Smart Irrigation System Using ARM 7

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Abstract – India's growing population needs a rapid development in food technology. India's economy is predominantly based on agriculture. Water is an important resource for agriculture. Water quality management of freshwater resources is extremely important. Appropriate irrigation systems can be used to conserve water and increase crop yields. As we all know, drip irrigation is economical and efficient. Traditional drip irrigation systems are controlled and monitored by farmers. This article presents an automatic water filling system that is controlled and monitored using an ARM7 processor. The sensors are used to monitor the moisture content of the soil and automatically turn on or off at various times depending on the system's valves. It is also important to consider the pH of the soil because it affects the availability of nutrients in the soil, sensors are used to measure the pH of the soil and based on the pH good feedback is given to the farmers to maintain the proper pH. Nitrogen is an important macro element in soil. It is an important nutrient for plant growth. Sensors are used to detect soil nitrogen levels and based on current nitrogen levels, farmers are given advice to control nitrogen levels as needed. It is a important nutrient compound for plant growth. Sensor to detect the soil nitrogen content is used and depending upon the available nitrogen content suggestions are given to the farmer maintain nitrogen level as per requirement.

***Key Words*:** ARM 7 , GSM module ,LM35 temperature Sensor ,Integrated Circuit , Transmitter , Receiver , Sensor

1. INTRODUCTION

Many crops require irrigation. In semiarid and arid regions, water quality and management is an important consideration. Continuous draining of the soil reduces the amount of water because large volumes of water flow slowly into the soil without water. Too much water is wasted due to poor water management. Currently, the demand for new technologies for water use and water conservation is growing rapidly.

Farmers' goal is to "get more crops per drop," so they need **to** find irrigation strategies that use less fresh water. This technique is useful in areas where water is scarce. The most important advantage of modern drip irrigation systems is that the water is transmitted close to the plant roots, which saves a lot of water. Currently, farmers in India use controlled irrigation systems, where farmers irrigate periodically. This process sometimes uses more water, and sometimes the late arrival of water causes the crops to dry out.

Lack of water can cause problems for plants before wilting is noticed. This problem can be effectively solved by using an automatic control based drip irrigation system that only irrigates when water demand is high. Irrigation systems use valves to open

or close. Automatic drip irrigation is an important tool to control the humidity of special crops in the greenhouse, it is a simple and precise method of irrigation. It also helps in time saving, removal of human error in adjusting available soil moisture levels and to maximize their net profits. Along with water the other important resources to the crop are the nutrients. If the nutrients are available in the right amount for the growth of crops, then the yield of the crops also increases. Thus the productivity can be raised with the proper management of water resources and nutrients.

2. LITERATURE SURVEY

G. Kavianand, V. M. Nivas at [1] Developed Smart drip irrigation system for sustainable agriculture

This will also provide useful information and useful information about soil pH and soil nutrients such as nitrogen. Data collected by the system can be sent for further analysis.

In the end, it was decided that using this proposal could save workers and water, increase production and ultimately increase profits.

Mr. Madhu Kumar Mr. Varun [2]

DevelopedAutomated Irrigation System by Using ARM Processor

Automatic Drip Irrigation is a valuable tool for accurate soil moisture control in highly specialized greenhouse vegetable production and it is a simple, precise method for irrigation.

According to the available nitrogen content in the soil suggestions can be given to the farmer to add the fertilizers containing nitrogen for healthy plant growth.

K Nilson, G Sharmila [3]

Developed Intelligent Auto Irrigation System Using ARM Processor and GSM

The second goal is to use the Arduino Mega to create a system that processes data from soil sensors to control all water flow by watering the plants.

The improvement suggestion for future work is to use solar panels as the energy consumption of the system. Therefore, the system will be environmentally friendly.

N. A. M. Leh,

M. S. A. M [4]. Developed Smart Irrigation System Using Internet of Things

The system is used to turn the valves ON or OFF automatically as per the water requirement of the plants.

It is safest system and no manpower is required. The system helps to farmer or gardener to work when irrigation is taking place, as only the area between the plants are wet. Reduce soil erosion and nutrient leaching.

S. Gurunathan V. Krishna [5] Proposed Smart Irrigation System

This system helps us in understanding the use of IoT in the field of Agriculture. It helps in increasing the yield of the crop and also maximizes the effective use of water by smart irrigation techniques. Here, all the environmental conditions are noted frequently so that any drastic change can be easily realized and corrected as soon as possible. The received data can be used for data analytics and study of climatic conditions in a particular area can be done. The main focus of this system is to improve farming methods

THEORETICAL BACKGROUND:

1. **ARM7 processor**:

ARM7 is a general-purpose 32-bit microprocessor with high performance and very low power consumption. The ARM architecture is based on the principle of reduced instruction set computing (RISC), and the instruction set and decision making process is simpler than a microprogrammed complex instruction set computer (CISC). This flexibility allows for highly efficient instruction and effective time-intervention responses from a small number of students at a reasonable cost. Pipeline allows processing and storage anywhere

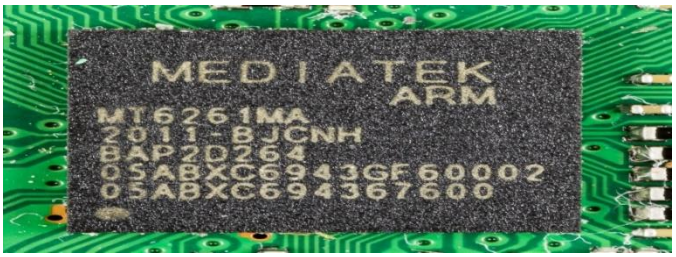


Fig -1: ARM 7 Processor

2 Sensors:

Sensors are devices that convert a physical parameter into an electrical signal. The system consists of a sensor for temperature, humidity, humidity, soil pH and soil nitrogen. The output of the sensor is an analog signal; the signal is converted to a digital signal and then fed to the processor. The temperature sensor is used to measure the soil temperature. An LM35 temperature sensor is used here. The output voltage of the sensor is linearly proportional to the temperature in Celsius (C). A humidity sensor is used to measure the humidity of the environment. HC-01 is used as a humidity sensor module. The relative humidity is converted to an output voltage which is the desired output. A moisture sensor is used to measure the moisture content of the soil. Copper electrodes are used to sense the moisture content of the soil. The conductivity between the electrodes helps to measure the level of moisture content. The pH sensor helps to determine the pH of the soil. The electrode is used to measure pH. A nitrogen sensor is used to measure the nitrogen content of the soil.

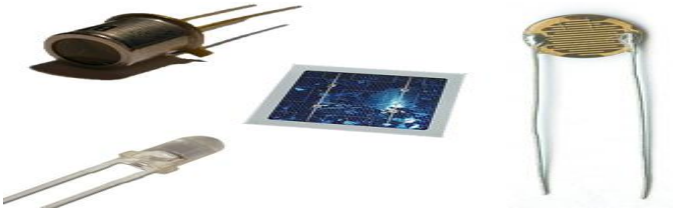


Fig 2 Sensors

3 Transmitter part:

Consists of ARM7, MAX 232 and Zigbee transceiver. Soil parameters are known from different sensors in the system. The benchmark is stored in the ARM7 processor.

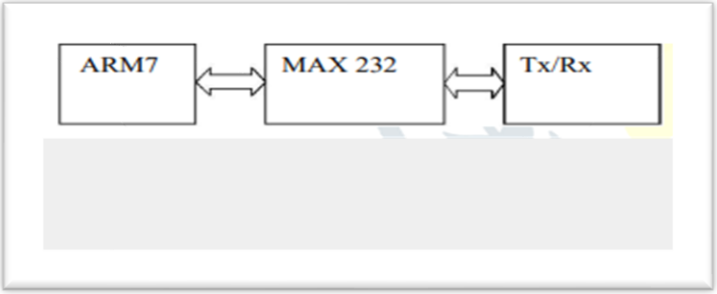


Fig 3 Transmitter Part

4 Receiver Part: The picture shows the receiver part. It has Zigbee transceiver, MAX 232 and PC.

The data sent by the system is received by the PC. VB software can be used to view and analyze collected data. Visual Basic or VB is used to create a Graphical User Interface (GUI).

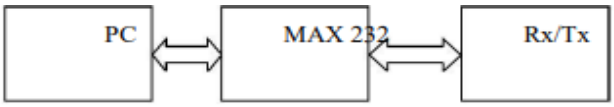


Fig. 4.Receiver Section

GSM module: SIM 900 A is smallest and cheapest module for mobile communication. It uses 900 and 1800 MHz frequency band and allow users to send and receive calls and messages

Fig 5 GSM module

6 LCD display: It is used to display the data in digital format

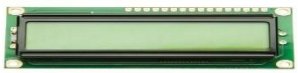


Fig 6 LCD disply

5 Software keil µ vision (ide): Keil's ARM company produces C compilers, macro assemblers, real-time kernels, debuggers, simulators, integrated environments, evaluation boards and simulators for the ARM7 / ARM7 / Cortex-M3, XC16x / C16x / ST10, 251 and 8051 families of MCUs. select the microcontroller you are using from the database and µVision IDE will install all compiler, assembler, linker and memory options. The Keil ARM toolset includes three main tools; assembler, compiler and linker. Defragmenters are used to assemble ARM defragmenter programs. Compilers are used to compile C source code into object files.

The connector is used to create discrete modules suitable for in-circuit emulators. Here are easy-to-find software that can be used on PC. Data sent from the system is output from the PC for analysis. The algorithm for displaying the data is given below.

4 PROPOSED SYSTEM:

The main aim of this project is to provide smart and efficient agriculture system to farmers. The components used are ARM 7 microcontroller, LM35 temperature Sensor, Soil Moisture Sensor, Wet Sensor and GSM module. The software which is used is keil micro version software. All components are connected to ARM 7 microcontroller. This system measures the environmental components such as Temperature, Humidity, Wetness and sends the data on users mobile

System Architecture:

System Architecture Comprises of ARM 7 microcontroller, LM35 temperature sensor, Wet sensor, Humidity Sensor GSM module, 16 *2 LCD display etc. All the components are connected to ARM 7 Microcontroller. It is heart of this system. First we will set certain levels of Temperature humidity in ARM 7 Microcontroller. The sensors are used to sense the environmental parameters such as temperature,

wetness, humidity etc. All this data is in analog form. Arm 7 microcontroller converts this data in digital format by using inbuilt A/D Converters. The data is displayed on 16*2 LCD model ARM 7 Passes the data to GSM 900 module which will send the alerts through SMS on users mobile.

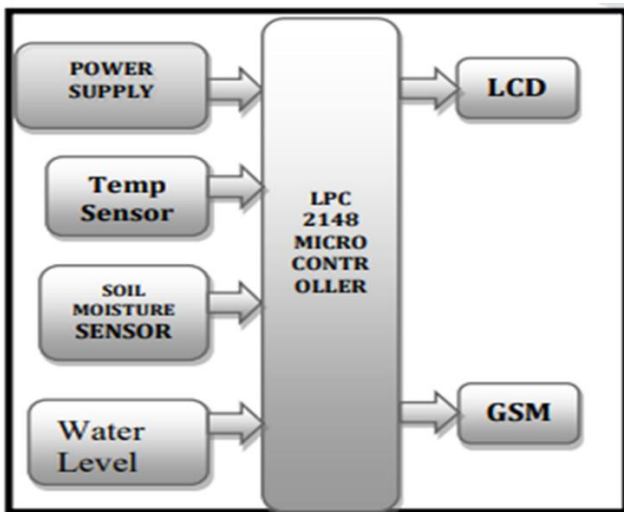
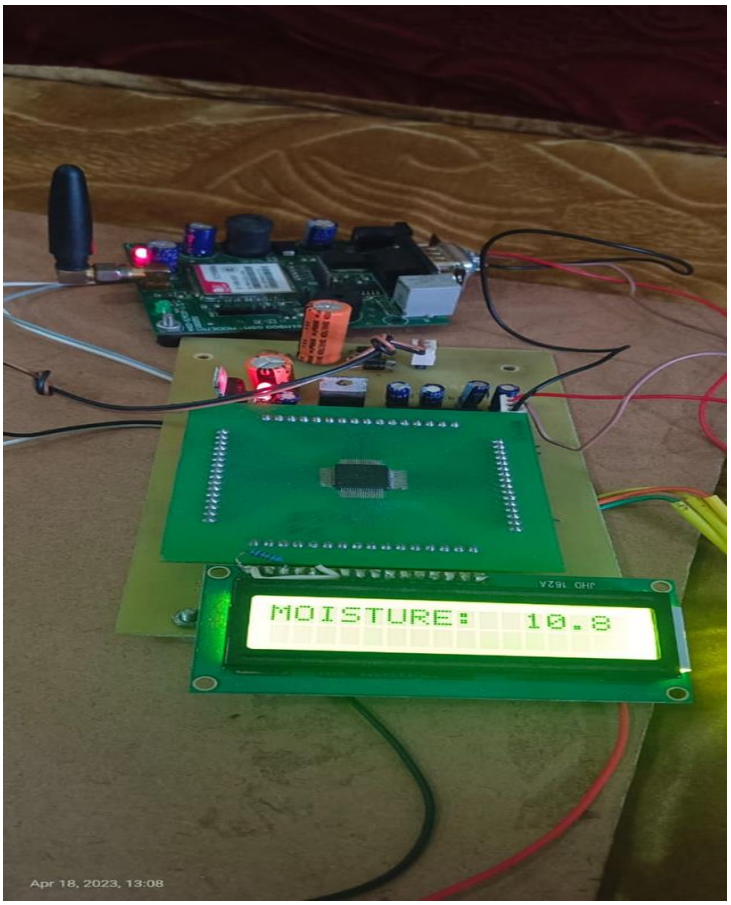


Fig 7Block Diagram

5.IMPLEMENTATION:

The prototype model consists of ARM 7 microcontroller, GSM module, LM35 temperature sensor, wet sensor, humidity sensor, LCD display etc. ARM 7 is used to interface with sensors. ARM 7 requires 3.3 volt supply to operate at same time 5.5-volt supply is needed to components such as LCD, LM35 temperature sensor, wet sensor. 12-volt supply is given to GSM 900 module. We have 230-volt AC available voltage and we require 22.3-volt DC supply in total. So we require step down transformer to minimize voltage level. It has 12-volt AC secondary voltage we require DC voltage so we will use full wave bridge rectifier. +5-volt voltage is provided to components like LM35 temperature sensor, wet sensor, wet sensor etc. for that we are using 7805 regulators.3.3 volt is provided to ARM 7 through LM317 voltage regulator. UART 0 port is used for serial communication. Keil micro vision 3 compiler is used for programming. The Program is written in Embedded C Language The written program is downloaded using Flash Magic tool. The generated file is dumped in ARM 7. According to written conditions in program it will send alerts on users mobile through GSM model. The data is displayed through 16*2 LCD display



Flowchart

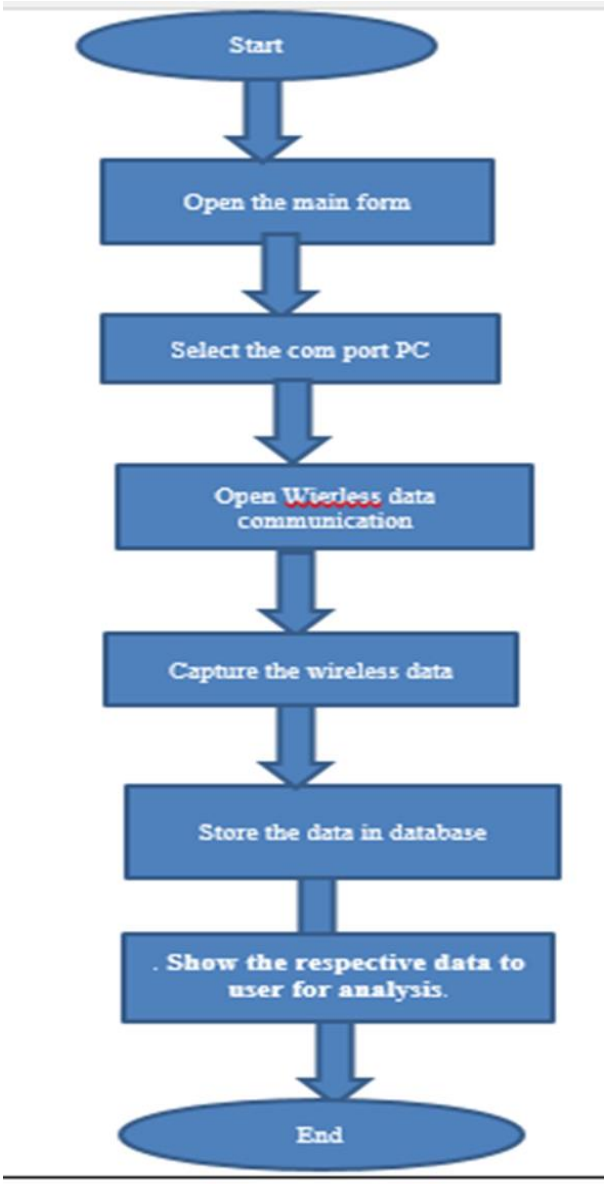


Fig 8 Flowchart of Smart irrigation System

6 Results and Discussion

This section represents the performance of project model with use of hardware ARM 7 to obtain results we are using Keil Software and Embedded C Programming Language

- Accurate Temperature was calculated by lm35 temperature sensor
- Accurate Moisture of soil was found using soil moisture sensor
- Wetness of soil was calculated using wet sensor
- According to above 3 calculations alerts were provided to farmers of water levels
- This system is highly effective and can be modernized in future

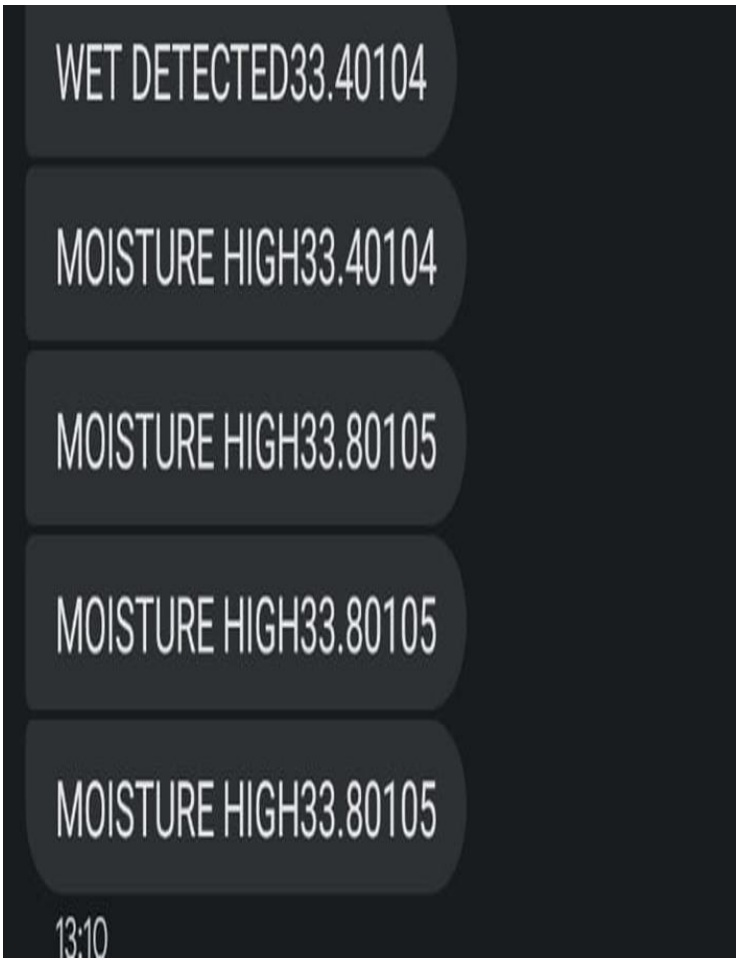


Fig 9 Message Received from GSM

7 Conclusion

The proposed model uses ARM-LPC2148, all based on GSM module. This project improves agriculture, increases food production and ensures good water management. This is also useful for business needs and supplementary food.

8 References

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