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WATER IRRIGATION SYSTEM USING ARDUINO

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Abstract - *The water irrigation system is introduce to optimize the use of water supply for agricultural crops.This project made to designthe water irrigation system based on Arduino microcontroller board.In area where low rain occursor in case of inadequate rain take place, irrigation becomes difficult.The need to automated for proper water supply and reduce farmer time and work.In case the farmer is not available for irrigation every time ,then this system is very useful . So, efficient water management makes an important role in the irrigated agricultural systems. This project is to design and develop a low cost system which is based on water irrigation system using arduinoboard . This project uses temperature and soil moisture sensors to detect the water quantity present in agriculture field . The project uses Arduino micro controller which is controller to the whole process of irrigation. The aim of the implementation was to demonstrate that the water irrigation can be used to reduce water use.*

***Key Words*: *Arduino UNO, soil moisture sensors, water level sensors, microcontroller,water pump*.**

1. INTRODUCTION

Agriculture is depends on the rain which is not sufficient sources of water for whole irrigation for the agricultural crops. The irrigation system helps to supply water to fileds according to the mositure of soil .Rain play a vital role in irrigation, water supply is required because of most of the fields are depends on the rain. In conventional system the farmer has to work properly and with a full care of water supply for watering the crops, which is depend on crops types .Unsufficent watering causes ruin to plants. To provides proper and needed amount of water for different region and avert the water overflow at the sloppy areas and considering the situation of farmer, the water irrigation system will be most useful for proper irrigation.The proper water supply system is the major examine in cropping system . An irrigation process is useful to reduce water use for agricultural crops which is a much required process . The need of water irrigation system is to previal over irrigation and under irrigation. Over irrigation occurs because of bad distribution of water and chemical which fed to water pollution. Under irrigation proceed to increased soil salinity with buildup of toxic salts on the soil surface in region with high evaporation . To overcome these problems and to minimize the man power by smart irrigation system has been used.To Overcoming these limitation new techniques are been implementing in the irrigation system, through which small amounts of water supply to the parts of root of a plant. The plant soil moisture stress is cure by providing proper amount of water resources frequently by which the moisture condition of the soil will retain better growth.

The full concept of the water irrigation system is like traditional techniques of sprinkler or surface irrigation requires half of water sources. Even more specific amounts of water can be supplied for plants.The main objective of this project is to save water and reduce or minimize labour work in the agriculture lands.Continuously Monitoring the status of sensors provide signal for taking necessary action to implementing the process and get the output of soil moisture sensor & provide wateraccording to the need or required of crop.

1.1 LITERATURE SURVEY

Archana and Priya (2016) proposed a paper in which the humidity and soil moisture sensors are placed in the root zone of the plant. Based on the sensed values the microcontroller is used to control the supply of water to the field. This system doesn't intimate the farmer about the field status [1].

SonaliD.Gainwar and Dinesh V. Rojatkar (2015) proposed a paper in which soil parameters such as pH, humidity, moisture and temperature are measured for getting high yield from soil. This system is fully automated which turns the motor pump ON/OFF as per the level of moisture in the soil. The current field status is not intimated to the farmer[2].

V. R. Balaji and M. Sudha (2016) proposed a paper in which the system derives power from sunlight though photo-voltaic cells .This system doesn't depend on electricity. The soil moisture sensor has been used and based on the sensed values PIC microcontroller is used to ON/OFF the motor pump. Weather forecasting is not included in this system [3].

G.Parameswaran and K.Sivaprasath (2016) proposed a smart drip irrigation system using IOT in which humidity, temperature and pH sensors are used. Irrigation status is updated to the server or local host using personal computer.

The farmer can't access about the field condition without internet [4].

S.Reshma and B.A.Sarath (2016) proposed an IOT based automatic irrigation system using wireless sensor networks in which various sensors are used to measure the soil parameters. This system provides a web interface to the user to monitor and control the system remotely. Weather monitoring is not done in this system [5].

Joaquin Gutierrez (2013) proposed a gateway unit which handles sensor information, triggers actuators, and transmits data to web application. It is powered by photovoltaic panels and has duplex communication link based on cellular internet interface that allows for data inspection and irrigation scheduling to be programmed through web page [6]

1.2 PROPOSED SYSTEM

To overcome the drawbacks of existingsystem like high cost, difficult in maintenanceand more wired connection. We introduce a newsystem which will have wireless connection betweenserver and nodes. We introduce a new design ofembedded web server making use of GSM networktechnology in the paper. Compared to the wired link webserver system.

This system is characterised by having nowires between the web server and terminal nodes. Thesesystems have lower cost and having more flexibility of thenetwork topology.For every node we will use separate GSM trans-receiver to transmit the details to server nodes. Waterirrigation control based on microcontroller and internet ofthings. By internet of things we mean that it has theability toanalyses and distribute data that can be used asinformation and knowledge. Internet of things improvesdistribution of world's resources to those who need it themost. In agricultural farm we use water irrigation ismonitored by using sensor like. Soil moisture sensor and water level sensor are connected to arduino UNO board through jumper wires and breadboard, connections have been provided in this section only.

Soil moisture sensor will sense the dankness of soil and through WSN the data will be transferred to actuators to act upon that data. A threshold value has been set, both minimum and maximum, so that whenever the measured value crosses the predefined threshold value the motor will be switched on/off automatically.

Same working goes with water level sensor in which a minimum and maximum threshold value has been set so that whenever the measured value of water level crosses the predefined threshold value the motor will be switched on/off automatically to fill the tank.

An LCD is connected witharduino and all the sensors to display the status of moisture content in soil and water level in tank. A 5V motor pump has been used for this project as this is a mini prototype model and arduino that is used in this project can provide maximum of 5V power.

2. FRAMEWORK OF SYSTEM

Physical layer in the given framework (fig. 1) consist soil moisture sensor which collects the data by detecting environmental conditions, in this case its moisture of soil and fed the information to the microcontroller where the processing of that information will take place to convert it into relevant data. This processing comes under decision making layer where the program logic takes its role. The automatic irrigation system was designed to continuously sense the moisture and temperature level of the soil. The system responds appropriately by watering the soil with the exact amount of water required and then shuts down the water supply when the required amount of soil moisture is achieved.

The reference amount of soil moisture is already fed to the microcontroller beforehand. This reference soil moisture content was made to be adjustable for the three most common soil types (sandy, loamy and clayey soils).The moisture sensors and temperature sensors were designed using probes that are made from corrosion resistant material which can be pinned into soil sample test and voltage levels corresponding to the wet and dry condition of the soil test were implemented by measuring the resistance between the moisture probes and matching them to output voltage of a comparator circuit.

The main objective of this project is to automate the process of irrigating the plants. The procedure could also improve the current methods of automatic irrigation systems by introducing the new matrix system thereby reducing the labor and also the total amount of necessary for the whole procedure. The process involves the moisture sensor to analyze the amount of moisture in the soil and then if the moisture in the soil is low. the processor then produces an output signal that informs the water valve to open and reach the right destination to give the maximum effect. Thus this system gives a very efficient way of irrigating the plants automatically without any human intervention.

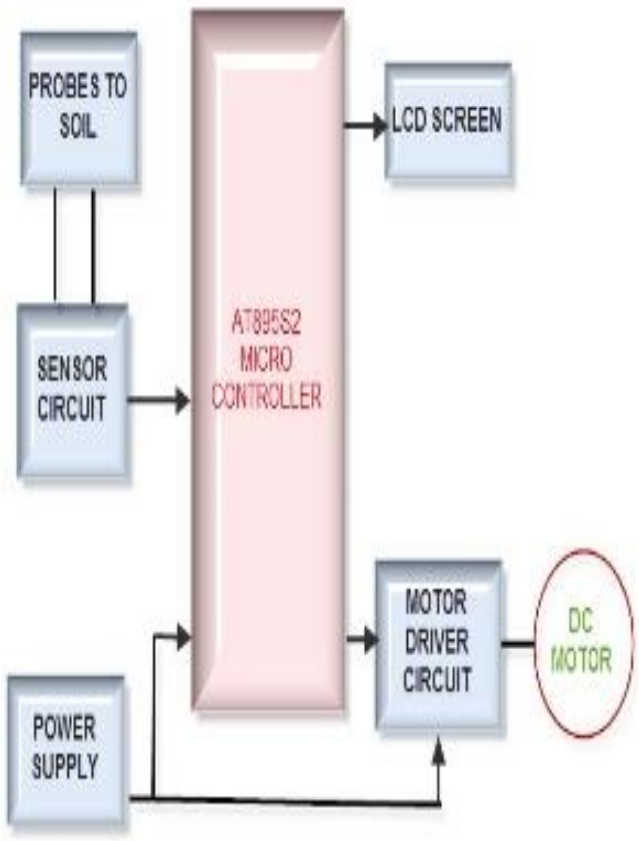

Fig -1: Block Diagram

2.1 Module Description

This project on "Water Irrigation System" is build to create an automated irrigation mechanism which turns the pumping motor ON and OFF on detecting the dampness content of the soil. In the domain of farming, utilization of appropriate means of irrigation is important. The continuous extraction of water from earth is decreasing the water level due to which lot of land is coming slowly in the zones of un-irrigated fields. The benefit of employing this technique is to reduce human interference and still make certain proper irrigation. The circuit contains of sensing arrangement parts built using op-amp IC LM358. Op-amp's are configured here as a comparator. Two stiff copper wires are dipped in the earth to sense whether the soil is damped or dry.

if the sensing arrangement senses the earth to be damped. The microcontroller perform its task as it receives the signal from the sensing arrangement through the output of the comparator, and these signals operate under the control of software which is stored in cloud.

2.1.1 Arduino Micro-controller:

Arduino is an open-source which provide prototyping platform based on easy-to-use software and hardware. Arduino boards are able to read inputs - a finger on a button, light on a sensor - and turn it into an output - turning on an LED , activating a motor, publishing acceptably online. We can tell board what to do by sending a set of instructions to the microcontroller board. To do so we use the Arduino Software(IDE), and the Arduino programming language (based on wiring), based on Processing. The Arduino Uno can be powered via with an external power supply or the USB connection.

The power source is selected automatically External or non-USB power can come either from an AC-to-DC adapter or battery. The adapter are |will be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from electric battery are often, may be inserted within the Gnd and Vin pin headers of the power connector. The board will operate on, care for Associate in Nursing external provide of six to twenty volts. If provided with less than 7V, however, the 5V pin may provide less than 5 volts and therefore the board is also unstable. If exploitation over 12V, the voltage could overheat and harm the board. The suggested range is seven to twelve volts.

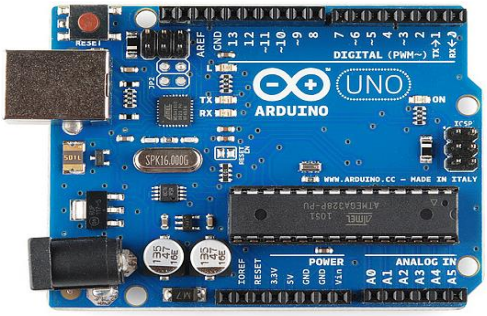

Fig -2 Arduino Board

2.1.2 Soil Moisture Sensor:

Although soil water status will be determined by direct (soil sampling) and indirect (soil moisture sensing) ways, direct methods of observing soil moisture aren't usually used for irrigation planning because they're intrusive and labour intensive and can't offer immediate feedback. Soil wetness probes is may be for good put in at representative points in an agricultural field to supply continual wetness readings over time which will be used for irrigation management. Special care is required when exploitation soil moisture devices in coarse soils since most devices require close

contact with the soil matrix that's generally troublesome to achieve in these soils. Most of the presently available volumetrical sensors appropriate for irrigation are insulator.

This cluster of sensors estimate soil water content by measurement the soil bulk permittivity(or non-conductor constant) that determines the speed of an Associate in Nursing electromagnetic radiation ,non-particulate radiation or pulse through the soil. during a material stuff just like the soil (i.e., created from totally different elements like minerals, air and water), the worth of the permittivity is formed up by the relative contribution of every of the elements.

Since the insulator or non-conductor constant of liquid water is far larger than that of the opposite soil constituents, the entire permittivity of the soil or bulk permittivity is principally ruled by the presence of liquid water. The insulator or non-conductor ways use empirical (calibrated) relationships between volumetrical water content and therefore the detector output signal (time, frequency, impedance, wave phase).

These techniques are getting wide adopted as a result of they need sensible| reaction time (almost fast measurements), don't need maintenance, and may give continuous readings through automation. though these sensors are supported the insulator principle the varied varieties out there or accessible (frequency domain reflectometry- FDR, capacitance, time domain transmission-TDT, amplitude domain reflectometry-ADR, time domain reflectometry-TDR, and section transmission) gift necessary variations in terms of standardization needs accuracy, installation and maintenance needs and value.

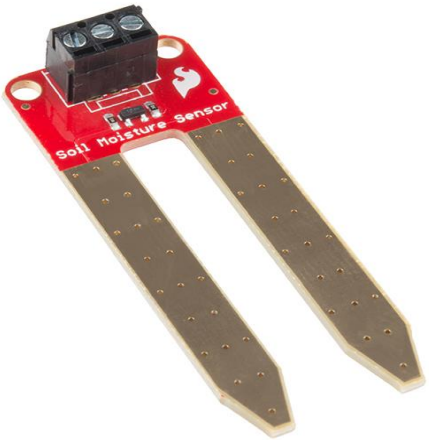

Fig - 3 soil moisture sensor

2.1.3 Humidity Sensor

A humidity or humidness sensor or detector also referred to as a hygrometer measures frequently reports the humidity within the air. A humidity sensor senses relative this suggests that it measures each air temperature and wet. relative humidity expressed as a percent, is that the magnitude relation of actual wetness within the air to the very best quantity of moisture air at that temperature will hold. The hotter the air is, the additional wet it will hold, therefore relative humidity changes with fluctuations in temperature. The foremost common kind of humidity detector uses what's referred to as "capacitive measuring this technique depends on electrical capacitance, or the flexibility of two near electrical conductors to form an Associate in Nursing degree electrical field between them.

The sensing itself consists of two metal plates with a non-conductive compound film between them. The film collects wet from the air, and therefore the wet causes minute changes within the voltage between the 2 plates. The changes in voltage are converted into digital readings showing the quantity of wet within the air

2.1.4 Voltage Regulator

The voltage regulator (14) isn't truly one thing} you'll be able to (or should) act with on the Arduino. However it's potentially helpful to understand that it's there and what it's for. The transformer will precisely what it says – it controls the quantity of voltage that's let into the Arduino board. Consider it as a kind of gatekeeper; it'll shy away an additional voltage which may|that may damage the circuit. Of course, it has its limits, therefore don't attach your Arduino to something larger than 20 volts.

2.1.5 LCD Panel

A liquid-crystal show (LCD) could be aflat-panel display or different electronic visual show that uses the light-modulating properties of liquid crystals. Liquid crystals don't emit light-weight directly. LCDs are accessible to display arbitrary images(as) in an exceedingly , in a very all-purpose pc or laptop display) or mounted pictures with low info content, which may be displayed or hidden, like predetermined words, digits, and 7-segment displays as during a in a very digital clock. They use an equivalent basic technology, except that arbitrary pictures are created from a larger variety of tiny pixels, whereas different displays have larger components.

2.1.6 Main IC

The black thing with all the metal legs is an IC, or Integrated Circuit (13). Think of it as the brains of our Arduino. The main IC on the Arduino is slightly different from board type to board type, but is usually from the A Tmega line of IC‟s from the ATMEL company. This can be important, as you may need to know the IC type (along with your board type) before loading up a new program from the Arduino software.

This data will sometimes be found in writing on the highest facet of the IC. If you wish to understand a lot of concerning the distinction between varied IC‟s, reading the datasheets is commonly an honest plan.

2.1.7 Water Pump

The pump is employed to by artificial water for a selected task. It are often electronically controlled by interfacing it to a microcontroller. It are often triggered ON/OFF by causing signals pro renata. the method of by artificial means activity water is understood as pumping. There are many sorts of water pumps used. This project employs the employment of a little pump that is connected to a H-Bridge. The pumping of water could be a basic and sensible technique, much more sensible than scooping it up with one's hands or lifting it in a very hand-held bucket.

This is true whether or not the water is drawn from a contemporary supply, affected to a required location, purified, or used for irrigation, washing, or waste product treatment, or for evacuating water from associate undesirable location. notwithstanding the result, the energy needed to pump water is an especially exigent part of. All alternative processes rely or profit either from water descending from the next elevation or some pressurised utility.

2.1.8 ATMEGA 328P MICRO CONTROLLER :

The ATmega48PA/88PA/168PA/328P could be a low-power CMOS 8-bit microcontroller supported the AVR increased RISC| architecture} architecture. By capital punishment powerful directions in a very single clock cycle, the ATmega48PA/88PA/168PA/328P achieves throughputs approaching one MIPS per rate permitting the system designer to optimize power consumption versus process speed The ATmega48PA/88PA/168PA/328P provides the subsequent features: 4K/8K bytes of In-System Programmable Flash with Read-While-Write capabilities, 256/512/512/1K bytes EEPROM, 512/1K/1K/2K bytes SRAM, twenty three general purpose I/O lines, thirty two general purpose operating registers, 3 versatile Timer/Counters with compare modes, internal and external interrupts, a serial programmable USART, a byte-oriented 2-wire Serial Interface, associate SPI interface, a 6channel 10-bit ADC (8 channels in TQFP and QFN/MLF packages), a programmable Watchdog Timer with internal generator, and 5 package selectable power saving modes. The Idle mode stops the hardware whereas permitting the SRAM, Timer/Counters, USART, 2-wire Serial Interface, SPI port, and interrupt system to continue functioning. The Power-down mode saves the register contents however freezes the generator, disabling all alternative chip functions till successive interrupt or hardware reset. In Power-save mode, the asynchronous timer continues to run, permitting the user to take care of a timer base whereas the remainder of the device is sleeping. The ADC Noise Reduction mode stops the hardware and every one I/O modules except asynchronous timer and ADC, to reduce change noise throughout ADC conversions. The AVR core combines a chic instruction set with thirty two general purpose operating registers. All the thirty two registers ar directly connected to the Arithmetic Logic Unit (ALU), permitting 2 freelance registers to be accessed in one single instruction dead in one clock cycle.

3. FUTURESCOPE

1. The performance of the system can be further enhanced in terms of the operating speed, memory capacity, and instruction cycle period of the controller. The number of channels can be enhanced to interface more number of sensors which is possible by using advanced versions and more effective controllers.
2. The system can be updated with the help of a data logger and a graphical LCD panel showing the measured data over a period of span.
3. This system can be connected to communication devices such as modems, cell phones or satellite terminal to enable the collection of recorded data
4. 4. The device can be made to perform better by providing the power with the help of battery source which can be both rechargeable or non-rechargeable which lessens the requirement of main AC power.
5. The time bound administration of fertilizers, insecticides and pesticides can be introduced.
6. A multi-controller system can be developed that will be enable to master controller along with its slave controllers to automate multiple greenhouses simultaneously.

4. CONCLUSION

By proper algorithm approach in designing the controller based system for measurement and control of several crucial parameters for growth of plants, i.e. soil moisture, humidity, light intensity, temperature and many more is under ambit. The final results obtained from the evaluation after sensing of parametric values ;needs to be definitive and precise. The system has to avoid quite a few many imperfection of the present systems by carefully handling the complexity, at the same time providing a flexible form of maintaining the environment. The continuously minimize costs of hardware and software, the expanded taken of electronic systems in agriculture, and an growing agricultural control system industry in several region of agricultural production, will result in control systems which we can rely upon, that will provide quality and quantity of production. Improvements will be made less expensive and more reliable sensors will be developed for use in agricultural production. The required technologies and components are available, many such systems have been independently developed. Also, integration of all these technologies is not a ominous test and can be successfully carried out.

5.Result

Irrigation becomes accurate ,practical and easy withthe same soil test impossible. Because of the idea shared and can be implemented in agricultural difficulties of absolutely measuring dry soil and water fields in future to take agriculture to next level. The quantity, volumetric water contents are not usually giveoutput from moisture sensor and level system plays major determined directly. Role in producing the output, When the soil is dry, the soil resistance between the non-inverting and the positive supply input is high resulting in positive supply to the non-inverting input low than the inverting input making comparator output as logic low

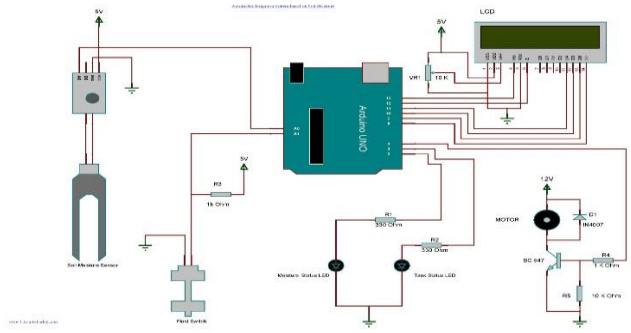

Fig -4 Pin Diagram

This command is pass to microcontroller. In this condition the microcontroller outputs logic high that switches on a relay driving transistor because of that the relay is switched on and the pump motor is in ON condition.

Thus water flow is started Then, while the soil goes sufficiently wet, the soil resistance decreases making available a voltage to the non-inverting input higher than inverting input, so that the output of comparator is logic high which is given to microcontroller. In this condition microcontroller outputs logic low to a transistor which conducts by making the relay OFF and tends the pump motor in stops condition.

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