ISSN: 2278 – 909X
International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE)
Volume 5, Issue 8, August 2016

# 21st Century Industrial Farming

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*Abstract*- **Considering the current issues of farmers & deficiency in food production, it is important to have a system which can provide good quality mass production of food under any circumstances or natural calamities to solve the deadlocks of farmers. This project mainly focuses on industrialized farming system with the help of microcontroller and various sensors. In this project, we have developed a prototype of atomized farming industry in which the crop production will be done in 3 stages on conveyor belt so as to yield maximum production in a definite period of time. This entire system is monitored with the help of temperature, moisture, light, humidity sensors. Also remote sensing of the entire system can be done with the help of wireless technology. This eliminates the physical presence of a person, increasing efficiency and security of the system and at the same time reducing the operational cost. This project consists of PIC16F877A microcontroller & sensors embedded system for controlling and monitoring the entire system. The hardware is to be implemented using microcontroller PIC16F877A and the required software programming will be done using Microsoft Visual Basics. Sensors used involves light sensor , Temperature Sensor , Humidity sensor , water sensor.**

## I. INTRODUCTION

### A. *problem statement*

The aim of the paper is to develop a cost effective and quality solution that will provide good mass production of food and solve the current issues of farmers. It will also enable to eliminate loss of production due to natural calamities and manual interferences. At present due to uncertain environmental conditions and loss in fertility of lands due to pollution and human intervention, many farmers are committing suicides as they have lost their major source of earning. Hence it became very important to develop a system which can help farmer to at least survive in this modern generation. With most of lands becoming barren day by day and left unused, this system can be effectively deployed at such sites which will help our economy by delivering mass production and also employment to many people of country.

### B. *Study and Analysis*

Agriculture is the backbone of India's economic activity and our experience during the last 50 years has demonstrated the strong correlation between agricultural growth and economic prosperity. The present agricultural scenario is a mix of outstanding achievements and missed opportunities. If India has to emerge as an economic power in the world, our agricultural productivity should equal those countries, which are currently rated as economic power of the world. We need a new and effective technology which can improve continuously the productivity, profitability, sustainability of our major farming systems. One such technology is

## II. SYSTEM DESIGN CONSIDERATION

The proposed system characteristics involve developing a automatically monitored industrialized farming with crops being grown on conveyor belt which looks similar to conventional field. The crop is grown on conveyor belt in 3 stages with various sensors being involved. With the help of moisture sensor the need of water by the crop is detected and thus sufficient water is automatically pumped as per need. Similarly other parameters like light intensity and temperature required by the crops are controlled with help of sensors. Whenever a particular crop is selected, the respective parameters of the selected crop can be displayed on monitor for reference purpose with the help of microcontroller [2]. This will help the person or farmer to know the parameters required by that crop just by looking at the monitor. This system is capable of providing production on a large scale since it grows more crops in lesser time span as compared to conventional farming being undertaken. Thus it is a reliable and promising system which will provide continuous uninterrupted production irrespective of atmospheric conditions or season of the country.

## III. DESIGN OF SYSTEM

### A. *Sensors Used*

1. Light sensor: In this project we have used LDR as light sensor. It detects change in light intensity and according to that provides high or low signal to microcontroller. It has a linear response (when plotted Log R vs. Log L) over a wide range and it has high sensitivity in the visible frequencies.

2. Temperature sensor: Here we have used thermistor (NTC) as temperature sensor. It detects the change in the temperature and with respect that provide high or low signal to microcontroller. They are made from a single piece of semiconductor material, where the charge carrier mobility, therefore the resistance, depends on temperature

3. Humidity sensor: In this project we have used electrodes to detect change in the surrounding humidity and to provide control signal to microntroller.The electrical properties of an absorbent material changes with humidity and the variation in conductivity or capacitance can be measured[4].

4. Water sensor: In this project we have used float and angular potentiometer to detect the water presence and according to that provides sensed signal to microcontroller.

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industrialized farming technology.

B. *Circuit Diagram*

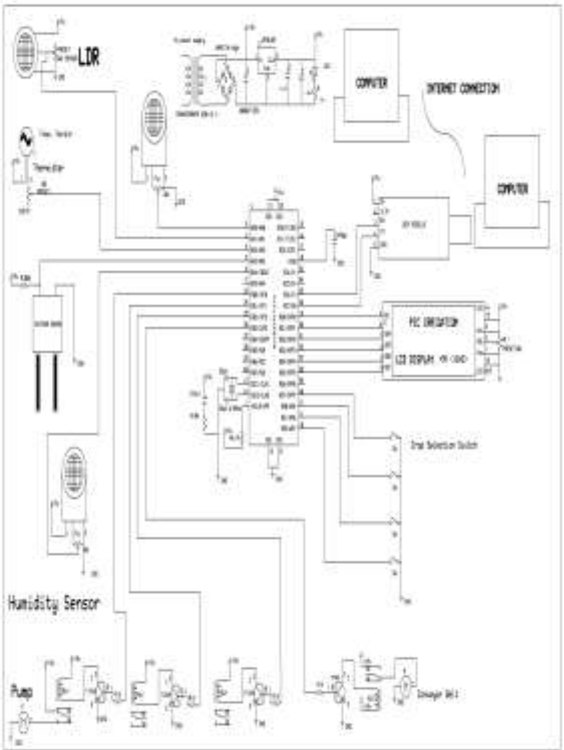


Fig.1: Circuit Diagram

C. *Description of components*

1. PIC16F877A microcontroller

Peripheral Features : Timer0: 8-bit timer/counter with 8-bit prescaler. Timer1: 16-bit timer/counter with prescaler, can be incremented during Sleep via external crystal/clock. Timer2: 8-bit timer/counter with 8-bit period register, prescaler and postscaler. Two Capture, Compare, PWM modules Capture is 16-bit, max. resolution is 12.5 ns Compare is 16-bit, max. resolution is 200 ns PWM max. resolution is 10-bitSynchronous Serial Port (SSP) with SPI™ (Master mode) and I2C™ (Master/Slave)Universal Synchronous Asynchronous Receiver Transmitter (USART/SCI) with 9-bit address detection Parallel Slave Port (PSP) – 8 bits wide[3].

Special Features: 100,000 erase/write cycle Enhanced Flash program memory typical 1,000,000 erase/write cycle Data EEPROM memory typical Data EEPROM Retention > 40 year. Self-reprogrammable under software control. In- Circuit Serial Programming™ (ICSP™) via two pins Single-supply 5V. In-Circuit Serial Programming Watchdog Timer (WDT) with its own on-chip RC oscillator for reliable operation Programmable code protection. Power saving Sleep mode. Selectable oscillator options In-Circuit Debug (ICD) via two pins.

I/O ports : PORTA is a 6-bit wide, bidirectional port. The corresponding data direction register is TRISA. Setting a TRISA bit (= 1) will make the corresponding PORTA pin an input (i.e., put the corresponding output driver in a High-Impedance mode) as shown in fig.3.2Clearing a TRISA bit (= 0) will make the corresponding PORTA pin an output (i.e., PORTC is an 8-bit wide, bidirectional port. The corresponding data direction register is TRISC. Setting a TRISC bit (= 1) will make the corresponding PORTC pin an input (i.e., put the corresponding output driver in a High-Impedance mode). Clearing a TRISC bit (= 0) will make the corresponding PORTC pin an output (i.e., put the contents of the output latch on the selected pin). PORTD is an 8-bit port with Schmitt Trigger input buffers. Each pin is individually configurable as an input and output. PORTD can be configured as an 8-bit wide microprocessor port (Parallel Slave Port) by setting control bit, PSPMODE (TRISE<4>). In this mode, the input buffers are TTL. PORTE has three pins (RE0/RD/AN5, RE1/WR/AN6 and RE2/CS/AN7) which are individually configurable as inputs or outputs. These pins have Schmitt Trigger input buffers the PORTE pins become the I/O control inputs for the microprocessor port when bit PSPMODE (TRISE<4>) is set. In this mode, the user must make certain that the TRISE<2:0> bits are set and that the pins are configured as digital inputs. Also, ensure that ADCON1 is configured for digital I/O. In this mode, the input buffers are TTL.

2. Relay driver

The eight NPN Darlington connected transistors in this family of arrays are ideally suited for interfacing between low logic level digital circuitry (such as TTL, CMOS or PMOS/NMOS) and the higher current/voltage requirements of lamps, relays, printer hammers or other similar loads for a broad range of computer, industrial, and consumer applications. The ULN2803 is designed to be compatible with standard TTL families while the ULN2804 is optimized for 6 to 15 volt high level CMOS or PMOS. It supports output voltage upto 50v and output current to 500ma.It has integral suppression diodes. The output can be paralleled.Inputs are pinned opposite to outputs to simplify board layout.[3]

3. LCD Display

LCD display can be interfaced with microcontroller to read the output directly. In our project we use a two line LCD display with 16 characters each. Liquid crystal Display (LCD) displays temperature of the measured element, which is calculated by the microcontroller. CMOS technology makes the device ideal for application in hand held, portable and other battery instruction with low power consumption.

General specifications:

Drive method: 1/16 duty cycle .
Display size: 16 character * 2 lines.
Character structure: 5*8 dots.
Display data RAM: 80 characters (80*8 bits).
Character generate ROM: 192 characters.
Character generate RAM: 8 characters (64*8 bits).
Both display data and character generator RAMs can be read from MPU.
Internal automatic reset circuit at power ON.
Built in oscillator circuit.

put the contents of the output latch on the selected pin).
PORTB is an 8-bit wide, bidirectional port. The corresponding data direction register is TRISB. Setting a TRISB bit (= 1) will make the corresponding PORTB pin an input (i.e., put the corresponding output driver in a High-Impedance mode).[1]

## IV. WORKING

The heart of this project is PIC16F877A. All the controlling stuff is done by this controller. It operates on 5v supply and its operating frequency is 11.08952 MHZ. It consist of 5 inbuilt port i.e. port A, port B, port C, port D, port E. Port A has inbuilt ADC so all the analog sensors are connected to port A.
Following sensors are connected to port A: LDR is connected to port A.1, its resistance decreases as the intensity of light falling on it increases. There is another 10k resistor is connected in series with the LDR to form voltage divider. When voltage generated across 10k resistor will be more than LDR then this will give high signal to microcontroller and according to that microcontroller will switch corresponding light appliance which will keep crops worm enough.Thermistor (NTC) is connected to port A.2. There is another 10k resistor is connected in series with the thermistor to form voltage divider. Its resistance decreases as the surrounding temperature increases while this generate high voltage across potential divider and this will send high signal to microntroller. In response to this high signal controller will switch off the corresponding heater appliance.For moisture sensing electrodes are connected to port A.3. As the moisture increases it will pass more current through it and this will increase voltage drop across 1k resister connected in series with it and will provide high signal to microcontroller. This sensor work in coordination with angular potentiometer signal to which water sensor is connected whenever the output of these two sensor goes high microcontroller forces pump to pour water to field.
Port D controls all our relay outputs.
ULN2803 IC is used to provide compatibility between controller outputs and relay input which helps to drive relay. Port C of this controller has inbuilt UART (universal synchronous, asynchronous receiver and transmitter) pins of port c.6 and port c.7 are interfaced to computer to with the help of TTL to USB converter so that all the ongoing details of project can be seen on PC.
The LCD is connected to port D and it operates in the 4 bit mode. The LCD used is 16x2 which will display all the parameters of the crops. It will also display below the set point parameters required by that particular crop.Ic1 7805 is 5v regulator IC to give stabilized supply to microcontroller LD1 LED is a power indication led. Crystal gives the necessary clock to micro controller. Diodes d1 to d1 are power rectifier to 9v 1 ampere transformer.
Output of bridge rectifier and capacitor is 12v dc. All our relays are operated by 12v dc. Relay output can be connected to any 250v 7 ampere load, this limit should not be crossed otherwise it will damage the relay circuit .The relay 4 is connected to dc motor which drives the conveyor belt as per the programming. All the components connected around this IC are as per the application notes given in the datasheet by the manufacturer.
Capacitor c5 and r1 gives the required reset pulse to microcontroller. Crystal x1 along with capacitor c6 and c7 gives the required clock pulse to microcontroller. Resistances connected to indication LEDs are current limiting resistors.

## V. RESULTS AND DISCUSSIONS

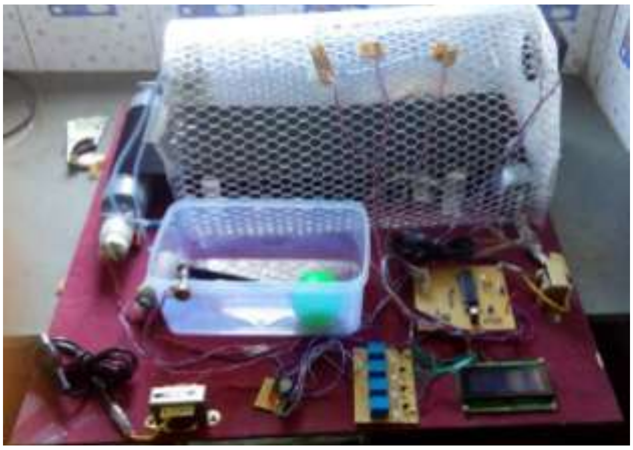

Fig.2: Model Setup

When the entire model was turned on by power supply, all the sensors reading were properly displayed on LCD display with required reading for crop on other side. we had provision to select different crop and its required parameters setting displayed on LCD with help of visual basics programming. Also graphical display of parameter monitoring was possible on laptop screen by connecting through usb cable.

## V. CONCLUSION

Thus with the literature survey, interaction with our project guide and expert interaction enabled us to understand the problem statement and find a practicable solution for current issues of farmer and improve the food productivity. This model can be enhanced in various way. It is possible to upgrade this system with remote sensing with the help of wireless technology like GSM and Zigbee Technology. This will help the person to view the entire system at his home or control unit. To make the project more error free, Use of high sensitivity power sensors can be done. By Using Multi layered conveyor belt, we can increase the production of crop and also the time consumed will be less because all the conveyor belts will be synchronized together. This will increase the overall efficiency of system. Theft control system can be added to the system so as to prevent damaging of crops or any other loss.

## VI. ACKNOWLEDGEMENT

We would like to thank **Prof. Mrs. POONAM GADGE** for the support and encouragement provide by her, without which it would not have been possible to go ahead with the research work.We would like to thank **Prof Mrs. GEETA DEVURKAR**, Project co-ordinator for her support and valuable suggestions, and always giving us valuable feedback. We would like to thank **Prof Mr. MANOJ DONGRE**, Head of the department of **Electronics and Telecommunication**, **Ramrao Adik Institute of Technology**, for showing confidence in us and ensuring that we have access to any literature material and infrastructure required to successfully execute our work.

We set up the entire model as shown in the image below. The conveyor belt was set to rotate every 10 sec by using programming. We used a water tank for monitoring moisture content of soil and maintaining continuous supply.Fan and bulbs were used for montoring light conditions. We used small cups of plastics filled with a particular crop placed on conveyor belt to display crop to be produced on regular basis.

## VII. REFERENCES

[1] Ramesh gaonkar, ”fundamentals of microcontrollers and Applications in Embedded System(with the PIC18 Microcontroller family)”, by Penram International India pvt.ltd 2nd edition,year-2007 pages-59-65.

[2] Kenneth Ayala, ”The 8051 Microcontroller”, 3rd edition, year 2005, pages-76-78.

[3]Muhammad Ali Mazidi, “The 8051 Microcontroller and Embedded System”, 2nd edition, year 2008, pages-300.

[4] A.K.Sawhney”, Electrical and Electroniucs Measurements and Instrumentation” by Gagan Kapur, Dhanpat Rai & Co.(9) ltd., Delhi, Ninteenth Revised Edition, year 2011,pages 1119-1120.