THERMAL BASED WHITE GRUBS DETECTION AND ERADICATON SYSTEM

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Abstract—The agricultural sector faces systematic annual losses due to pests and diseases. The damage caused by insect pests is one of the primary factors leading to the reduction in the production of crops.Pest insects can have adverse and damaging impacts on agricultural production,market access, the natural environment, and our lifestyle.The main objective of the research is to detect and eradicate the white grubs in agricultural crop field.An embedded system is a special-purpose computer system designed to perform a dedicated function.The research focuses on a system that automatically detects the white grubs (white worm) in a crop soil specifically for Allium cepa (onion)with help of thermocouple.

Keywords-thermocouple,temperature,onion,White grub,eradication.

I. INTRODUCTION

The crop productivity depends on environmental factors or product resources, such as temperature, humidity, labor and electrical costs. Above all these factors, crop disease causes 20–30% reduction of the productivity due its infection. Thus, the disease of the crop is one of the critical factor affecting the productivity of the crops. Therefore, it is important for the farmer to concentrates on the cause of the disease in the crops during its growth, but it is not easy to recognize the disease visibly or during the initial stages. Until now, they rely on the opinion of the experts or based on their own past experiences when the disease is doubtful. If appropriate action are not initiated at the right time, it leads to decrease in the yield of the crop.For increased productivity, Management of crops from early stage toharvest stage involves identification and monitoring of plant disease is required.Although there is rise in usage of remote sensing solutions, the ground visibility during critical growth stages of crops continues to be a major concerns.The robot used in the proposed system is a ground based agricultural robot that overcomes challenges existing in onion production in specific. It provides a small, portable and reliable platform to automatically survey farmland, detect diseases as well as sprays the pesticide. A thermocouple is placed atcertain depth of soil, nearer to the plant where the thermal level of soil is monitored primarily.It is known that soilmaintains certain range ofthermal level and the grubs nearer to the soil contain different thermal level. Based on the differential thermal levels adequatepesticides can be sprayed.The development of robot, real time testing results obtained from onion plantations and future focus has been detailed.

II. METHODOLOGY

A. Embedded Hardware Requirements and Construction

PIC16F877A microcontroller, Temperature sensor(thermo couple),driver circuit ,LCD display. The software program is written in EMBEDDED 'C' language and compiled by HI-TECH C compiler using MPLAB IDE software. The compiler is used to convert middle level language into machine level language. After compiler operation the hex code is generated and stored in the computer. The hex is nothing but machine level language understands by the micro controller. The hex code of the program is burnt into the ROM (Flash memory) of PIC16F877A by using PICKIT2 Programmer.PIC16F877A is a high performance RISC CPU machine. ONLY have 35 simple word instructions.100000 times erase/write cycle enhanced memory.1000000 times erase/write cycle data EEPROM memory. Using temperature sensor the temperature of the soil can be monitored, in case if this sensor range crosses the threshold it will be alerted by buzzer. So that the detection of worm is done as early as possible.

Hardware description

PIC16F877A:

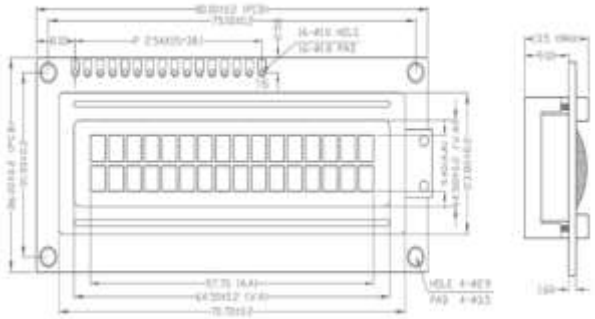
It is High performance RISC CPU machine. ONLY have 35 simple word instructions. Operating speed: clock input (200MHz), instruction cycle (200nS).Up to 368×8bit of RAM (data memory), 256×8 of EEPROM (data memory), 8k×14 of flash memory. Wide operating voltage range (2.0 –5.56) volts.2 8 bit timer and one 16 bit timer is available10bit multi-channel A/D converter Synchronous Serial Port (SSP) with SPI (master code) and I2C (master/slave). 100000 times erase/write cycle enhanced memory.1000000 times erase/write cycle data EEPROM memory

POWER SUPPLY CIRCUIT

The hardware of project requires different power supplies.5 v. the interfacing devices will get the supply from main microcontroller.

LCD

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.



DRIVER CIRCUIT:

A driver is an electrical circuit or electronic component used to control another circuit or component, such as a high-power transistor, liquid crystal display (LCD).They are usually used to regulate current flowing through a circuit or to control other factors such as other components, some devices in the circuit.

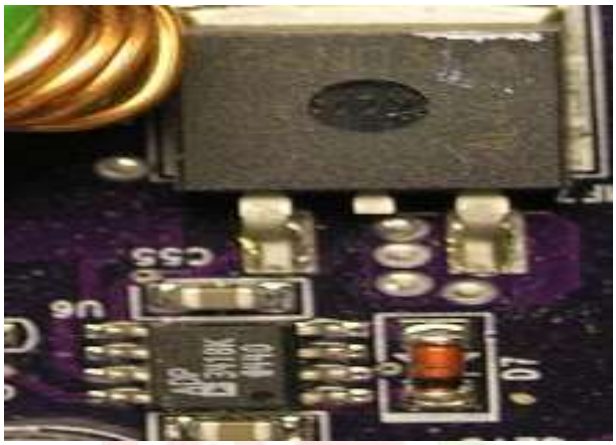


Fig1.Driver circuit

THERMOCOUPLE:

A thermocouple is an electrical device consisting of two dissimilar electrical conductors forming electrical junctions at differing temperatures.A thermocouple produces a temperature-dependent voltage as a result of the thermoelectric effect, and this voltage can be interpreted to measure temperature. Thermocouples are a widely used type of temperature sensor.A thermocouple produces small signals, often microvolts in magnitude. Precise measurements of this signal require an amplifier with low input offset voltage and with care taken to avoid thermal emfs from self-heating within the voltmeter itself. If the thermocouple wire has a high resistance for some reason (poor contact at junctions, or very thin wires used for fast thermal response), the measuring instrument should have high input impedance to prevent an offset in the measured voltage. A useful feature in thermocouple instrumentation will simultaneously measure resistance and detect temperature difference at thermocouple junctions.

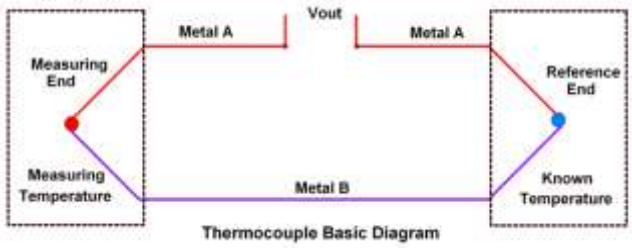


Fig.2: THERMO COUPLE (Temperature sensor)

FEATURES-

- Calibrated directly in ° Celsius (Centigrade)
- Temperature range from -210°C to 1760°C
- Fair linearity
- Excellent durability
- Fast response time
- Extension grade wire,-32° to 392°F (0 to 200°C)
- Melting point, I292°F (700°C)
- Standard: ±2.2C% or ±0.75%
- Special limits of error: ±l.IC or 0.4%

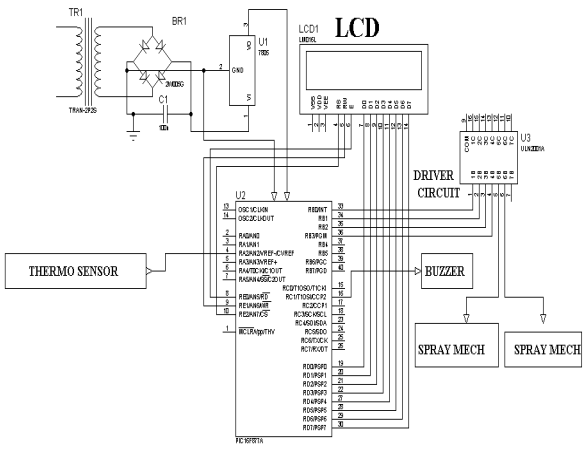


Fig.3:Circuit diagram

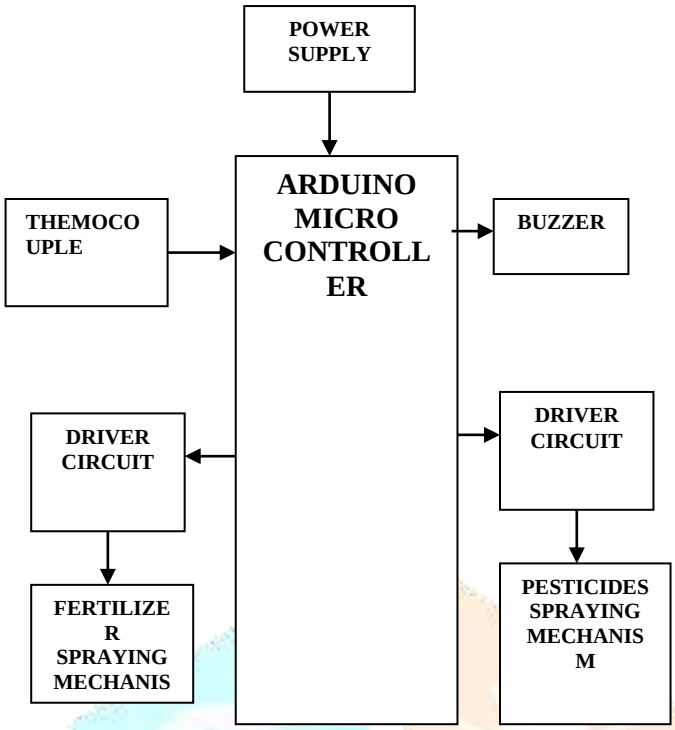


Fig 4:Block Diagram

III.RESULT

This paper proposes a different approach to the problem. It helps in detection of worms without disturbing the plant growth and eradicates the affecting worms.The system helps to improve the production of the onion with higher qualityIt helps to prevent the attack of worms on plantation which in turn improves the production of onion.The worms can be detected at the earlier stage of attack and eradicated.The fertility and quality of the soil can be improved by spraying the right quantity of fertilizers and alsoprevent from over usage of pesticides.

IV.CONCLUSION

With the advent of science and technology in every walk of life this system has been designed to detect the infection of the worm at the first stage in root, so that the plantation crop can be prevented from getting infected. Asmany researches have focused on detecting the disease from the symptoms shown in the plant above the soil level, this system is designed based on a novel idea of thermal sensorby which the disease will be found beneaththe soil. This paper provides the design which has the advantages of portability, compact, less expensive and easily expandable.

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