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# Industrial Monitoring System Using Wireless Sensor Networks

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ABSTRACT

The important aspect of our project revolves around the concept of monitoring the machines utilized in the textile industry. It is aimed at continuously examining the components and machineries in the industry. This project have the ability to establish communication link between various machineries in industries and the controlling system. It also helps in sequential power ON and power OFF of the machineries depending on the outputs received from the controlling unit. The project enables automatic manipulation of the machineries. The controlling system monitors various parameters of the machineries and evaluates its performance and updates the required changes. The machineries will be linked via RF transmitter and receiver. This enables communication link between the controlling device and the connected recipient devices. For maintenance purposes both automatic and manual methods of manipulation are provided. Either of them can be chosen depending upon the purpose. When automatic mode is turned on the machines can be controlled only by the server.

Keywords: Automatic system control, Remote access to machines, RF based monitoring and Wireless monitoring.

## 1. INTRODUCTION

The important aspect of our project revolves around the concept of monitoring the machines utilized in the textile industry. It is aimed at continuously examining the components and machineries in the industry. It also helps in doing an automatic and sequential power on and power off of certain components with the results of the monitoring. The set up consists of two LCD displays one at the controller level and the other at the recipient machinery. They are focused on directing the controls on either ways and vice versa. The machineries will be linked via RF. This enables communication link between the controlling device and the connected recipient devices. Using this connectivity the device's parameters will be monitored and necessary changes will be updated.

## 2. BLOCK DIAGRAM

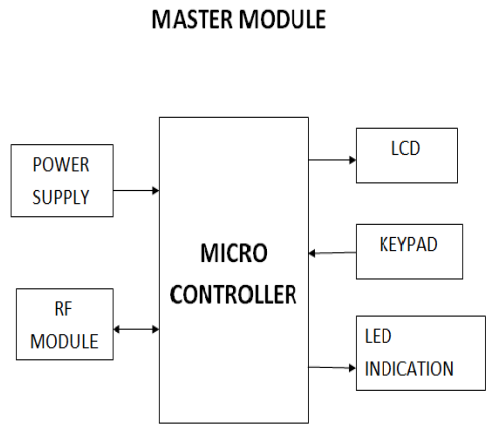


Fig.1. Block diagram of master module

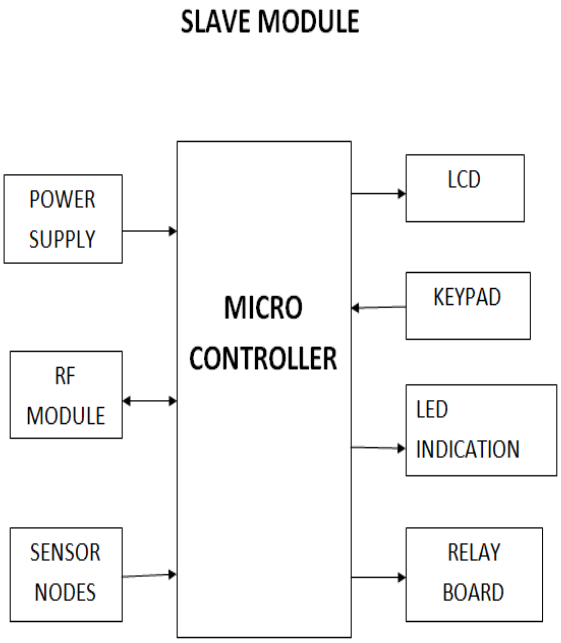


Fig.2. Block diagram of slave module

The block diagram has a power supply that is used to power up the whole module.

The RF module is used to receive and transmit data from and to the transmitter and receiver.

The micro controller is used to effect the necessary commands required. The LCD is the visual display that is used to manipulate the controls. The keypad is used to enter the input values.

## 3. OBJECTIVE

The objective of the project is to monitor the prospective changes in the parameters of the machineries automatically. It can indeed reduce the man-effort involved in the process of monitoring. This also involves in reducing the occurrence of prospective defaults owing to human carelessness.

## 4. WORKING

Our project has slave module and relay module. In slave mode the signals that are collected from the machineries are of high voltage. Those signals might damage atmega 32 micro controller. Atmega 32 has LCD display. Since the frequency of operation is 8 MHz we are using external clock. Depending upon the details collected the details reach the relay board. From the relay mode 12 v output is transmitted to master module. In Master module consists of LCD display. Either automatic or manual switching mode can be used in slave mode. In manual mode we will have to manually manipulate the start and stop of the machinery. In case, of automatic mode the server will control it. In master module also we are using external clock since the frequency of operation is 8 MHz. Here LEDs are used to indicate the parameters. RF link is used to communicate between master and slave module. In-order to enable communication between master and slave mode frequency switching must take place. Hence relay mode is used to carry out frequency switching. Only frequency switching can enable communication between master and slave module, hence relay must be used without fail. Hence by using the parameters from the machineries they are not only monitored but also handled automatically.

## 5. COMPONENT DETAILS

### *5.1 Opto Coupler*

In electronics, an opto-isolator, also called an optocoupler, photocoupler, or optical isolator, is a component that transfers electrical signals between two isolated circuits by using light. Opto-isolators prevent high voltages from affecting the system receiving the signal. Commercially available opto-isolators withstand input-to-output voltages up to 10 kV and voltage transients with speeds up to 10 kV/µs. A common type of opto-isolator consists of an LED and a phototransistor in the same opaque package.

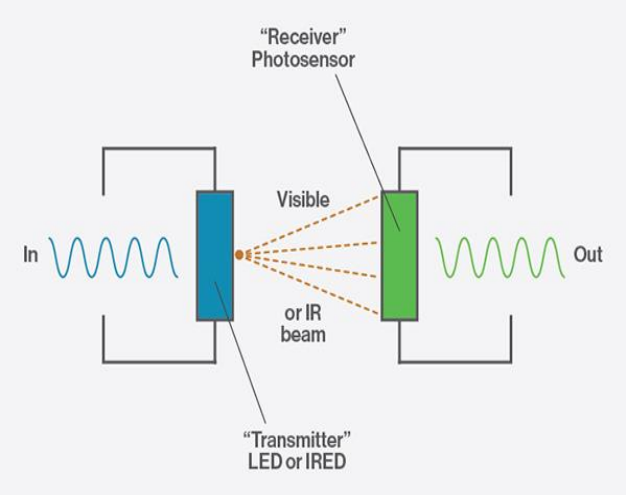


Fig.3. Working of photo sensor

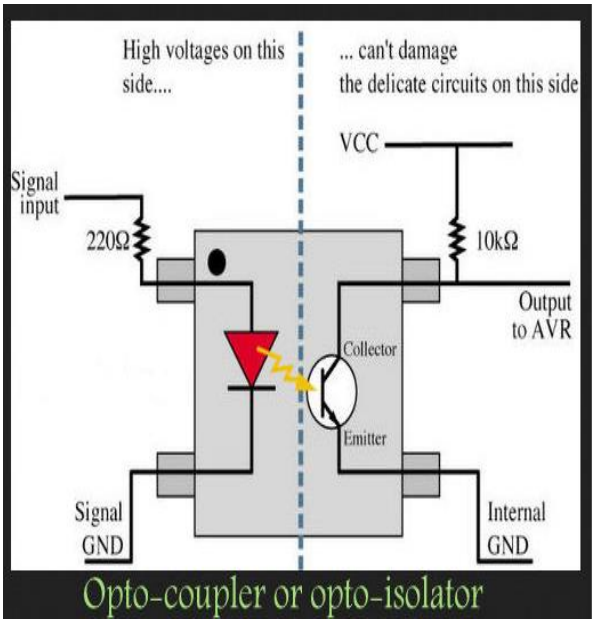


Fig.4. structure and working of optocoupler

### *5.2 ATMEGA 32 Microcontroller*

The high-performance, low-power Microchip 8-bit AVR RISC-based microcontroller combines 32KB ISP flash memory with read-while-write capabilities, 1KB EEPROM, 2KB SRAM, 54/69 general purpose I/O lines, 32 general purpose working registers, a JTAG interface for boundary-scan and on-chip debugging/programming, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a universal serial interface (USI) with start condition detector, an 8-channel 10-bit A/D converter, programmable watchdog timer with internal oscillator, SPI serial port, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. By executing powerful instructions in a single clock cycle, the device achieves throughputs approaching 1 MIPS per MHz, balancing power consumption and processing speed.

#### *5.2.1 Key Features*

1) 32 x 8 general working purpose registers.
2) 32K bytes of in system self-programmable flash program memory
3) 2K bytes of internal SRAM
4) 1024 bytes EEPROM
5) Available in 40 pin DIP, 44 lead QTFP, 44-pad QFN/MLF
6) 32 programmable I/O lines
7) 8 Channel, 10 bit ADC
8) Two 8-bit timers/counters with separate prescalers and compare modes
9) One 16-bit timer/counter with separate prescaler, compare mode and capture mode.
10) 4 PWM channels
11) In system programming by on-chip boot program
12) Programmable watch dog timer with separate on-chip oscillator.
13) Programmable serial USART.
14) Master/slave SPI serial interface

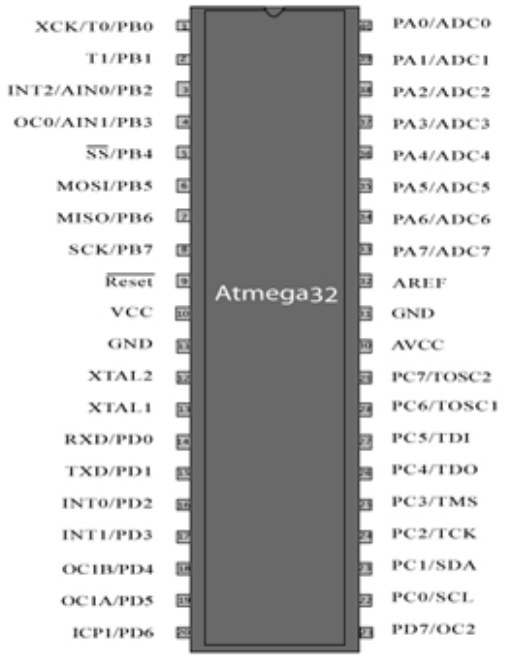


Fig.5. Pin diagram of atmega32

### *5.3 LCD Display*

A LCD Display Module with 4x20 characters and yellow/green LED backlight uses STN technology so it has a great contrast and a wide viewing angle. Display module is controlled by SPLC780D, parallel interface chipset that is easy to use. LCD (liquid crystal display) is the technology used for displays in notebook and other smaller computers. Like light-emitting diode (LED) and gas-plasma technologies, LCDs allow displays to be much thinner than cathode ray tube (CRT) technology. LCDs consume much less power than LED and gas-display displays because they work on the principle of blocking light rather than emitting it. A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome.

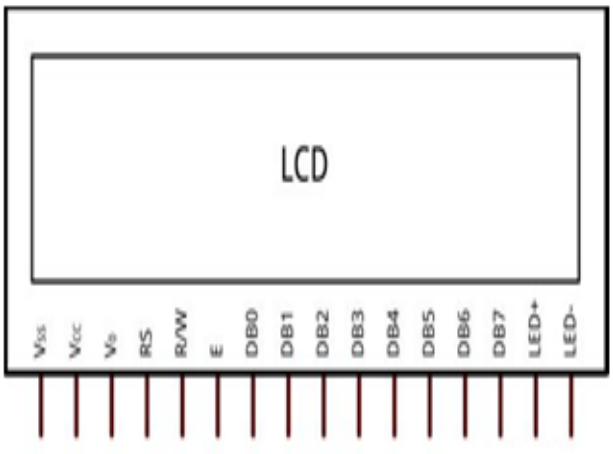


Fig.6. Pin diagram of LCD

### *5.4 Software Used*

Here we use the software Atmel studio 6.2. Atmel Studio 6 is a program designed for developing and debugging Atmel ARM Cortex-M and Atmel AVR microcontroller (MCU) based applications. The Atmel Studio IDP gives a seamless and easy-to-use environment to write, build and debug applications written in C/C or assembly code.

### *5.5 RF Transmitter and Receiver*

The RF module, as the name suggests, operates at Radio Frequency. The corresponding frequency range varies between 30 kHz & 300 GHz. In this RF system, the digital data is represented as variations in the amplitude of carrier wave. This kind of modulation is known as Amplitude Shift Keying (ASK).

Transmission through RF is better than IR (infrared) because of many reasons. Firstly, signals through RF can travel through larger distances making it suitable for long range applications. Also, while IR mostly operates in line-of-sight mode, RF signals can travel even when there is an obstruction between transmitter & receiver. Next, RF transmission is more strong and reliable than IR transmission. RF communication uses a specific frequency unlike IR signals which are affected by other IR emitting sources.

This RF module comprises of an RF Transmitter and an RF Receiver. The transmitter/receiver (Tx/Rx) pair operates at a frequency of 434 MHz. An RF transmitter receives serial data and transmits it wirelessly through RF through its antenna connected at pin4. The transmission occurs at the rate of 1Kbps - 10Kbps.The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter.

The RF module is often used along with a pair of encoder/decoder. The encoder is used for encoding parallel data for transmission feed while reception is decoded by a decoder. HT12E-HT12D, HT640-HT648, etc. are some commonly used encoder/decoder pair ICs.

Fig.7. RF receiver transmitter

## 6. FUTURE SCOPES

This has been designed to monitor and handle the machines automatically even if there are less or no workers available. The number of machines which are to be automated are yet to be added. Every change should be intimated to the server and

there should be a display regarding the work which is being done.

## 7. CONCLUSION

This project is proposed mainly to automate the functions or different stages of work done by machineries. This controls the machines by its own with the data collected from these machines. The data which are collected are processed by the slave and master modules efficiently. Thus we get the expected result from our project. It reduces the man effort and also the damages or destructions caused by the workers are reduced.

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