

# Automatic Irrigation System and Radio Frequency Based Pest Control Using ARM

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**Abstract:** Agriculture is the main sector in our country and proper irrigation plays a very important role in the fields. Most the times crops are failed due to lack of proper irrigation, either from excessive water and low amount of water supply to the crops. The reasons may differ from individuals some are shortage of water, poor irrigation system, excessive water when heavy rains and variation in temperature etc., and one more major problem is due to pests attacking the crops which leads to the failure of the harvest. The pests are controlled by chemical fertilizers, which are not organic. The above mentioned problems can to solved using Automatic irrigation system and frequency based pest controlling.

**Key Words—** *Agriculture, Irrigation, Automatic irrigation, Pest attacking.*

## I. INTRODUCTION

ARM7 LPC2148 Processor:

The full form of an ARM is an advanced reduced instruction set computer (RISC) machine, and it is a 32-bit processor architecture expanded by ARM holdings. The applications of an ARM processor include several microcontrollers as well as processors. The architecture of an ARM processor was licensed by many corporations for designing ARM processor-based SoC products and CPUs. This allows the corporations to manufacture their products using ARM architecture. Likewise, all main semiconductor companies will make ARM-based SOCs such as Samsung, Atmel, TI etc. ARM7 processor is commonly used in embedded system applications. Also, it is a balance among classic as well as New-Cortex sequence. This processor is tremendous in finding the resources existing on the internet with excellence documentation offered by NXP Semiconductors.

an apprentice to obtain in detail hardware & software design implementation.

The LPC2148 microcontroller is designed by Philips (NXP Semiconductor) with several in-built features & peripherals. Due to these reasons, it will make more reliable as well as the efficient option for an application developer. LPC2148 is a 16-bit or 32-bit microcontroller based on ARM7 family.

The main features of LPC2148 include the following.

1. The LPC2148 is a 16 bit or 32 bit ARM7 family based microcontroller and available in a small LQFP64 package.
2. ISP (in system programming) or IAP (in application programming) using on-chip boot loader software.
3. On-chip static RAM is 8 kB-40 kB, on-chip flash memory is 32 kB-512 kB, the wide interface is 128 bit, or accelerator allows 60 MHz high-speed operation.
4. It takes 400 milliseconds time for erasing the data in full chip and 1 millisecond time for 256 bytes of programming.
5. Embedded Trace interfaces and Embedded ICE RT offers real-time debugging with high-speed tracing of instruction execution and on-chip Real Monitor software.
6. It has 2 kB of endpoint RAM and USB 2.0 full speed device controller. Furthermore, this microcontroller offers 8kB on-chip RAM nearby to USB with DMA.
7. One or two 10-bit ADCs offer 6 or 14 analogs i/ps with low conversion time as 2.44  $\mu$ s/ channel.
8. Only 10 bit DAC offers changeable analog o/p.
9. External event counter/32 bit timers-2, PWM unit, & watchdog.
10. Low power RTC (real time clock) & 32 kHz clock input.
11. Several serial interfaces like two 16C550 UARTs, two I2C-buses with 400 Kbit/s speed.
12. 5 Volts tolerant quick general purpose Input/output pins in a small LQFP64 package.
13. Outside interrupt pins-21.
14. 60 MHz of utmost CPU CLK-clock obtainable from the programmable-on-chip phase locked loop by resolving time is 100  $\mu$ s.



Fig.1. ARM7 LPC2148 Processor

The sensors and components used are:

- Power supply
- Soil moisture sensor
- Temperature sensor
- Humidity sensor
- GSM and internet connectivity interface
- Frequency generator

#### A. Soil moisture sensor

Soil moisture sensors typically refer to sensors that estimate volumetric water content. Another class of sensors measure another property of moisture in soils called water potential; these sensors are usually referred to as soil water potential sensors and include tensiometers and gypsum blocks.



Fig.2. Soil moisture sensor

#### B. Temperature sensor

A Temperature Sensor is the instrumentation equipment which is used to measure temperature or heat on the operating machine part. Temperature sensing is performed by equipment called Thermocouple. A thermocouple is a temperature-measuring device consisting of two dissimilar conductors that contact each other at one or more points. It produces a voltage when the temperature of one of the points differs from the reference temperature at other parts of the circuit.



Fig.3. Temperature Sensor

#### C. Humidity sensor

A humidity sensor (or hygrometer) senses, measures and reports both moisture and air temperature. The ratio of moisture in the air to the highest amount of moisture at a particular air temperature is called relative humidity. Relative humidity becomes an important factor when looking per comfort.



Fig.4. Humidity sensor

#### D. GSM Module

A GSM module or a GPRS module is a chip or circuit that will be used to establish communication between a mobile device or a computing machine and a GSM or GPRS system.



Fig.5. GSM Module

### E. Internet Connectivity(IOT)

Internet access is the ability of individuals and organizations to connect to the Internet using computer terminals, computers, and other devices; and to access services such as email and the World Wide Web. Through this the system will be connected with weather forecasting to get the daily updates about the current weather conditions, on which the irrigation system responds.



Fig.6. Cloud connectivity.

### F. Storage tanks with auto locking system

These are the tanks constructed across the farms, to store the water in it, these tanks are locked during normal conditions and opens only during the scarcity of the water, the tank opens on the command given by the processor.

## II. WORKING EXPERIMENTAL MODEL

All the above mentioned components and sensors are connected to the processor.

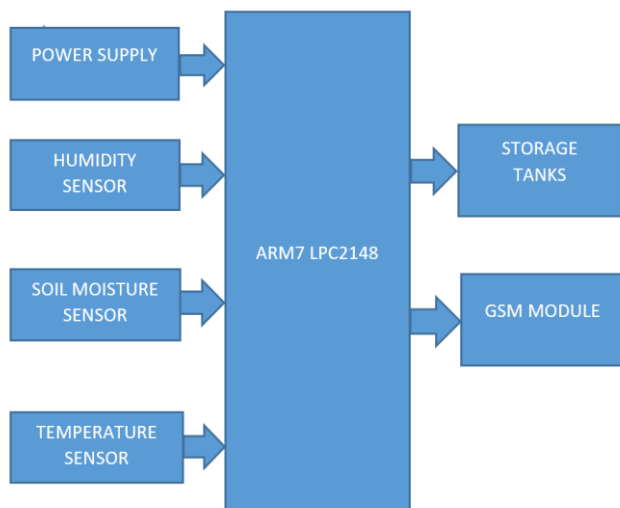


Fig.7. Proposed Experimental Model of the Irrigation System.

In Automatic irrigation system it is not required to provide

the water to the crops manually, the water will be supplied automatically based on the proper conditions.

Soil moisture sensor is used to check the moisture content of the soil, based on which the water will be allowed to the field, if the soil is already moist enough, then the amount of water released will be less, if the soil condition is dry than the normal condition the water will be provided accordingly, the temperature sensor is used to check whether the temperature is right for the harvest, acts accordingly based on the present conditions. The processor will be connected with Weather forecasting service via internet interface, through which the current weather reports will be provided, in case the report states it's a rainy day then that day water will not be provided as usual instead less amount or no water will be provided, as water from rain is enough for the particular day, because excessive supply of water spoils the harvest and the excessive water are stored in the storage tanks for further usage, and during the drought or shortage of water, the storage tanks are opened. And water stored is accessed, but now the water is not provided as normal condition instead it is supplied in limited manner as there is scarcity of the water, it should to store for further more days, by this way there is proper usage of the water and it is not wasted and crops are maintained in a proper way.

All these process are done automatically based on the inputs and the current conditions with help of the above mentioned sensors and components. All these processes are updated to the farmer via GSM module through message. After every process the message is sent through the GSM module. Through this there is no any improper irrigation management and everything will be under proper maintenance, leading to get the expected harvest.

## III. AUTOMATIC PEST CONTROL THROUGH RADIO WAVES

Pest controlling is another biggest factor in the harvest, most of the time the crops are spoiled due to the pests attacking the harvest, to avoid these chemical fertilizers are used which are inorganic and sometimes dangerous to. Another effective way of controlling the pests naturally is by sending the frequency signals or noise. Pests can be controlled by setting a particular frequency which do not harm the crops but a frequency is set where the pests can't survive, this method is best alternative to stop the chemical fertilizers.

## IV. CONCLUSION

As we saw this automatic irrigation and pest control method can solve the current and improper irrigation and pest control problems, it can be an effective method for getting the

deserved yield, by proper maintained and a good irrigation system.

#### REFERENCES

- [1]. Jump up to: a b ARM7 Family Webpage; ARM Holdings.
- [2]. "ARM7DI Data Sheet"; Document Number ARM DDI 0027D; Issued: December 1994.
- [3]. Decagon Devices "List of peer-reviewed publications using Decagon soil moisture sensors". Retrieved: 20 July 2015.

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