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Volume 08, Issue 07, Pages: 38–46.

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DESIGN OF IOT BASED GREEN HOUSE MONITORING AND CONTROLLING SYSTEM USING ARDUINO PLATFORM

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ABSTRACT: Greenhouse Automation System is the technical approach in which the farmers in the rural areas will be benefitted by automatic monitoring and control of greenhouse environment. It replaces the direct supervision of the human. In this paper the different papers have been reviewed and developed the proposed system based on the limitation in the present monitoring system. It also focuses on the Generic Architecture which can be applied for many other Automation Application. Greenhouse is a building where plants are grown in a controlled manner. Nowadays due to urbanization and lack of land availability there is a great need to construct the Greenhouses which will be reserved mainly for growing crops. With the advancement of technology we can control and monitor the multiple Greenhouses using IOT from the central location wirelessly.

Keywords: Arduino ATmega328, Atmospheric sensors, DC motor controlled sprinkler system, IOT.1.

(I) INTRODUCTION

The principle of this task is shrewd water system framework which is savvy and a working class rancher utilizes it in homestead field. Today we are living in 21st century where robotization is assuming essential job in human life. Mechanization enables us to control apparatuses programmed control. It give comfort as well as lessen vitality, proficiency and efficient. Development of the plants specifically relies on the water and supplements soil in which it is developed the water content soil and salt shape a dirt arrangement which will supplements to plants. Temperature and dampness assumes an imperative job a job in plants breath and photosynthesis process .Today enterprises are utilize computerization and control machine which is high in expense and not reasonable for utilizing in a homestead field.So here we additionally structure a

savvy water system innovation in ease which is usable by Indian ranchers. Upon the detecting the development the sensor transmits the information to the microcontroller which besides the switch is ON. A nursery is where plants are developed. Nursery shields crops from an excess of warmth or chilly, shield plants from residue tempests and snow squalls, and help to keep out vermin.

Light and temperature control enables nursery to transform arrive into arable land in this manner enhancing nourishment generation in edge situations. Since nursery enable certain products to developed all through the nursery are progressively essential in the sustenance supply high scope nation Greenhouses are frequently utilized for developing blooms, vegetables, leafy foods plants. Standard cultivating strategies once in a while prompts water marking in the field which makes soil unfertile or sailine . The objectives of this paper were to control the water motor thusly and select the heading of the flood of water in pipe with the help of soil suddenness sensor.

In this paper, the Design had been aimed data acquisition in greenhouse for multiple sensors to use data for simulation or processing to achieve the better enhancement of growth in greenhouse, this data has effect on the climate of greenhouse. Graphical User Interfaces (GUI) had been used through LabVIEW, firmware of arduino as software and arduino board and sensors as hardware. by using arduino mega board provides multiple inputs analogs and I/O digitals to made read data sensor easy to take temperature, humidity, CO2 gas, also measuring the soil moisture that needed for irrigation plants and the intensity of lights that applied for greenhouse . These factors has the major effect on increase in growth of plants. Greenhouse environments monitoring different changes to parameters, the system for this purpose had been provided and given ability to control on climate of greenhouse.

The crop agriculture in greenhouse is higher affected by the surrounding conditions. The significant environmental factors for the quality and better productivity of the plants growth are temperature, relative humidity, Lighting, moisture soil, and the CO2 amount in greenhouse. Continuous monitoring of these factors gives relevant information pertaining to the individual effects of the various factors towards obtaining maximum crop production [J. H. Shin et al., 1998]. Arduino is an open-source electronics prototyping platform based on flexible, easy-to-use hardware and software. It's intended for artists, designers, hobbyists, and anyone interested in creating interactive objects or environments. [David et al., 2007]. Arduino can sense the surroundings by receiving input signal from a variety of sensors and can affect its environment via controlling heater, Water pump, and other actuators. The AVR Atmega2560 on the board is programmed using the Arduino programming language (depended on Wiring) and the Arduino development environment (depended on processing). Arduino projects can be stand-alone or they can communicate with software running on a computer (e.g. Flash, Processing, MaxMSP) A greenhouse is seen as a multivariable process presents a nonlinear nature and is influenced by biological processes [Herrero et al., 2007].The five most important parameters must be taken into consideration when design a greenhouse are temperature,

relative humidity, ground water, illumination intensity and CO2 concentration. This parameters is important to realize that the five parameters mentioned above are nonlinearand extremely interdependent [Fourati et al., 2007; Blasco et al., 2007; Putter and J. Gouws, 1996]. the computer control system for the greenhouse involves the series steps [Melrolho, 1999]:

1. Acquisition of data through sensors.
2. Processing of data, comparing it with desired states and finally deciding what must be done to change the state of system
3. Actuation component carrying the necessary action.

This paper describes a solution to the first part of the system. The information is obtained from multi-sensors station and is transmitted through USB port to computer.

II. RELATED WORK

This project describes the design of a greenhouse monitoring & controlling system based on IOT using Arduino. Some of the previous systems used android phone to monitor the green house but lacked to control it using android from remote locations. One of them was based on Global System for Mobile Communications (GSM) in which notifications are sent via SMS, but disadvantage of this system was every time user had to type commands which was time consuming and costly. The biggest disadvantage of these systems was that one person always had to be present in the green house or in the vicinity of the green house[6]. The first problem which is overcome in our system is that a person need not always be present in the greenhouse. Plants in green house are grown under controlled environment. The temperature differences can cause harm to plants. Sometimes the farmers cannot predict which action needs to be taken so to control the environment and may take wrong decisions thus causing more harm to the plants in the green house. Our system will allow him to take proper decisions by providing the status of the sensors to the farmer with accurate information through the IOT web server. Thus this system helps farmer to control green house from remote locations.

III. THEORY

A. Arduino UNO

The arduino Uno is a microcontroller board based on the ATmega328, It has 14 digital input/output pins, 6 analog input, a 16 MHZ crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. The Uno differ from all preceding boards in that it does not use the FTDI USB to serial driver chip.”UNO” means one in Italian and is named to mark the upcoming release of arduino 1.0. The Uno is the latest in a series of USB Arduino boards and reference model for Arduino platform. The Arduino Uno can power via the USB connection or with external power supply. External power can come either from an AC to DC adapter or battery.The board can operate on an external supply of 6 to 20 volts. If supply with less than 7v, however, the 5v pin may supply less than five volts and the board may be unstable. The Ttmega328 has 32 KB of flash memory for storing code .It has also 2KB of SRAM and 1KB of EEPROM. The Arduino software includes a serial monitor which allows simple textual data to be send to and from the Arduino board, The RX and TX LEDs on the board will flash when data is being transmitted via the USB to serial chip and USB connection to the computer.

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A Software Serial library allows for serial communication on any of the UNO's digital pins, the arduino software includes a wire library to simplify use of the I2C bus. Arduino is open source hardware and software, which are license under the GNU lesser General public license, which is permitting the manufacture of Arduino board and software distribution by anyone.

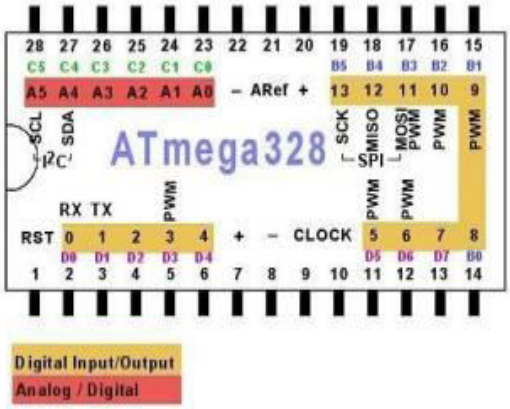

Fig:1: Pinout of ATmega 328

The Arduino are programmed using a dialect of feature from programming language C and C++. In addition to using traditional compiler tool chains, the Arduino provide integrated development environment (IDE) based on processing language project [1].

B. Atmospheric Sensor's

i) Soil Moisture Sensor:

The two copper leads act as the sensor probes. They are immersed into the specimen soil whose moisture content is under test. The conductivity of soil depends upon the amount of moisture present in it. It increases with increase in the water content of the soil that forms a conductive path between two sensor probes leading to a close path to allow current flowing through.

Fig 2: Soil Moisture Sensor

ii) Light Sensor (LDR):

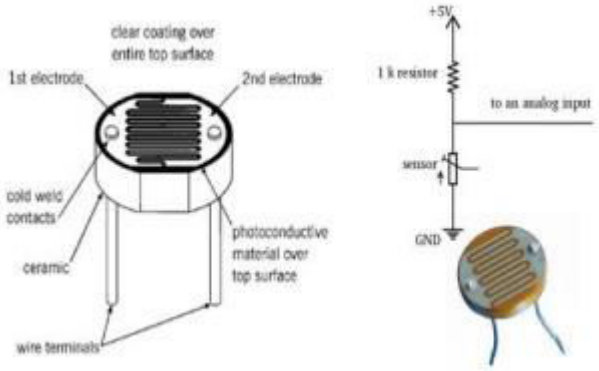

Fig 3: LDR Sensor

The light sensor is extremely sensitive in visible light range. With the light sensor attached to the system when the surrounding natural lights are low, it displays the digital values.

iii) Humidity Sensor (DHT11)

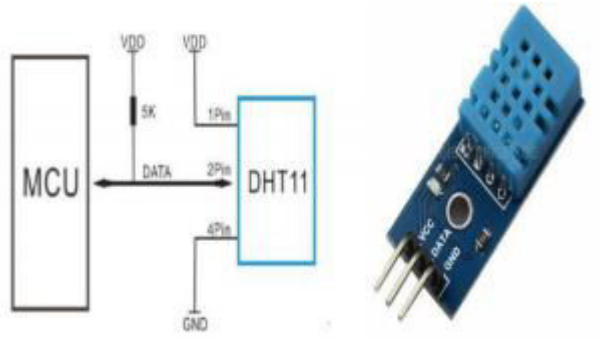

Fig 4: DHT11 Sensor

Humidity sensor is used for sensing the vapours in the air. The change in RH (Relative Humidity) of the surroundings would result in display of values

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iv) Temperature Sensor (LM35):

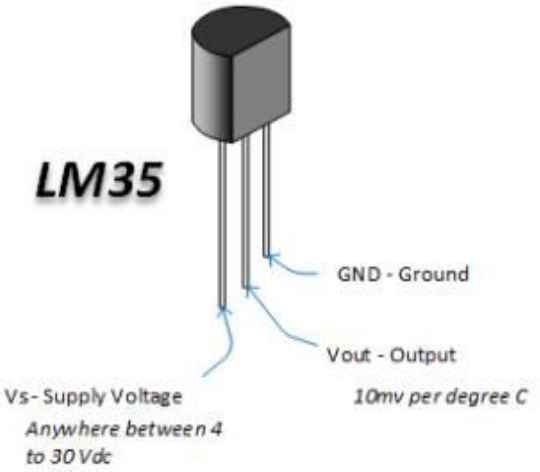

Fig 5: LM35 Sensor

If the temp exceeds beyond the limit set then a fan will be automatically switched ON as a coolant to reduce the temp.When it reaches the desired temp the fan will be switched OFF automatically with the help of a relay.But if the temp decreases bellow the optimum temp a bulb as a heater will be switched ON to set the temp within the desired range.

VI. SIGNIFICANCE AND SCOPE

Automatically control environmental conditions within greenhouse allowing any type of plants to be grown all year round. Eliminates risk of greenhouse not being maintained at specific environmental conditions due to human error.Minimizelabor costs involved in maintaining a greenhouse.A customer able to define specific greenhouse conditions."Plug-And-Play" product.

This project describes the design of a greenhouse monitoring & controlling system based on IOT using Arduino. Agriculture projects even in urban areas are on a rise in recent times, in unique forms technological progress makes the agricultural sector grow high, Which here is made by the IOT. The IOT will dramatically change the way we live our daily lives & what information is stored about us. The computing is free to use anytime from the cloud and anywhere as long as the computer is connected with the internet. This monitoring & controlling system precepts different parameters inside the greenhouse using sensors,GSM& IOT to provide the updates. The developed system can be proved profitable as it will optimize the resources in the greenhouse. The complete module is of low cost, low power operation hence, easily available to everyone.

V. PROPOSED METHODOLOGY

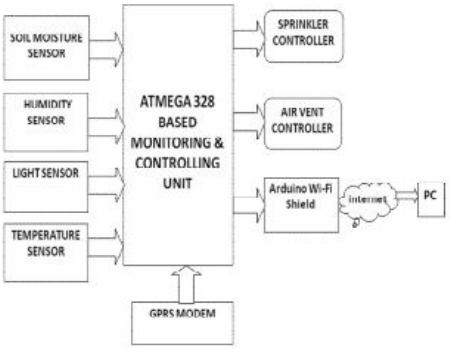

Fig 6: Block Diagram

The basic block diagram of greenhouse system is as shown in fig .5. An Arduino platform micro- controller is used to obtain values of physical data through sensors connected to it. And then sensor's collected data is given to GPRS module.

A. Mechanism

- An arduino based Greenhouse Automation is designed.
- The arduino can be programmed with arduino software (IDE).
- Internet Of Things concept is used for showing the sensed data on web portal page.

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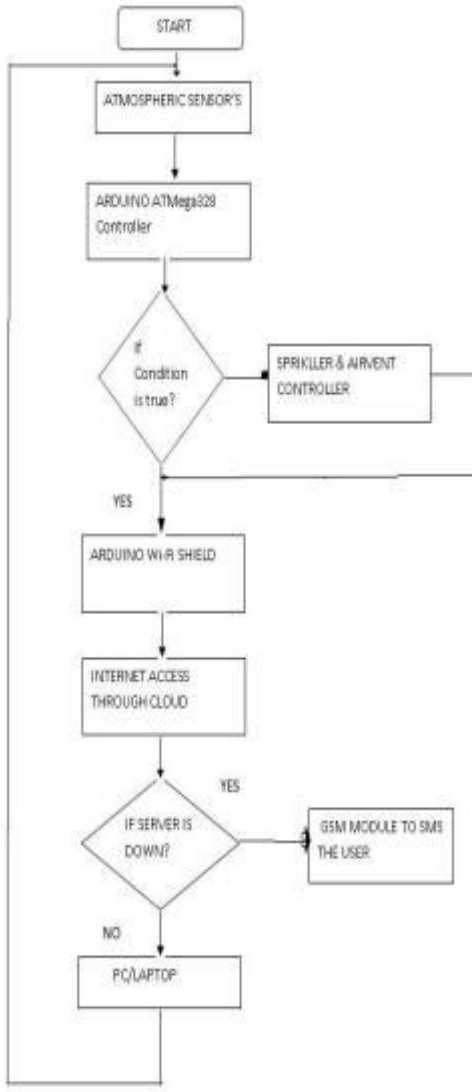

Fig 7: Flow chart

B. Software Implementation

The software part programming through Arduino Uno software (IDE). It is easy to write code and upload it to the board.C and C++ language are used for programming

VI. CIRCUIT IMPLEMENTATION

Fig. 8: Ardunio Kit

- Switch on the supply.
- Here I am using Arduino for data transmission and reception in the circuit. It acts as a control unit.
- First step is to initialize our mobile number on the GSM module for message transmissions.
- After initializing the mobile number on the GSM module
- The messages will sent to mobile number
- If the water level is high .the temperature is moderate the pump will on .this message will sent to mobile through GSM
- The humidity value also indicates in the mobile
- If any intruder will enter the buzz or will on

In this framework Arduino is the core of entire framework which takes power over the procedure. At the point when sensors sense any adjustment in condition or in soil Arduino comes in real life and process the required activity.

At the point when soil dampness sensor does not detect dampness in soil then Arduino turns on the water siphon and makes an impression on the proprietor of status that the engine is turned on .And on the off chance that LDR faculties low light, Arduino takes control and turns on the fake lights. In this framework an is utilized for showing status for al tasks like Motor turned on or off, temperature, stickiness and light status. The LCD's information pins are associated in 4-bit mode (information stick d5, d6, d7, d8 stick of LCD is specifically associated with stick no. 4, 5, 6, 7 of Arduino and order stick of LCD's Rs and En is associated with stick no. 2, 3 of Arduino).

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LDR is utilized for detecting light force and its yield is associated with Analog stick A0 of Arduino while the fake light is associated utilizing relay. The transfer is worked by utilizing ULN2003 and controlled utilizing pin number 10 of arduino. Stickiness and temperature sensors are utilized for detecting moistness and temperature that are associated specifically with Analog stick A1 of Arduino. Fan is straightforwardly associated with stick 8 of Arduino and CFL light (instead of Sprays) is associated with stick 11 of arduino by utilizing Relay. Water siphon is additionally associated by utilizing transfer and is controlled by Arduino's stick number 12 and the sensor for estimating the dirt dampness, stick number 9 is utilized.

This venture can be executed in any shut territory which found remote spots which should be checked without human nearness, similar to explore focus situated in high height. On the off chance that the esteem is higher than the predefined esteem it will send message to the proprietor that the mugginess is high. The temperature sensor will detect the estimation of the temperature and if the temperature is high the sensor will show it in the screen. The dirt dampness sensor will detect the water content in the dirt and if the water content is less the client will be demonstrated .Measuring soil dampness is essential for horticultural applications to enable agriculturists to deal with their water system frameworks all the more effectively.

VII. HARDWARE RESULT ANALYSIS

We structured this task to screen and control the ecological parameters. We got result dependent on viable administration of nursery condition by both programmed way and human association way. Programmed controlling procedure is completely done dependent on coding. Amid this procedure if any of sensor modules does not work appropriately no sources of info will be given to microcontroller or wrong outcome will be acquired. So around then human inclusion will be extremely helpful for nursery condition. The sensors are associated with the small scale controller. In this the dampness sensor and the dirt dampness sensor are associated through the ADC on the grounds that they are simple sensors. The sensors will detect the diverse parameters.

When we start the on button LCD will display:

FIG 9 start position of the on button LCD will display

FIG 10 The displayed result when the patient exceeds the standard temperature value:

On LCD display:

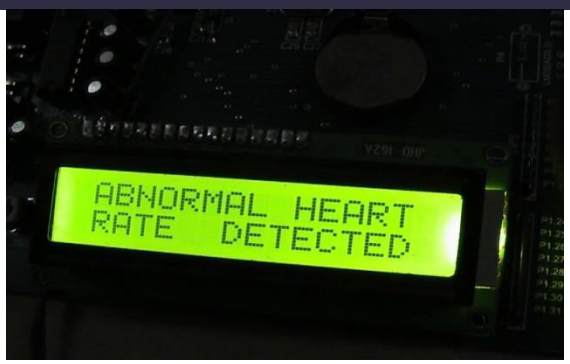

FIG 11 The displayed result when the patient exceeds the standard heart beat value: On LCD display

VIII. CONCLUSION

Here, proposed configuration is executed with Arduino stage for nursery checking, In green house innovation, more number of the parameters is to be control in light of the fact that, the assortments of the harvest are huge. They are expanding step by step in view of the advancement in agribusiness innovation. In this circumstance, the remote sensor coordinate with extra equipment and programming is an effective answer for green house control. Tentatively it is demonstrated that the equipment create by Cypress Inc. is the best arrangement which chips away at low power with less multifaceted nature and high unwavering quality for nursery control.

Later on, on the off chance that parameter still increment, for WSN innovation with right now accessible band width, may not be adequate. At that point WSN with psychological radio innovation might be the arrangement .This progression in accuracy farming through Wireless Sensor Network in nursery control is greatly valuable. This has scope in creating nations in globe, where agribusiness is the principle business. Controlling temperature and soil dampness with the assistance of Web server utilizing IOT.

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