenoid Valves (gate valves). Once the call is made by the Farmer to GSM1, then the call will be auto attended after two seconds. For example,

Press 1   -   To know the water source level via SMS.
Press 2   -   To switch ON the motor.
Press 3   -   To switch OFF the motor.
Press 4   -   To switch ON the Solenoid Valve 1
Press 5   -   To switch OFF the Solenoid Valve 1
Press N   -   To switch ON the Solenoid Valve N
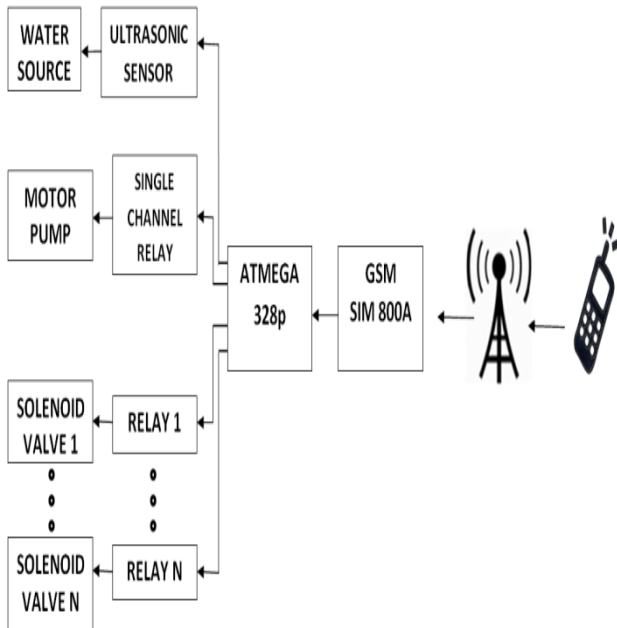Press (N+1) - To switch OF the Solenoid Valve N

Figure 1. Block Diagram of proposed design

In the proposed system, the level of the water source is integrated with the switching of motor and gate valves (solenoid valves). Here, the water source level will be monitored through SMS by the farmers which helps them to decide the schedule of watering to their crops.

V. SYSTEM IMPLEMENTATION

Sensors, Microcontroller, DF Mini MP3 Player, GSM module, Solenoid Valves, Relay and Water pump forms the hardware part of the system. The software part includes the AT Commands which controls the GSM module and DTMF coding for mobile actuation. Also the Arduino coding which controls the microcontroller.

VI. HARDWARE DESIGN AND RESULT

The connections between the hardware components will be explained with the help of following figure 2.
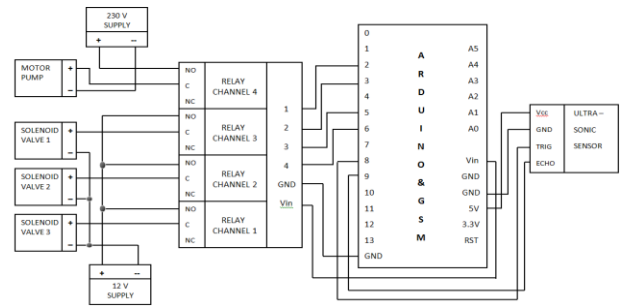

Figure 2. Circuit Diagram proposed design

A. Ultrasonic Sensor (HC-SR04)

Sensor HCSR04 is Ultrasonic, whose extend is from 1.9cm to 399cm. It is a non-contact estimation work. Its running exactness can reach to 3mm. The modules incorporates ultrasonic transmitters, beneficiary and control circuit as appeared in figure

Figure 3. Ultrasonic Sensor

The basic work rule: (1) Using Ip/Op trigger for at any rate 9us abnormal state flag, (2) The Module naturally sends eight 39 kHz and look for a heartbeat motion back. (3) The season of high Input / Output term is given when from ultrasonic goes and comeback. Test separate = (unusual state time × sound speed (340min/sec)/2

B. Solenoid Valves

A solenoid valve contains two basic functional units which are as follows:

- Electromagnetic solenoid
- Valve containing orifices

Figure 4. Solenoid Valve

Move through an opening is closed off or permitted by the development of the center when the solenoid is invigorated or de-stimulated. As appeared in given figure 4, the middle is encased in a settled barrel, giving a lessened, discharge tight social gathering and its valves have a solenoid mounted particularly on the valve body

C. Relay

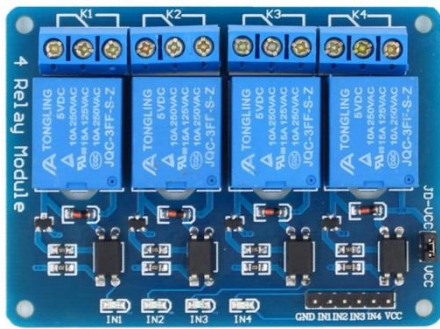Two kinds of transfer innovation are accessible, mechanical and strong state.

Figure 5. 4-Channel Relay

A mechanical transfer is the mix of an inductor and a switch. This makes the electromagnetic power of the inductor makes a switch change position. A strong state hand-off achieves a similar capacity with semiconductor gadgets changing impedance to adequately enact or deactivate a circuit open or shut.

D. Water Pump

The kind of siphon which is chosen dependent on a few criteria, for example, framework prerequisites, release weight required, stream limit required, and accessibility of room.

The kinds of siphons regularly found in water dissemination frameworks are: diffusive siphons, vertical turbine siphons and submersible siphons. Each siphon has its own applications. Submersible siphon is utilized in our application which are put underneath the water level and are utilized for the most part to siphon groundwater from wells. The siphon is essentially a multi-organize centrifugal pump and the impellers of the pump are mounted on a vertical shaft.

Figure 6. Pump

The siphon is built for submerged task. It is driven by an electric engine set nearby the pump-set arrangement.

E. Gsm

GSM ordinarily works on the versatile correspondence groups 900 MHz and 1800MHz. The architecture has some additional components as well as databases and messaging systems functions and its additional components:

(VLR) Visitor Location Reg
(EIR) Equipment Identity Reg
(SMS SC) SMS Serving Center
(TRAU) Transcoder and Adaptation Unit

(HLR) House Location Register
(AuC) Authentication Center
(GMSC)Gateway MSC
(CBC) Chargeback Center

The accompanying chart demonstrates the GSM organize alongside the additional component
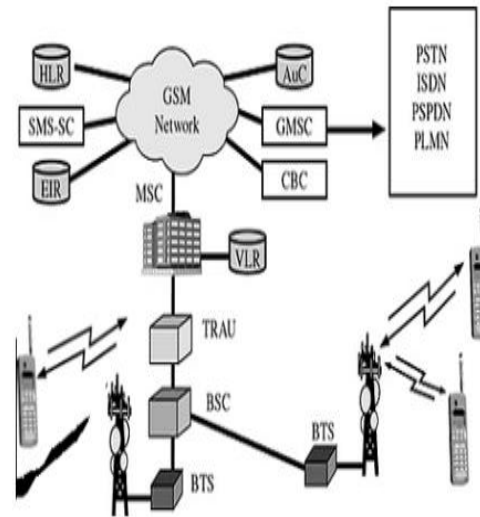

Figure 7. GSM Network

GSM remains for Global System for Mobile Communications. It is an advanced cell innovation utilized for transmitting versatile voice and in addition information administrations. a circuit-traded structure that isolates each 200 kHz channel into 8 26 kHz timeslots.

F. Microcontroller

The controller is an independent framework incorporates memory, processor and peripherals that can be utilized as an implanted framework dumped by the program. The controller here utilized is AT-mega 328P. The 8 bit microcontroller improves the Risc engineering.
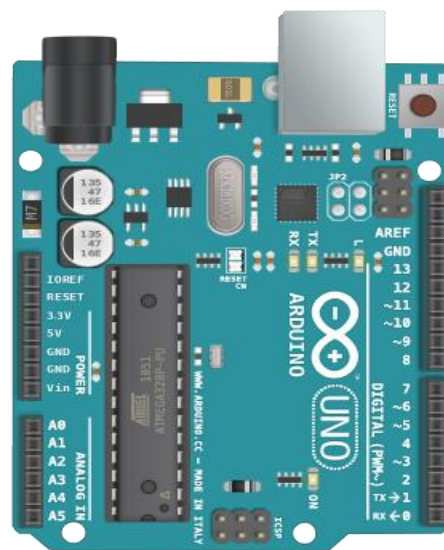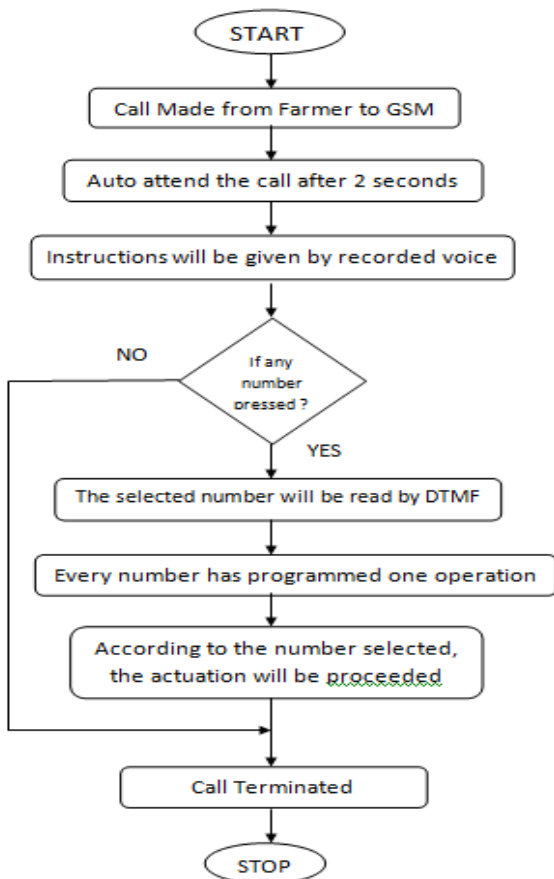

Figure 8. Arduino UNO

By executing exceptional rules in a singular clock cycle, the ATmega328P achieves throughputs close 1MIPS/MHz. This connects with structure organizer to alter the contraption for power use with dealing with speed.

VII. SOFTWARE DESIGN AND RESULT

A. AT Commands

Three areas, which start with AT, trailed by a request and completed with the line end character. The uncommon cases to this are An/and +++ which are sent without AT and carriage return. These bearings have three essential structures, some of which are not material to all request types. Test Commands (ATxxx=?) test's the nearness of a request and checks it's level of sub-parameter(s). Scrutinized Commands (ATxxx?) which examines the sub-parameter and its current regard. UbiNetics may not support the full extent of characteristics returned by this test and examined arrange. Set Command (ATxxx=a,b) will attempt to set another sub parameter value(s). If the bearing is productive the AT request go between will get OK else a bumble or edifying result code will be returned.
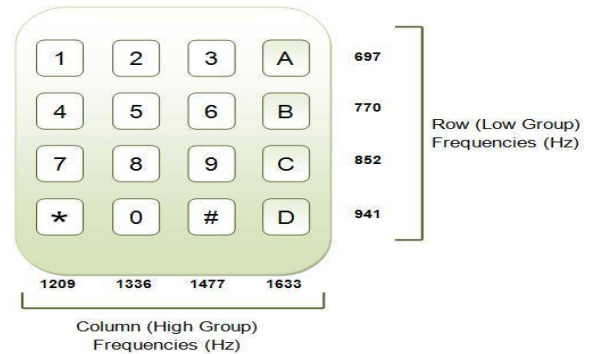
B. System Flow

Figure 9. System Flow chart

A System Context Diagram (SCD) defines the barrier between the system and the system's environment, showing the entities interacting with it. The application works on the precept of "Ternary Structure Context Model", consisting of Simple Monitoring, Automatic Controlling and User centric services.

C. DTMF

DTMF (Dual Tone Multi Frequency) which makes the sound frequencies conveyed when a telephonic key is crushed. DTMF generally called touch tone was essentially used for telephone motioning to and from the area exchange.

Figure 10. DTMF Keypad

An alternate recurrence is appointed to each key in the cell phones as appeared in the figure underneath. There are two tones – one low recurrence and another high recurrence – that are played all the while when a key is squeezed. Every one of the four lines of keys in a cell phone is appointed a low recurrence tone, likewise every one of the three sections is doled out a high recurrence tone. A fourth segment of keys named as A, B, C and D is for the most part utilized in military systems.

VIII. CONCLUSION

The paper reviews the integration of monitoring of level of water source as well as controlling the motor and gate valves (solenoid valves) using GSM. Also farmers manage their irrigation system far away from their farm. This helps the farmers not only to save their time but also they can engage themselves in some other agricultural jobs in order to increase their income and reduce the cost of transportation.

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