Design and implementation of purifying waste water and plant Irrigation system by using solar panel with GSM

M.Prabu[1], T.Jayakumar[2] D.Nallasivam[3], D.Mohan Raj[4], K.Vignesh[5]

ABSTRACT

In this paper, the Design of Embedded system for the Automation of Drip irrigation is presented. Drip irrigation was named in Israel in 1959. The green house based modern agriculture industries are the recent requirement in every part of agriculture in India. In this technology, the humidity and temperature of plants are precisely monitored and controlled. Water is very precious to all the humans and as well as to the plants, trees. The major amount of fresh water is utilized by the agricultural industry for irrigation. By using drip irrigation the water will be maintained at the constant level i.e the water will reach the roots by going drop by drop. This is very important because this can only ensure the survival of the plants. Water can be applied at a single point on the land surface through devices called emitters or as a line source from either closely spaced emitters or tubes with continuous or equally spaced openings that discharge water a drop at a time. If the field is irrigated heavily with water, there are chances that the plant may die because of excessive irrigation. The water could also wash them away during irrigation if very strong force of water is released at the same time. On the other hand, if there is insufficient water, then also there are chances that the plants may die due to lack of water. So, it is very important for the farmer to maintain the content on the field. In this paper the design of a Microcontroller based drip irrigation mechanism is proposed, which is a real time feedback control system for monitoring and controlling all the activities of drip irrigation system more efficiently. Irrigation system controls valves by using automated controller to turn ON & OFF. This allows the farmer to apply the right amount of water at the right time, regardless of the availability of the labor to turn valves or motor ON & OFF. This reduces runoff over watering saturated soils avoid irrigating at the wrong time of the day. It improves crop performances and help in time saving in all the aspects.

Index Terms: Drip Irrigation, LM3S5T36 Microcontroller, Wireless Sensor Nodes, Soil Moisture Sensor.

INTRODUCTION

It has been ten years since drip irrigation was introduced in California to be used on commercial agricultural crops. The initial work was started in an avocado orchard in San Diego County, and from this small five-acre experimental orchard the acreage has increased tremendously. Many crops are under test with drip irrigation. Equipment used in drip irrigation systems is very important. There are many pieces of equipment required. They include plastic hose or pipe, spaghetti hose, emitters, pressure regulators, pressure gauges, valves, fertilizer tanks, filters — both sand and screen, time clocks, tensiometers, evaporative pans, meters, and fertilizer injectors. One of the most important items in the hardware for drip irrigation systems is the filter. An automated management of green house brings about precise control needed to provide the most proper condition of plant growth.

Author for correspondence:

[1]Professor, Department of Electrical and Electronics Engineering, Nandha Engineering College, Erode, Tamilnadu, India

Email: prabunec2013@gmail.com

[2]Assistant Professor, Department of Electrical and Electronics Engineering, Nandha Engineering College, Erode, Tamilnadu, India

Email: jayakumar.t@nandhaengg.org

[2, 3, 4]UG Student, Department of Electrical and Electronics Engineering, Nandha Engineering College, Erode, Tamilnadu, India

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The five most important parameters to consider when creating drip irrigation are humidity, temperature, ground water, carbon dioxide, light intensity.

In this paper an advance microcontroller LM3S5T36 which is 32-bit ARMS CortexTm-M3 with features of 32kb single flash memory, 12kb RAM and three 32 bit timers and two 10 bit analog to digital converter is used. A timer for the automation of drip irrigation is set, which works accordingly to the sensors and combining all this features the flow of water in fields will be automatically controlled rather than manually. It also contains the temperature and moisture sensor.

EXISTING SYSTEM

Most of the existing systems are manual system. The manual system needs labor for monitoring the productivity and health crop. Considering labor's salary, the system will cost much more than the automatic system, in which there is no assistance to the system. The farmer himself has to check the moisture level of the soil and has to make a judgment whether the field requires water or not. This way of inspecting the moisture level is not accurate and this drawback can be eliminated by using soil moisture sensor which is been used in our architecture. Moreover, the temperature required for the crops to sustain, differs from crops to crops. If the temperature increases or decreases than the expected temperature, it may affect the quality of the crops. This problem can be overcome by using the shielding mechanism, thereby maintaining the desired temperature.

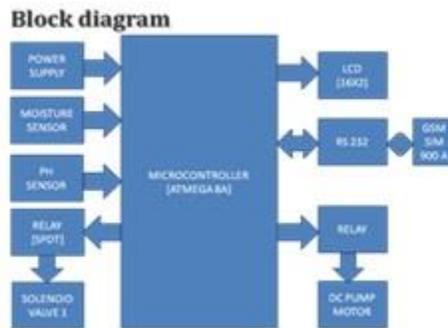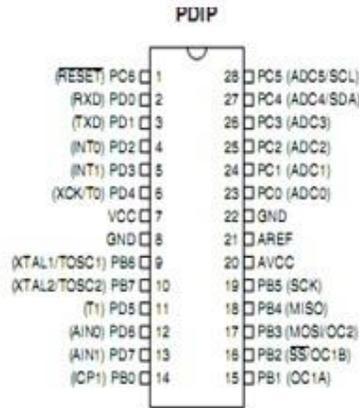## ARCHITECTURE DESIGN AND COMPONENTS

Architecture Design

Fig. 1 Architecture of Solar Panel Based Automatic

Plant Irrigation System *Working*

On the input side there are three sensors as shown the architecture. Soil moisture sensor will check the moisture of the soil as per the crop which is to becultivated. When the moisture level of the soil goes above or below the set value, it will direct the microcontroller whether it should pump the water or not. Humidity sensor will check the temperature of the surrounding. If the temperature goes above or below the set value which is needed for a crop to grow, the microcontroller will direct the shedding to shed the entire field thereby maintaining the temperature needed by the crop for its healthy growth. The water level sensor will check whether the water in the reservoir or tank is empty or not. Buzzers are connected at the output side to get rid of birds, animals, and mosquitoes. LCD display is used to notify what actions is been taken by the microcontroller. The entire system is been monitored wih the help of GSM module, thereby making it a close loop system, thus, providing feedback to the farmer on what actions is been taken by the microcontroller.

Pin configuration

PDIP

```
(RESET) PC6 □ 1        28 □ PC5 (ADC5/SCL)
    (RXD) PD0 □ 2       27 □ PC4 (ADC4/SDA)
    (TXD) PD1 □ 3       26 □ PC3 (ADC3)
    (INT0) PD2 □ 4      25 □ PC2 (ADC2)
    (INT1) PD3 □ 5      24 □ PC1 (ADC1)
 (XCK/T0) PD4 □ 6       23 □ PC0 (ADC0)
        VCC □ 7         22 □ GND
        GND □ 8         21 □ AREF
(XTAL1/TOSC1) PB6 □ 9   20 □ AVCC
(XTAL2/TOSC2) PB7 □ 10  19 □ PB5 (SCK)
      (T1) PD5 □ 11     18 □ PB4 (MISO)
    (AIN0) PD6 □ 12     17 □ PB3 (MOSI/OC2)
    (AIN1) PD7 □ 13     16 □ PB2 (SS/OC1B)
    (ICP1) PB0 □ 14     15 □ PB1 (OC1A)
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Pin diagram of MAX232

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C1+  [1]            [16]  Vcc
V+   [2]            [15]  GND
C1-  [3]   MAXIM    [14]  T1OUT
C2+  [4]   MAX220   [13]  R1IN
C2-  [5]   MAX232   [12]  R1OUT
V-   [6]   MAX232A  [11]  T1IN
T2OUT [7]           [10]  T2IN
R2IN [8]            [9]   R2OUT
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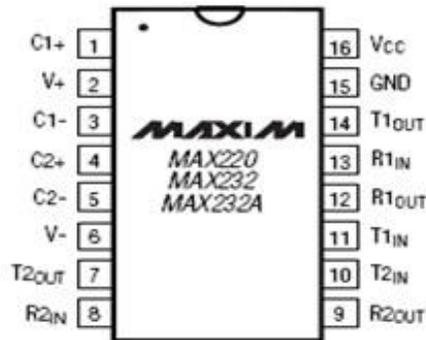
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COMPONENTS

Water Level Sensor

An annoying drawback of many liquid level sensors is the effect of electrolytic reaction between the liquid and the sensors. Metal electrodes are prone to corrosion and consequent loss of effectiveness (reduced conductivity), with the result that they have to be replaced at frequent. One solution to this problem is to ensure that there is an AC, rather than DC potential between the sensor electrodes. The constant reversal of electrode polarity drastically inhibits the electrolytic process, so that corrosion is considerably reduced.

Humidity Sensor

The humidity sensor HIH4000/HSY220, manufactured by Honeywell is used for sensing the humidity. It delivers instrumentation quality RH (Relative Humidity) sensing performance in a low cost, solder able SIP (Single In-line Package). Relative humidity is a measure, in percentage, of

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the vapour in the air compared to the total amount of vapour that could be held in the air at a given temperature.

Soil Moisture Sensor

It is a measure of temperature at different levels of the Earth's atmosphere. It is governed by many factors, including incoming solar radiation, humidity and altitude. This variable should be defined as a continuous signal (normally as a sine wave which simulated the day and night temperature changes). An analog temperature sensor that is LM35 is a chip that tells us what the ambient temperature is. These sensors use a solidstate technique to determine the temperature.

Solar Panel

Newly added feature for our project is – Solar Panel. As we were facing problem for regularly discharge of 12v battery used at filed. We finally decided to go for solar panel renewable energy source. It converts light energy from the sun into 12 Volt DC electricity. Slowly charges our 12V battery. It also helps to maintain a charge and extend battery's life. It protects battery through long storage periods. This solar panel charger has no moving parts that could wear out over time.

Components

- RS232
- GSM Modem
- 12 V Battery(Solar Panel)
- Bridge Rectifier(AC –DC)
- Capacitors
- Voltag Regulator
- IC7805
- Micro-Controller8051
- Series Embedded
- C/ASSBUZZER
- LCD Water level Display
- Sensor
- Humidity Sensor
- Soil Moisture Sensor

CIRCUIT DIAGRAM
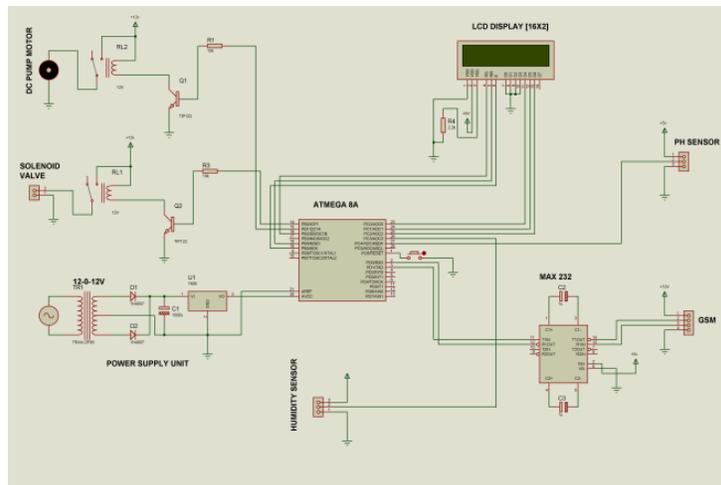
Microcontroller

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in system programmable Flash memory. The device is manufactured using Atmel's high-density non volatile memory technology and is compatible with the industry standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non volatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port,

on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

GSM Modem

Short Message Service is GSM techniques to transfer data from distant places such as from one area to the area of the same city or from another city .In our project we are using SMS technique to instant or quick transfer of data or notice to the required destination. It is a convenient facility of the GSM network. A message consisting of a maximum of 160 alphanumeric characters can be send to or from a mobile station. If the subscriber's mobile unit is powered of f or has left the coverage area, the message is stored and offered back to the subscriber when the mobile is powered on or has reentered the coverage area of the network. This function ensures that the message will be received. In our project we are using SIM300 for transfer of data from weather station. Interfacing with PIC is done with RS-232 through D-TYPE 9 pin connector. SIS is the leading manufacturers of GSM modems for lower price in India.

LCD

This is the first interfacing example for the Parallel Port. We will start with something simple. This example doesn't use the Bi-directional feature found on newer ports, thus it should work with most, if not all Parallel Ports. It however doesn't show the use of the Status Port as an input for a 16 Character x 2 Line LCD Module to the Parallel Port. These LCD Modules are very common these days, and are quite simple to work with, as all the logic required running them is on board.

Buzzers

The buzzers used in this architecture, produces ultrasonic sound of 17.4 kHz which is annoying for mosquitoes and another buzzer ranging in the frequency 15-25 kHz which is not annoying for birds. By using these two buzzers, we provide protection to the crops from birds which tries to feed on the crops, and prevents mosquitoes from breeding in the reservoir or tank which is present near the field. Also, piezo buzzers are used to make sure that no animals trespasses the field.

CONCLUSION

The entire system will act as a crop insurance system, as it will protect the crops by shielding it from untimely rain, hail tones, and temperature, thereby helping the farmers to get optimum cultivation. Also, it will help to make proper use of water, as the soil moisture level differs from crops to crops and this will be taken care of by the soil moisture sensor. As the entire system will be powered by solar energy which will be stored in the rechargeable batteries, one need not think of the lectricity consumption, as life of solar panel which is available these days is 25 years. Moreover, the entire system is been monitored by GSM model, farmer will always be alerted what actions is been taken by the microcontroller.

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