International Journal of Electrical and Electronics Research ISSN 2348-6988 (online)
Vol. 3, Issue 1, pp: (173-180), Month: January - March 2015, Available at: www.researchpublish.com

Automatic Agricultural System

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Abstract: **The Conventional Agricultural Systems have been around for decades, but the main problem with them is their manual operation. This results into excessive mental stress on the part of motor operator, pertaining to constant observation. Also the conventional system lacks protection mechanism from single phasing, overheating, dry run, & can sometimes lead to excessive water wastage. Thus there was a need to develop the water pumping system which would free the user from constant observation & safeguard the motor from single phasing, dry run, overheating, & to reduce water wastage.This project primarily focuses on creation of smart agricultural water pumping system which is free from above mentioned drawbacks of conventional system firstly, we surveyed the problems faced by farmers .Then we brainstormed the possible solution to the problems. Then we reached to the conclusion of using water level sensor WS-30, moisture sensor MS-16, thermistor to understand the environmental variables and then using a micro controller to control the motor. And this whole system was to be controlled remotely using GSM and DTMF technology.A prototype of system has been created and it is observed to be working with little or no interference from the user. The operation is hassle free and completely automatic. In conclusion, this smart design will make the water pumping system used in farms more efficient with safe and hassle free operation of the motor.**

Keywords: **Motor, Sensor, Water Pump, Smart Agricultural System, DTMF, Micro-controller.**

I. INTRODUCTION

Water is required for the basic growth and maintenance of turf grass and other landscape plants. When a sufficient amount of water is not present for plant needs, then stress can occur and ultimately lead to reduced quality or death. Irrigation is common in Florida landscapes because of sporadic rainfall and the low water holding capacity of sandy soil.

This inability of many of Florida soils to hold substantial water can lead to plant stress after only a few days without rainfall or irrigation. Water conservation is a growing issue in Florida due to increased demands from a growing population. One of the areas with the largest potential for reducing water consumption is residential outdoor water use, which accounts for up to half of publicly supplied drinking water. Most new homes built in Florida have automated irrigation systems. These irrigation systems use an irrigation timer to schedule irrigation.

These automated irrigation systems have been shown to use 47% more water on average than sprinkler systems that are not automated (i.e. hose and sprinkler), which can be attributed largely to the tendency to set irrigation controllers and not readjust for varying weather conditions. Irrigation control technology that improves water application efficiency is now available. In particular, soil moisture sensors (SMS) can reduce the number of unnecessary irrigation events.

This project primarily focuses on creation of smart agricultural water pumping system which is free from above mentioned drawbacks of conventional system firstly, we surveyed the problems faced by farmers .Then we brainstormed the possible solution to the problems.

Then we reached to the conclusion of using water level sensor WS-30, moisture sensor MS-16, thermistor to understand the environmental variables and then using a micro controller to control the motor. And this whole system was to be controlled remotely using GSM and DTMF technology. A prototype of system has been created and it is observed to be working with little or no interference from the user.

1.1 BASIC BLOCK DIAGRAM:

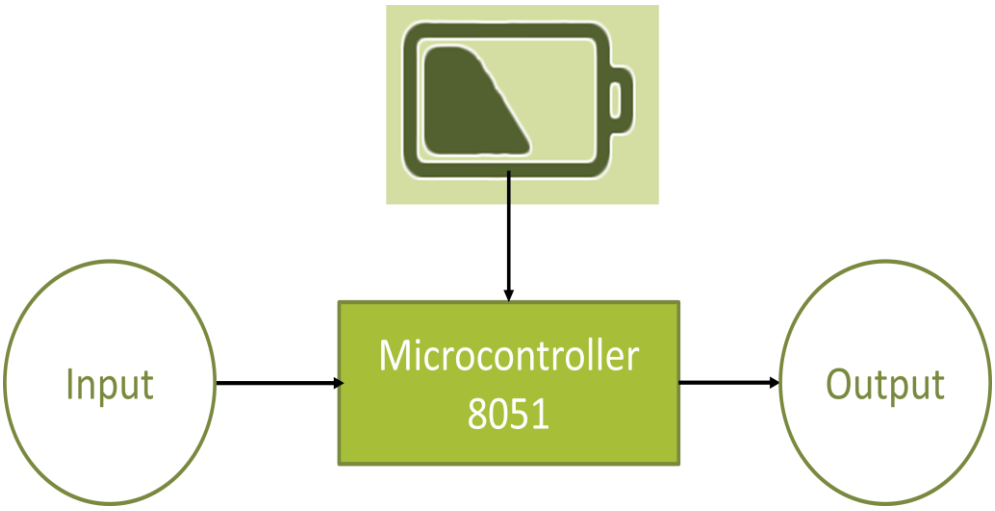


Figure.1 Basic Block Diagram

- Water Level Sensor
- Moisture Sensor
- Temperature Sensor
- Single Phasing Sensor
- Motor On/Off

Like any other equipment, our project also consists of input, process, output and the most inherent part power supply. The input section consists of sensors: water level sensor, moisture sensor, temperature sensor and single phasing sensor. The processor we have used is AT89S52 from 8051 microcontroller family. The Power supply required to operate this kit is 230 V, AC. The output of this kit is turning ON and OFF of the pump depending upon the status of sensor.

1.2 DETAILED BLOCK DIAGRAM:

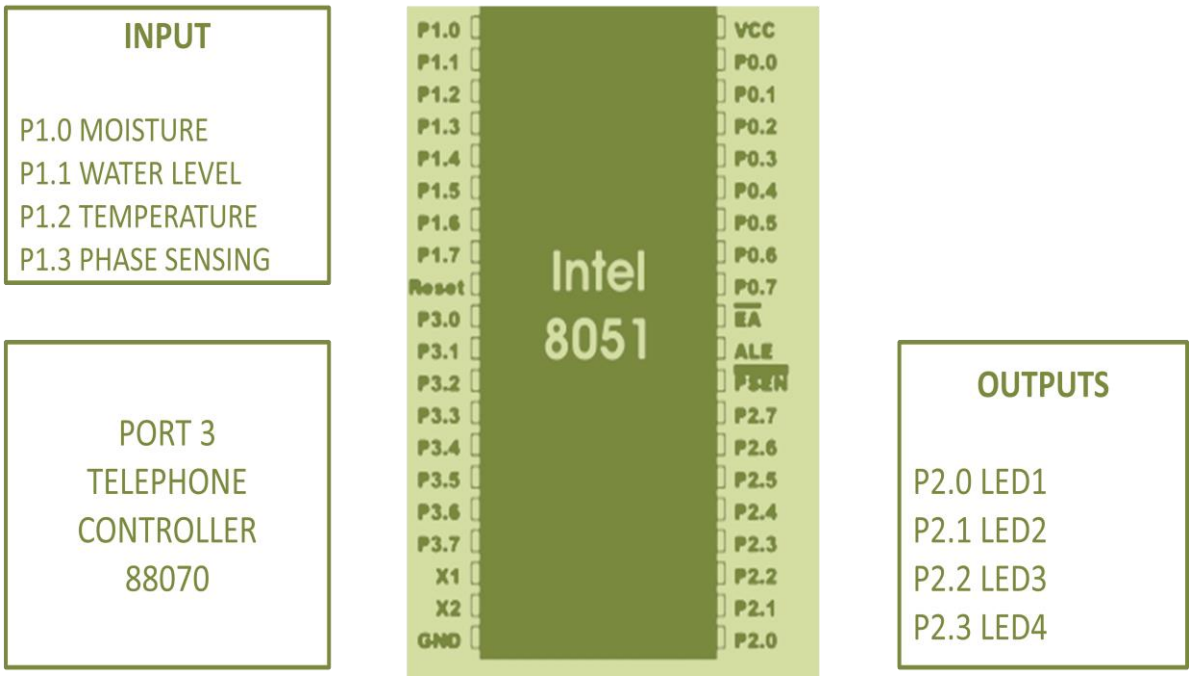


Figure.2 Detailed Block Diagram

2. WORKING

Power supply:-

The kit is working on 230V, single phase, A.C., 50 Hz supply.

This supply is then stepped down to 12V single phase, A.C. 50 Hz supply.

Output of transformer is fed to diode bridge rectifier which converts A.C. voltage to pulsating D.C.

The regulator is used maintain the 5V D.C. at its output terminals. This 5V output is required for operation of micro-controller, BCD to decimal converter, DTMF IC.

Sensor and amplifier circuit:-

Four sensors are used. These sensors are treated as switches. They are either in ON/OFF condition.

Configuration used for transistor circuit is common collector configuration. The input is applied across the collector and base and the output is obtained across the emitter and collector.

This output is then applied across the next transistor to amplify the signal. This amplified signal is applied to microcontroller through pull up resistors.

Microcontroller:-

Oscillator circuit

XTAL1 and XTAL2 are the input and output, respectively, of an inverting amplifier that can be configured for use as an on-chip oscillator, as shown in Figure 16-1. Either a quartz crystal or ceramic resonator may be used in our project we have used the quartz crystal. It is easily available in the market and inexpensive

To drive the device from an external clock source, XTAL2 should be left unconnected while XTAL1 is driven, as shown in Figure 16-2. In our project we haven't used the external clock circuit.

There are no requirements on the duty cycle of the external clock signal, since the input to the internal clock- ing circuitry is through a divide-by-two flip-flop, but minimum and maximum voltage high and low time specifications must be observed

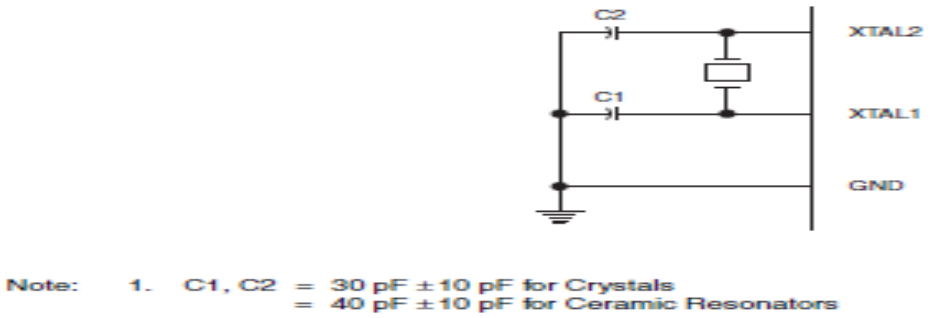


Figure3. Oscillator connection

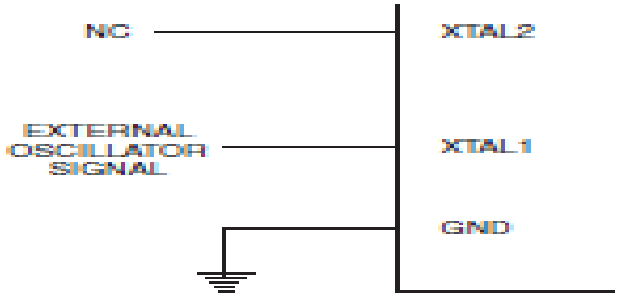


Figure4. External clock drive configuration

Reset circuit in our project we have used capacitor of 1pF in the reset cicuit and this ciruit is grounded through the 10K resistor.

DTMF Receiver:-

Pin no. 10, 11, 12, 13 are connected to BCD to decimal converter.

When enabled by TOE, provide the code corresponding to the last valid tone-pair received (see Table given below). When TOE is logic low, the data outputs are high impedance.

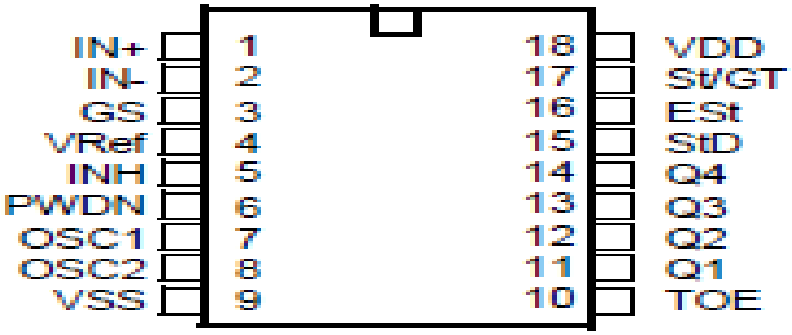


Figure 5

Table: 1. Functional Decode Table

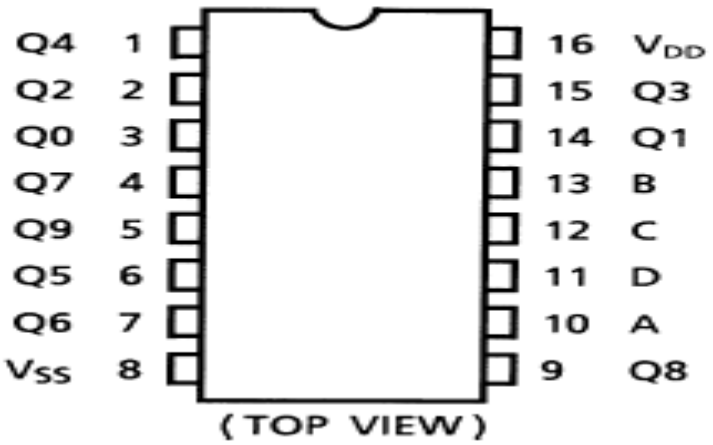
Digit	TOE	INH	ESt	Q_4	Q_3	Q_2	Q_1
ANY	L	X	H	Z	Z	Z	Z
1	H	X	H	0	0	0	1
2	H	X	H	0	0	1	0
3	H	X	H	0	0	1	1
4	H	X	H	0	1	0	0
5	H	X	H	0	1	0	1
6	H	X	H	0	1	1	0
7	H	X	H	0	1	1	1
8	H	X	H	1	0	0	0
9	H	X	H	1	0	0	1
0	H	X	H	1	0	1	0
*	H	X	H	1	0	1	1
#	H	X	H	1	1	0	0
A	H	L	H	1	1	0	1
B	H	L	H	1	1	1	0
C	H	L	H	1	1	1	1
D	H	L	H	0	0	0	0
A	H	H	L	undetected, the output code will remain the same as the previous detected code			
B	H	H	L				
C	H	H	L				
D	H	H	L				

L=LOGIC LOW, H=LOGIC HIGH, Z=HIGH IMPEDANCE, X = DON'T CARE

BCD to decimal converter:

TC4028B is a BCD-to-DECIMAL decoder which converts BCDsignal into DECIMAL signal. Of ten outputs from Q0 to Q9, one output corresponding toinput BCD code goes to the "H" level and all the others remain atthe "L" level.When D is used as inhibit input by use of three input linesfrom A to C, this decoder can be served as a BINARY-to-OCTALdecoder.

Pin Assignment



Truth Table

Inputs				Outputs									
D	C	B	A	Q0	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
L	L	L	L	H	L	L	L	L	L	L	L	L	L
L	L	L	H	L	H	L	L	L	L	L	L	L	L
L	L	H	L	L	L	H	L	L	L	L	L	L	L
L	L	H	H	L	L	L	H	L	L	L	L	L	L
L	H	L	L	L	L	L	L	H	L	L	L	L	L
L	H	L	H	L	L	L	L	L	H	L	L	L	L
L	H	H	L	L	L	L	L	L	L	H	L	L	L
L	H	H	H	L	L	L	L	L	L	L	H	L	L
H	L	L	L	L	L	L	L	L	L	L	L	H	L
H	L	L	H	L	L	L	L	L	L	L	L	L	H
H	L	H	L	L	L	L	L	L	L	L	L	L	L
H	L	H	H	L	L	L	L	L	L	L	L	L	L
H	H	L	L	L	L	L	L	L	L	L	L	L	L
H	H	L	H	L	L	L	L	L	L	L	L	L	L
H	H	H	L	L	L	L	L	L	L	L	L	L	L
H	H	H	H	L	L	L	L	L	L	L	L	L	L

The output pins of DTMF receiver 11,12,13,14 i.e Q1,Q2,Q3,Q4 are given to BCD to decimal converter pins11, 12, 13, 10(i.e D, C, B,A respectively).The received signal is then converted to decimal and given to microcontroller. The microcontroller acts according to program. In our project we have programmed the microcontroller to turn on the motor when the DTMF receiver receives 1 and to turn off the motor when DTMF receiver receives 2.

The kit works on two modes: 1) Automatic

2) Manual

AUTOMATIC:-

In the Automatic mode the programmer checks the moisture, water level in tank, temperature of stator; also it checks the presence of phases depending upon this respective condition these sensors gives signal to the microcontroller.

If the tank level is sufficient and the soil moisture is lower than the desired level then the motor will automatically turn on provided the supply is available.

If the moisture level is low also the tank level is lower than the required value and then the motor will not start since this condition is harmful to the motor. If the moisture level is low tank level is sufficient then only motor will start .If the condition is like that if moisture level is low and tank level is within the safe limit but the temperature of motor is not within the safe limit then the motor will not start.

Sometimes due to some reasons the motor experiences the single phasing problem. The single phase preventer protects motor also the microcontroller receives the signal when single phasing occurs and it makes off the relay due to which the motor automatically turns off and it glows the LED on the kit which indicates single phasing has been occurred.

MANUAL:-

In the manual mode the user can operate the pump by using his mobile phone. This is achieved here, by using DTMF technique and GSM technology. Whenever the user feels the need to turn operate the pump through GSM, he is required to call to the mobile phone interfaced with the kit. The phone which is interfaced is auto-answering, when the call is automatically received the user presses 1 to turn on the pump and presses 2 turn off the motor. If the conditions on the site are not favorable i.e. if the conditions are harmful to the motor such that if single phasing has been occurred or tank level is low or the supply is not available then the motor will not start. Thus the motor remains protected in the manual mode too.

POWER SUPPLY:-

Power supply required to operate the kit is 230V, 50Hz, AC supply.

OUTPUT:-

The pump operates at desired conditions; also it remains protected under fault conditions.

3. ADVANTAGES, DISADVANTAGES AND APPLICATIONS

ADVANTAGES:

1) Provides maximum types of protection:-

According to all market survey we are providing multiple protections as compare to other such as temperature protection, dry run protection, and single phasing protection.

2) Compact in size:-

As compare to other which is available in market this project kit is compact in size.

3) Reasonable cost:-

As compare to market price of sensor the sensor use in this kit are much expensive & having low cost.

4) Easy to use:-

Any non-technical person can handle the kit.

5) Easy to install:-

It does not require much more area and direct installation can be done and also installation cost is low.

6) Light in weight:-

Although there are various protection in one kit, it is light in weight.

7) Saves water –

Studies show that drip irrigation systems use 30 - 50% less water than conventional watering methods, such as sprinklers.

8) Improves growth –

Smaller amounts of water applied over a longer amount of time provide ideal growing conditions. Drip irrigation extends watering times for plants, and prevents soilerosion and nutrient runoff. Also, because the flow is continuous,water penetrates deeply into the soil to get well down into the root zone.

9) Discourages weeds –

Water is only delivered where it's needed.

10) Saves time –

Setting and moving sprinklersare not required. A timer delay as per environment can be added to the system for automatic watering.

11) Helps control fungal diseases:-

Which grow quickly under moist conditions? Also, wet foliage can spread disease.

12) Adaptable –

A drip irrigation system can be modified easily to adjust to the changing needs of a garden or lawn.

13) Simplest Method –

Start by drawing a map of your garden and yard, showing the location of plantings. Measure the distances required for lengths of hose or plastic tubing to reach the desired areas.

DISAVANTAGES:

1) Unemployment of number of people:-

Many times farmer need employ to making ON or OFF the motor and look after the farm it Results unemployment of number of people.

1) Human becomes lazy:-

Due to all automatic action human becomes lazy.

2) Charging of the battery:-

Battery should be charge frequently.

APPLICATIONS:

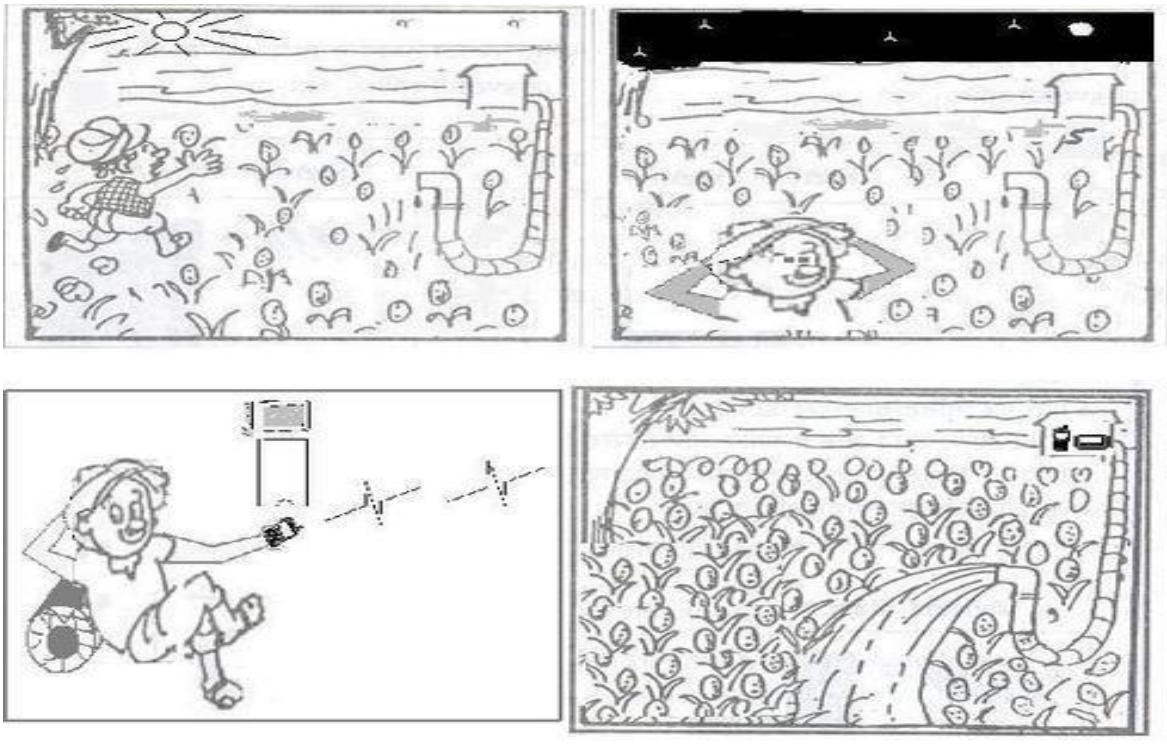


Figure 6

Picture-1

At early in the morning farmer want to go at his farm but sometime if he is getting let it will affect on his crop. because at particular time his crop not getting water so his crop yields are less.

Picture-2

He thought of recruiting a person for this purpose but as this proves to be expensive way and there is no guarantee that person will not do the job sincerely, he got an idea to buy this kit and install at his farm .

Picture-3

Now he can operate his farm from home or anywhere he want so he does not need to go at farm.

Picture-4

His crop yields are much more and he getting more n more benefit.

4. CONCLUSION

The Conventional Agricultural Systems have been around for decades, but the main problem with them is their manual operation. This results into excessive mental stress on the part of motor operator, pertaining to constant observation. Also the conventional system lacks protection mechanism from single phasing, overheating, dry run, & can sometimes lead to excessive water wastage. Thus there was a need to develop the water pumping system which would free the user from constant observation & safeguard the motor from single phasing, dry run, overheating, & to reduce water wastage.This project primarily focuses on creation of smart agricultural water pumping system which is free from above mentioned drawbacks of conventional system firstly, we surveyed the problems faced by farmers .Then we brainstormed the possible solution to the problems. Then we reached to the conclusion of using water level sensor WS-30, moisture sensor MS-16, thermistor to understand the environmental variables and then using a micro controller to control the motor. And this whole system was to be controlled remotely using GSM and DTMF technology.A prototype of system has been created and it is observed to be working with little or no interference from the user. The operation is hassle free and completely automatic. In conclusion, this smart design will make the water pumping system used in farms more efficient with safe and hassle free operation of the motor.

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