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Fpga Based Soil Irrigation Robot

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Abstract:- The design of FPGA based soil irrigation robot is proposed. The soil moisture sensor senses the moisture level and gives output to the FPGA board. gives This board gives signal to motor drives which turn on the motor pump. The obstacle detection is done by using IR sensor. This simulation is done on Xilinx software with Spartan 3.

Keywords:- *Field Programmable Gate Array (FPGA),Soil Moisture Sensor, Motor Driver, Relay.*

I. INTRODUCTION

A basic requirement common to all living organisms is water. Less than 1% of the world's water supply is clean and water use is increasing daily. Farming methods alone require a lot of water. The drip method improved the efficiency of water use for irrigation and initiated the introduction and development of fertilizer, integrated distribution of water and fertilizer. Over the past few decades there has been extensive research into the development and testing of various technologies available to measure / measure soil moisture to assist in various uses and to facilitate the use of drip irrigation for users and farmers.

Agriculture has played a major role in promoting human civilization but we know that agriculture is highly dependent on the climate which is why climates such as droughts, floods, etc. This is due to the lack of drought which results in loss of yield and on the other hand the loss of yield in the heavily irrigated area is due to water availability. To avoid such losses in productive water management should be required. So, a well-designed irrigation system is needed to properly distribute water to the field. The system must be environmentally friendly and distribute the water in an irrigated irrigation system which means that water is supplied to those areas of the field where it is needed to prevent water wastage and to provide good water management in the field.

India has an important history. Planting of plants is very necessary for the survival of the human species. India is well known for its agricultural activities. It plays an important role in providing more people with employment. Agricultural development is seen as a prerequisite for developing countries from a traditional economy to a modern one. Almost all farmers still depend on farming methods. We see that the yield of plants and fruits does not increase at all. The farmer has a lot of trouble while watering the fields. These problems will be solved by making an irrigation plan. By doing this we can increase the yield and quality of the plants. With this a new plan was proposed in this paper to improve the irrigation system. Smart robot is presented based on FPGA.

II. PROPOSED METHODOLOGY

The design of soil irrigation robot based on FPGA is proposed.The robot can detect the obstacle by use of distance sensor.If the obstacle is detected then the motor M1 and M2 output is off. It is possible by making the output pin low othewise it is high. Soil moisture sensor is used to detect the moisture level in the soil.If the required moisture level reach then the sensor provides the logic high to FPGA pin. Once it detect the logic high value to the particular pin which is input pin of FPGA then the outpins of FPGA gives logic 1 which result turn on the relay.As the relay turn on which results to turn on the M3 motor which is nothing but the DC 5 volt submersible pump.Also if any obstacle detected infront of the distance sensor the sensor will give the output to the input pin of FPGA and the fpga gives low output to the enable pin/ input pin of motor driver ic results to stop the motor.The details are given below.

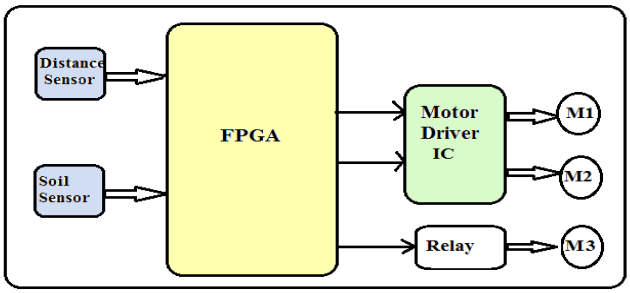

Fig.1 Architecture of Soil Irrigation Robot Based on FPGA

A. Soil Moisture Sensor

Soil moisture sensor measures water content in soil. Soil moisture balance is very important in agriculture to help farmers manage their irrigation systems properly. Farmers are able to use less water to grow crops, they are able to increase the yield and quality of crops by better managing soil moisture during important stages of crop growth. It is a sensor-based system distributed over agricultural field. Here the moisture sensor is connected to it FPGA board for information on agricultural moisture field.

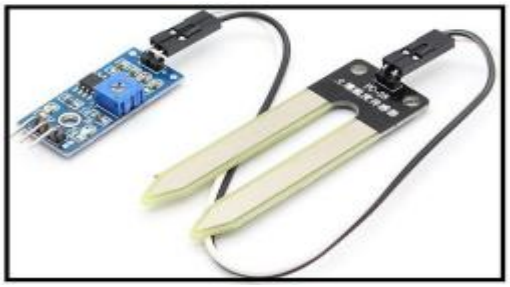

Fig. 2 Soil Moisture Sensor

Figure 2 provides a drawing of the FC-28 moisture sensor pin. This sensor provides output in two digital formats as well analog. In both modes there is no moisture in the soil sensor output is high i.e. 3.4V, but in analog mode soil moisture is accurately determined. So in our system to obtain an exact measure of soil moisture using an analog which releases the moisture sensor.

B. Motor Driver Ic

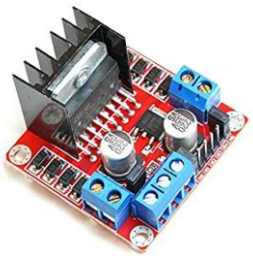

Fig. 3 L298

L298N Module Pinout Configuration

Pin Name	Description
IN1 & IN2	Motor A input pins. Used to control the spinning direction of Motor A
IN3 & IN4	Motor B input pins. Used to control the spinning direction of Motor B
ENA	Enables PWM signal for Motor A
ENB	Enables PWM signal for Motor B
OUT1 & OUT2	Output pins of Motor A
OUT3 & OUT4	Output pins of Motor B
12V	12V input from DC power Source
5V	Supplies power for the switching logic circuitry inside L298N IC
GND	Ground pin

This L298N Motor Driver Module is a module for high power DC and Stepper Motors. This module contains an L298 motor driver IC and a 78M05 5V controller. The L298N Module can control up to 4 DC motors, or 2 DC motors with speed control and control. The L298N Motor Driver module consists of L298 Motor Driver IC, 78M05 Voltage Regulator, resistors, capacitor, Power LED, 5V jumper in the integrated circuit.

The 78M05 Voltage regulator will only work if the jumper is mounted. If the power supply is less than or equal to 12V, then the internal circuit will be powered by an electrical controller and the 5V pin can be used as an output pin to power the small controller. The jumper should not be placed when the power supply is more than 12V and a separate 5V should be provided with a 5V terminal to enable internal circulation.

ENA & ENB are the speed control pins for Motor A and Motor B while the IN1 & IN2 and IN3 & IN4 direction control pins for Motor A and Motor B.

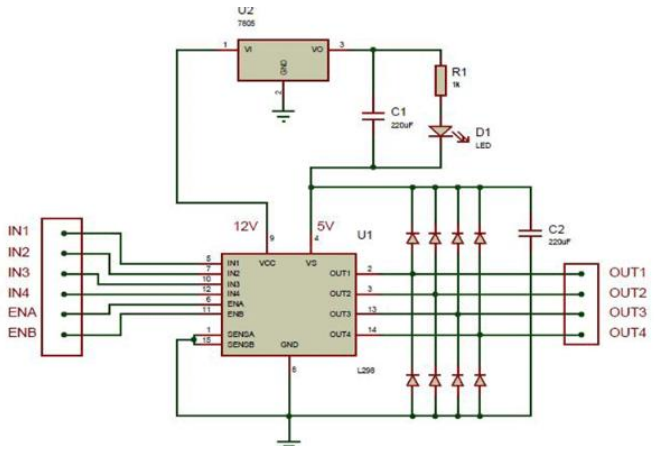

Fig. 4 Internal diagram of L298

III. RESULT

The design of HDL program for Spartan 3 is simulated. The RTL view and device utilization summary is shown below.

Device Utilization Summary (estimated values)			
Logic Utilization	**Used**	**Available**	**Utilization**
Number of Slices	1	960	0%
Number of 4 input LUTs	1	1920	0%
Number of bonded IOBs	5	66	7%

Fig. 6 Device Utilization summery

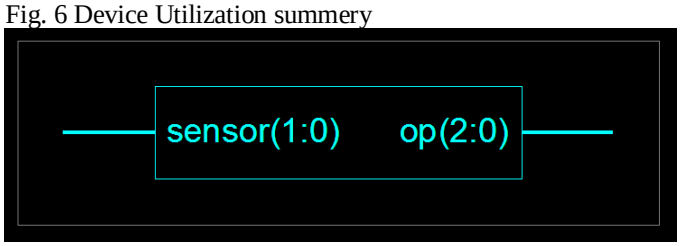

Fig.7. RTL of Soil irrigation system

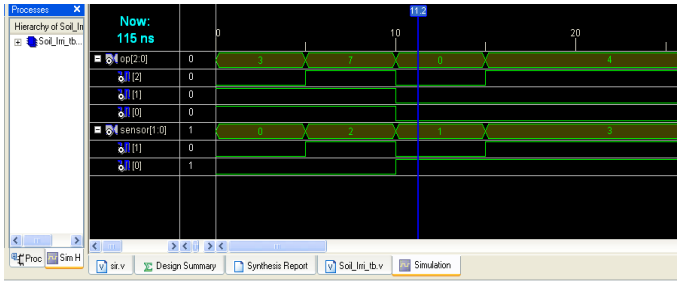

Fig. 8 Simulation result

IV. CONCLUSION

In this paper a smart irrigation system is based on FPGA define with powerful methods and real-time processing. Thus, the program will contribute to better water distribution in agriculture field. This kind of system intended for use of microcontroller with low processing speed and complexity, edit some of them using the FPGA board but only monitor the environment but in the proposed system is designed for field

module to monitor soil moisture sensor and an FPGA-based irrigation control module.

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