Smart Irrigation And Nutrition Monitoring System

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***Abstract*—In this project we are using PIC16F877A, controller to monitor the field.In this water level sensor and Soil nutrition sensor is used to monitor the field environment and flooding of the fields.If any abnormalities means send SMS to the owner.The Water level sensor is used to monitor the water level of ground.The controller have program for control the water level so we can control the water level using two pump motors.If water level will high it will compare it to program then the water pump motor will supply water to the ground.The Soil nutrition is used to identify the nutrition Level in the soil.Also the temperature sensor is used to track environmental changes and also maximize energy efficiency and grow healthier crop with higher yield.Controller status and everything is displayed in LCD.The whole process is controlled by microcontroller.**

Keywords—Irrigation,Water pump motors,Water resources, Sensor,Monitoring,Automation,Decentralized control.

I. INTRODUCTION

Due to its scarcity,there is high incentive to reduce to its usage across the board.In the North America,turf also known as lawn,is the largest irrigated crop by surface area,covering over 128,000km and was estimated in 2015 to consume in excess of 9 billion gallons of freshwater each day.With a historic drought affliciting the Western United States following a similar shortage in the south-east United States ,improved efficiency at this massive scale can help reduce the strain on our limited freshwater reserves.

Although we wish to reduce water consumption as much as possible ,the goal of these irrigation systems is to maintain plant health.To keep turf healthy,a proper amount of water must be periodically app lied.Providing too little water to the turf will leads to turn brown and die .Although traditional irrigation control strategies often over-irrigate to be safe,this can cause its own problems.Excess surface water can cause further waste due to evaporation and runoff and cause root rot, killing the plant.Furthermore,over-watering can cause erosion of the surrounding soil and even leech unsafe fertilizer chemicals beyond the root zone and into the ground water,as occuredin California's Salinas Valleyand Tulare LakeBasin,investigated Improper irrigation is the only cause of these issues.Great improvements in irrigation system design have been made recently; new sprinklers ahead apply water much more slowly to avoid runoff and leeching , and new irrigation controllers schedule irrigation using weather data into account the water lost each day due to evaporation and plant transpiration, known coupled as evapotranspiration.Even the best control strategies also still behave as though all turf requires the same amount of water,when in fact there often exist large variations in soil type and depth, topography and direct sunlight.If this informations were utilized, every location throughout the irrigated space could be given the amount of water it needs. However, as the infrastructure of the traditional irrigation systems is usually configured for each valve to actuate many sprinklers, such as a system could not even make proper use of fine-grained water requirement information as all sprinklers must be actuated for the same amount of time.

In this paper we are using two water pumps and also three types of sensors such as water level sensor,soil nutrition sensor and temperature sensor.These sensors are used for monitoring the crop field.Each type of sensor have its own functionality.Everything will be carried out in automated manner.The water pumps are used for storing the water and also it will automatically inlet and outlet the water into the field.All these process will be get displayed by using LCD display.current field status will also be send to the farmer in the form of SMS.

We are mainly doing this project for our farmers welfare and also the various scenarios which have been taking part in our society .Inorder to avoid such bad conditions and also for overcoming those problems we have been proposed this project.From the various disadvantages which has been preset in previous existing systems,also by studying various techniques which have been present we have proposed this system.

II. EXISTING SYSTEM

In existing system wired connections such as CAN,LIN is used to collect the details about the nodes.Also the operations can be performed only by using the manual operations.It can perform only less .Whereas In some system we need to introduce wireless connection between the client and server.We also have some drawbacks in those existing systems such as overirrigation and underiirgation problems may also takes place.The flushing or Washing out

of crops with more amount of water is known as Overirrigation .whereas if there is no adequate amount of water is available in field,then it is known as Underirrigation.In some systems the technique will be applied only for small fields and for larger land areas we need more man power .These were about some of the techniques and also the drawbacks present in existing system.So inorder to avoid those problems we introduces a new type of methods in the proposed system.

(a)OVER-IRRIGATED FIELD

(b)UNDER-IRRIGATED FIELD

III. RELATED WORK

Today irrigation problem plays a vital role in our country,most of the farmers were committing suicide due to drought condition of harvesting field ,they donot know how to avoid these problems.Many works have been created to solve these problems but are ended in vain.Some works were focused only in storing of excess amount of water during rainy season whereas some works were focused only inlet the water when the field is dry.some of the previous works which will focused on how fluid moves across and through soil.This can be well-studied in the field of soil physics;some of very accurate models including Hydrus[1]and comsolMultiphysics Subsurface Flow Module[2] which is used for solving PDEs for pressures that exist between soil and water praticles in the porous media.

Some of the over complicated fluid model makes optimization unreasonable ,so some of the alternative DataAssimilation method.Used to predict states of advanced systems given a particular input such as weather forecasting[6]and large-scale hydrological patterns from statellite images[8]

Researchers in [10] build a one-dimensional soil water balance model to stimulate the vertical movement of moisture content is in an irrigated space based on soil characteristics ,irrigation schedule,real-time weather data, irrigation infrastructure.

Some works were carried out for Mangolian pine plantation in Northeast china which is mainly based on the Effects of field simulation of precipitation changes on soil nitrogen availability[5] and it will Shows how changes in precipitation amount would affect soil N availability in Mongolian pine plantations. [3] Irrigation controllers exist that utilize one or more soil moisture sensors spread throughout the turf [7],[4],[9] to gauge need for irrigation.However,Whereas systems that model the space can infer and utilize moisture status between the sensor points to create schedules,these systems can utilize only the limited data from the sensor points.Furthermore these systems still have the same physical constraints as a traditional system;they cannot provide irrigation to specific irrigation system that need more or less.

Becoming more prevalently used in modern irrigation controller, evapotranspiration technologies [11],[12]
Use weather stations to monitor the air temperature humidity and other factors to estimate water lost to the environment throughout the day.

IV. PROPOSED SYSTEM

There are various problems a raised in the existing system so in order to avoid those problems and also to add more features the proposed system has been developed with various new facilities and techniques.

In this system operations can be performed in both automatic and manual mode.we can be able to perform more operations using automation.Everything can be performed automatically hence so no man-power is needed.

We can be able to overcome all the problems which has been faced in the previous systems.Time can be saved by farmers since all the operations can be performed automatically.Farmers need not want to wait for rainy season since by using our proposed system we can be able to store excess amount of water during rainy season, and utilize it in summer.

If any abnormalities arise immediate notification SMS will be send to the owner which can be done by using GSM facilities.

The block diagram of the proposed system is shown in Fig.1.Water level sensor ,Soil Nutrition sensor and Temperature sensor are used for continuous monitoring of the conditions.PIC16F877A controller is used as the central component of the system.

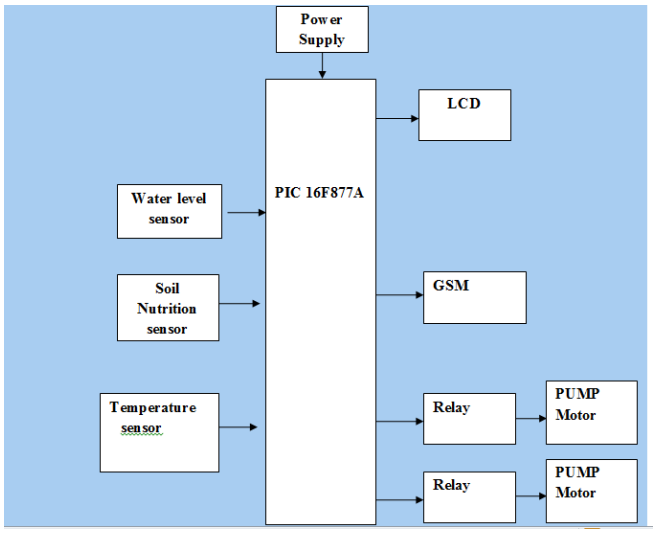


Fig1.Architecture for smart irrigation and nutrition monitoring system

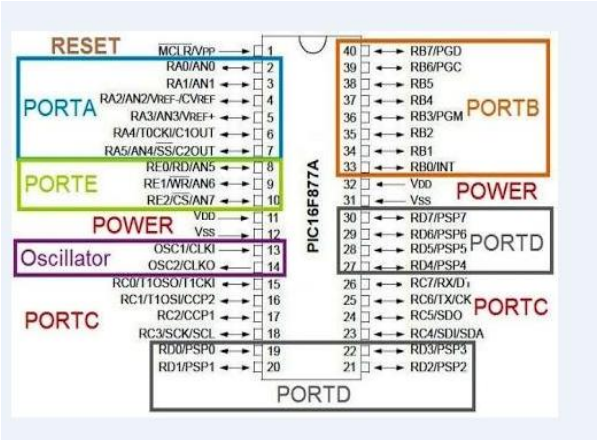
- In this system Water-level sensor is used for sensing the amount of water present in the agricultural field. **Level sensors** will detect the **level** of liquids and fluids and fluidized solids, including the slurries granular materials, and powders that exhibit in an upper free surface.

- The **water sensor** is not an analogue **water** level measuring device.Instead it's a digital **sensor** that indicates whether the maximum **water** level has been reached or not.If the **sensor** is triggered, the box will have full of **water**.

- Soil nutrition sensor is used for sensing the presence of nutrients in the agricultural field.If it detect any abnormalities it will notify to the owner in the means of SMS.

(A) pic16f877A(PIC CONTROLLER)

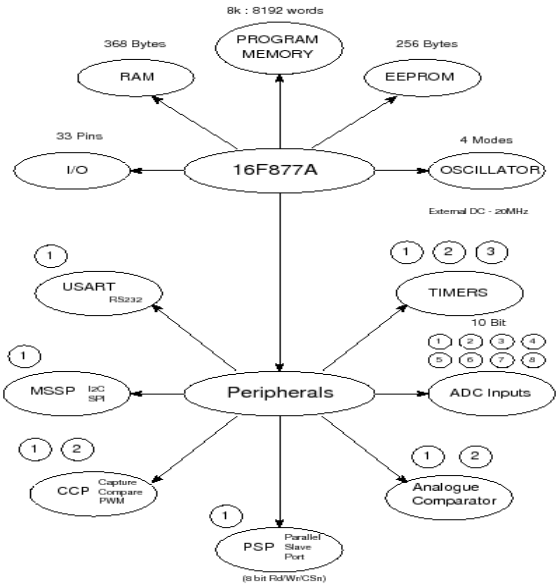
It is a capable micro controller that can do many task because it has large enough programming memory(large in terms of the sensor and projects)8K words and 368 Byte of RAM.



(B) *ANALOG APPLICATIONS*:

10-bit, up to the 8-channel Analog-to-Digital Converter (A/D), Brown-out Reset (BOR),and Analog Comparator module with, Two analog comparators Programmable on chip voltage reference (VREF) modules, Programmable input multiplexing from the device inputs and internal voltage reference Comparator outputs are externally accessible

(C*) High-Performance RISC CPU:*



Only 35 single-word instructions is to learn and All single-cycle instructions except for program branches, which are the two-cycle, Operating speed: DC – 20 MHz clock input and DC – 200 ns instruction cycle, Up to 8K x 14 words of the Flash Program Memory, Up to the 368 x 8 bytes of the Data Memory (RAM), Up to 256 x 8 bytes of EEPROM Data Memory, Pinout compatible to the other 28-pin or 40/44-pin PIC16CXXX and PIC16FXXX microcontrollers are used.

(D) *Peripheral Details*:

Timer0: 8-bit timer/counter with 8-bit prescaler, Timer1: 16-bit timer/counter with the prescaler, can be incremented during the Sleep via external crystal/clock, Timer2: 8-bit timer/counter with 8-bit period register, prescaler and the postscaler, Two Capture, Compare, PWM modules, Capture is the 16-bit max, resolution is 12.5 ns Compare is 16-bit max, and the resolution is 200 ns, PWM max, resolution is in the 10-bit Synchronous Serial Port (SSP) with SPI (Master mode) and I2C (Master/Slave), Universal Synchronous and Asynchronous Receiver Transmitter (USART/SCI) with 9-bit address detection, Parallel Slave Port (PSP) – 8 bits wide with external RD, WR and CS controls (40/44-pin only), Brown-out detection circuitry for Brown-out Reset (BOR).

(E)*RELAY:*

A relay is an electro-mechanical switch that is capable of being remotely actuated/controlled. The schematics is involving relays could be very simple, or incredibly very complex since they may employ well-known "relay-logic function". The first computer was built out of the only electro mechanical relays. Now, we can differentiate the relays as being:

1.electro-mechanical devices
2.electronic

Between the two, first category is the "true relays".. Any logic of electronic component behave in similar to the way the relays do. Take the transistor for example: it is the for perfect current controlled relay.

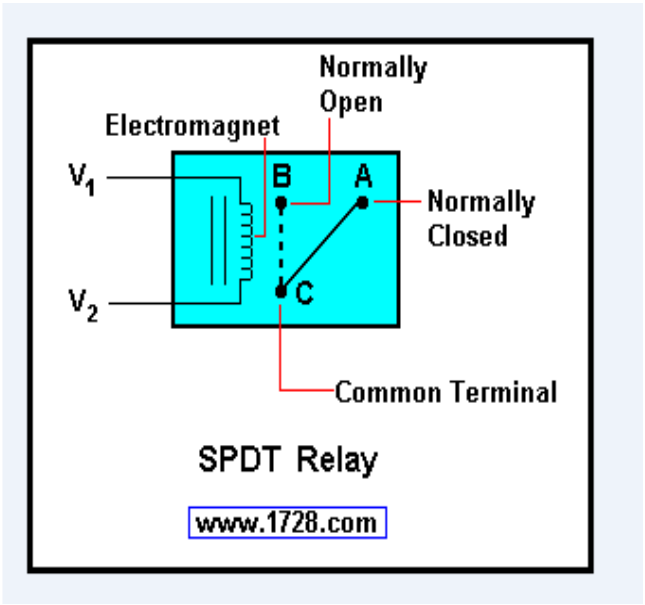
A relay contains of two parts: a switch (or a system of switches) controlling the power/primary/analog circuits, and the digital (remote) control part. Regarding the switch function,please read carefully the design notes above, because they do apply to all relay switch just as well.The second part of relay, the (digital) control one, could be very complex, and specialized on detecting.

1. Ground faults
2. Minimal voltage
3. Maximal currents
4. Increased temperature
5. Mechanical motion
6. Time actuated
7. The number of counts
8. And many ,many more.

There is strong pressure from the electronic industry to replace electro-mechanical relay with electronic equivalents, but Regulatory Authorities refuse to accept. The requirements for power utility grid relays (and switches) are clear: a relay (or switch) will separate electrical circuits mechanically, and operation/state needs to be visually noticeable**.**

Although we replace (almost) all electrical relays with the electronic equivalent , there are many types of mechanical relays that cannot be replaced here.; for example, the electrically actuated pneumatic or hydraulic relays.

We discuss more about the switches and electronic relay equivalents in the following Design Notes. The page highlights just a few topics related to the switches and relays; however, these few topics is very important. Our intention is to encourage you to study the aspects thoroughly. Please be aware because there are thousands of beneficial industrial applications employing relays, and switches, which could be very greatly improved. All it takes is just little investigations.

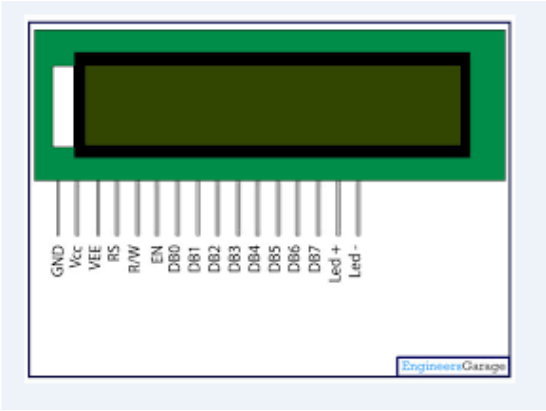


(F)LCD:

LCD (Liquid Crystal Display) screen is an electronic display module and find the wide range of the applications. A 16x2 LCD display is the very basic module and it is very commonly used in the various devices and circuits. These modules are the preferred over seven segments and also other multi segment LEDs. The reasons being: LCDs are more economical; and easily programmable; have no limitation of the displaying special & even custom characters (unlike in seven segments), animations and so on.

A 16x2 LCD means it can display 16 character per line and there are 2 lines. In this LCD each character is displayed in the 5x7 pixel matrix. This LCD has two registers function namely, Command and Data.

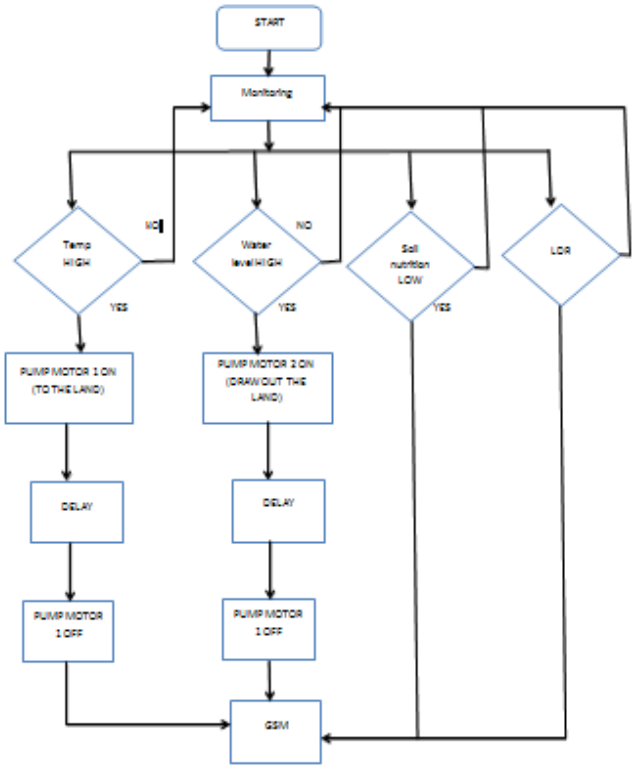
The command register stores the command instruction given to the LCD. A command is an instruction given to LCD to do the predefined task like initializing it, clearing its screen, setting cursor position, controlling display etc. The data register stores data to be displayed on the LCD. The data is ASCII value of the character to be displayed on the LCD. Click to learn more about the internal structure of a LCD.



(E)PROPOSED ARCHITECTURE:

In this proposed system there are three important functions that takes place they are,(a)sensing water level(b)controlling the motor(c)Notifying the user.

These are the important functions which takes place in our proposed architecture.The first will be the sensing of water level in the field can be takes place after that the controlling of water motor pumps will be takes places and finally from the observed details the status of the field can be notified to the user.



V.CONCLUSION AND FUTURE ENHANCEMENT

The system proposed in this paper is automatic and there is no need of man power in this project.It will low in cost when compared to our related systems.It will be more useful to the farmers.Lesser knowledge is needed for the farmers to operate this device.

This proposed system is very much useful for our country since droughting of lands and inadequate rainfall were the common issue in our country.

The further enchancement of this paper is by implementing it in every industries and for household purpose.so that people can get more benefit.

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