Power Control and Data Log System Design in Loom Industry Using Controller

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ABSTRACT

The main objective of this paper is to control the electric power wastage and take data logs from a motor and also to check the performance of an employee in industries. In manufacturing industries, the manpower machineries are running unnecessary without giving raw input, it leads to wear the machine and power loss. This system works on basic microcontroller 8051, so it requires low cost and gives efficient performance in unnecessary electric power wastage in power loom motors. The function of microcontroller is to controls a motor and take data logs at the time of looms running without yarn.

Keywords: AC motor, Power loom, PIC controller, Integrated circuit, Microcontroller 8051.

INTRODUCTION

The manufacturing industries percentage of production is based on electric power and manpower. The human has response to control the power wastage in manufacturing industries, when no raw input. The power loom machineries requires manpower to give the yarn. When the labour are delayed to give the yarn to loom machine, the power loss will occurs at low load in motor. For controlling this power loss, the microcontroller is connected to PIC controller in design box. The PIC controller output pin is connected to 8051, it gives status of loom. When the loom don't have yarn to run, this microcontroller controls the motor.

Through microcontroller 32 I/O ports multi-number of PIC controllers are connected shown in Fig. 1. The Purpose of SD card is to be connected with 8051, it takes data logs when a motor at low load, from these data logs the working status can be known.

System Hardware

AC Motor

An AC electrical motor is electromechanical device which converts electrical energy into a mechanical energy. In case of three phase AC operation, most widely used and self-starting induction. Stator: Stator of three phase induction motor

is made up of numbers of slots to construct a 3 phase winding circuit which is connected to 3 phase AC source. Rotor of three phase induction motor consists of cylindrical laminated core with parallel slots that can carry conductors[1-3]. The principle of electric motor is Faraday's law an emf induced in any circuit is due to the rate of change of magnetic flux linkage through the circuit.

The working principle of three phase induction motor it may observed that the rotor speed should not reach the synchronous speed produced by the stator. Three phase AC motor stator is a classic three-phase stator with the winding displaced by 120°. Medium construction complexity, multiple fields on stator, cage on rotor. High reliability even at very high achievable speeds. Medium efficiency at low speed, high efficiency at high speed, driven by multi-phase Inverter controllers, motor EMI good terrible from inverter, sensorless speed control possible, low cost per horsepower, though higher than for 1-phase AC induction motor. Three Phase AC Motor provides some functionality Self-starting Robust in construction, Economical, Easier to maintain.

Power loom

A loom operated by mechanical or electrical power. A power loom is a mechanised loom powered by a line shaft. The huge components of the loom are the warp beam, heddles, harnesses, shuttle, reed and take up roll. In the loom, yarn processing includes shedding, picking, battening and taking-up operations. Shedding is the raising of the warp yarns to form a loop through which the filling yarn, carried by the shuttle, can be inserted and Picking is the harnesses raise the heddles or healds, which raise the warp yarns, the shed is created. Battening is the shuttle moves across the loom laying down the fill yarn, it also passes through openings in another frame called a reed.

The weaver can watches for warps problems in the warp itself which were not detected in the slashing process and weavers can expect to make several dozen circuits of their machines a night, with most of their time spent ensuring the quality of the cloth and its standard production.

PIC controller in design box

The PIC16F887 controls the working operation of design box, it provides design to clothes from stored data in Integrated Circuit (ATMEL 138 - 24C31A) is shown in Fig. 2. It is low price, high quality, easy availability and applicable to control of different processes in industry, machine control devices and measurement of different values[4].

Some important features are RISC architecture, internal oscillator Software selectable frequency range of 8MHz to 31KHz, Power supply voltage 2.0-5.5V, Power-Saving Sleep Mode, 35 input/output pins, 8K ROM memory in FLASH technology, 368 bytes RAM memory, A/D converter, USART module, Supports Recommended Standard Cables, Master Synchronous Serial Port (MSSP) and protocol supports SPI and I2C mode Serial Programming Option Chip can be programmed even embedded in the target device.

Integrated circuit (IC) in design box

An integrated circuit or monolithic integrated circuit (also referred to as an IC, a chip, or a microchip) is a set of electronic circuits on one chip of semiconductor material, normally silicon. This can be made much smaller than a discrete circuit made from independent components. ICs can be made very compact, having up to several billion transistors and other electronic components in an area the size of a fingernail.

The width of each conducting line in a circuit can be made smaller and smaller as the technology advances.

AT24C32 provides 32,768/65,536 bits of serial electrically erasable and programmable read only memory (EEPROM) and operates at 1.8 to 5.5v. The device feature allows up to 8 devices to share a common 2-wire bus and optimized for use in many industrial and commercial applications where low power and low voltage operation.

Microcontroller (8051)

The 8051 is an 8-bit powerful microcontroller which perform valuable operations at limited to 8 bits and this chips are often available in DIP (dual in-line package) form. These 8051 are all programmed using assembly language and c program, and they all share certain features. The features of 8051 are 4 KB on chip program memory, 128 bytes on RAM and it has 32 bank register, 16 bit addressable register and 80 general purpose register in 4 register banks. It supports 128 user defined software flags, 8-bit data bus, 16-bit address bus, 16 bit timers, 3 internal and 2 external interrupts, four 8-bit ports, 16-bit program counter and data pointer at instruction cycle with 12 MHz Crystal.8051 models may also have a number of special, model-specific features, such as UART, ADC, Op-Amps[5,6].

SD card

The SD-memory cards are the most popular memory cards in modern communication, computer and consumer appliances. They support state-of-the-art security and capacity requirements of modern audio and video applications in consumer and communication products.

SD-memory cards support content protection, prevention of illegal use of content and security systems based on, for example ISO-7816. An embedded version of MMC is eMMC, according to the JESD84-A43. It offers up to 8-bit wide interface and can be applied in SD-memory card compatible hardware interfaces[7]. While the SD-memory card adds an advanced data storage function to an application.

System Software

The software programming gives the working principle for every system design. The description of a software product gives an efficient function to hardware of the system, that a software designer writes in order to give a software development team overall guidance to the architecture of the software project.

Assembly programming

An assembly language is a low-level programming language for programmable device and coded machine instructions. Assembly language instructions usually consist of an opcode mnemonic followed by a list of data, arguments or parameters each assembly language is specific to portable across multiple architectures. Assembly language is converted into executable machine code by a utility program referred to as an assembler that can be loaded into memory and executed.

C programming

C is a high-level and general purpose programming language that is ideal for developing firmware or portable applications. C has a compiler for many computer systems and widely used languages. Fixed number of keywords, multiple logical and mathematical operators in bit manipulators, multiple assignments may be applied in a single statement. C gives control of function and object visibility to other files.

Pin Configuration

After selecting the hardware component for designing and configuration

details are necessary to make the system. To implementation of this system with pin configuration of controllers are necessary for designer view to make it an efficient.

PIN configuration of PIC controller

The PIC controller 16F887 has 40 pins inconnection, it has 3 I/O ports A, B, C and ports D, E supports internal connection of CPU which gives 35 I/O pins is shown in Fig. 3. Each ports has 8 pins and perform multiple function during connection.

PIN Configuration of 8051

8051 microcontrollers have 4 I/O ports and each ports have 8 bits which can be configured as inputs or outputs. From this 32 input/output pins enabling for peripheral devices connection in Fig. 4. Pin configuration is to be configured as an input (1) or an output (0), depends on its logic state. In this case, voltage level on appropriate pin will be 5V.

PIN Configuration of AT24C32A

ATMEL IC24C32A have 8 pins DIP, it has 3 I/O pin and its configuration is refer in Table 1.

The AT24C32 is available in space saving 8-pin JEDEC PDIP, 8-pin JEDEC SOIC, 8-pin EIAJ SOIC and 8-pin TSSOP (AT24C32) packages accessed through 2-wire serial interface is reference in Fig. 5.

CONCLUSION

The implementation of this system requires low cost and gives efficient performance in unnecessary power wastage in loom motor control. The function of this PIC controller provides a design to clothes from stored Integrated Circuit (IC) and connected to microcontroller in weaving industries. The microcontroller controls a motor, when the looms running without raw input and take data logs by connecting SD card. The purpose of this system is to control the power wastage and also monitoring the performance of an employee in manufacturing industries. Depends on the connecting machineries, the controllers can be replaced. This system implementation can be varied from its range of industry.

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Table 1. Pin configurations

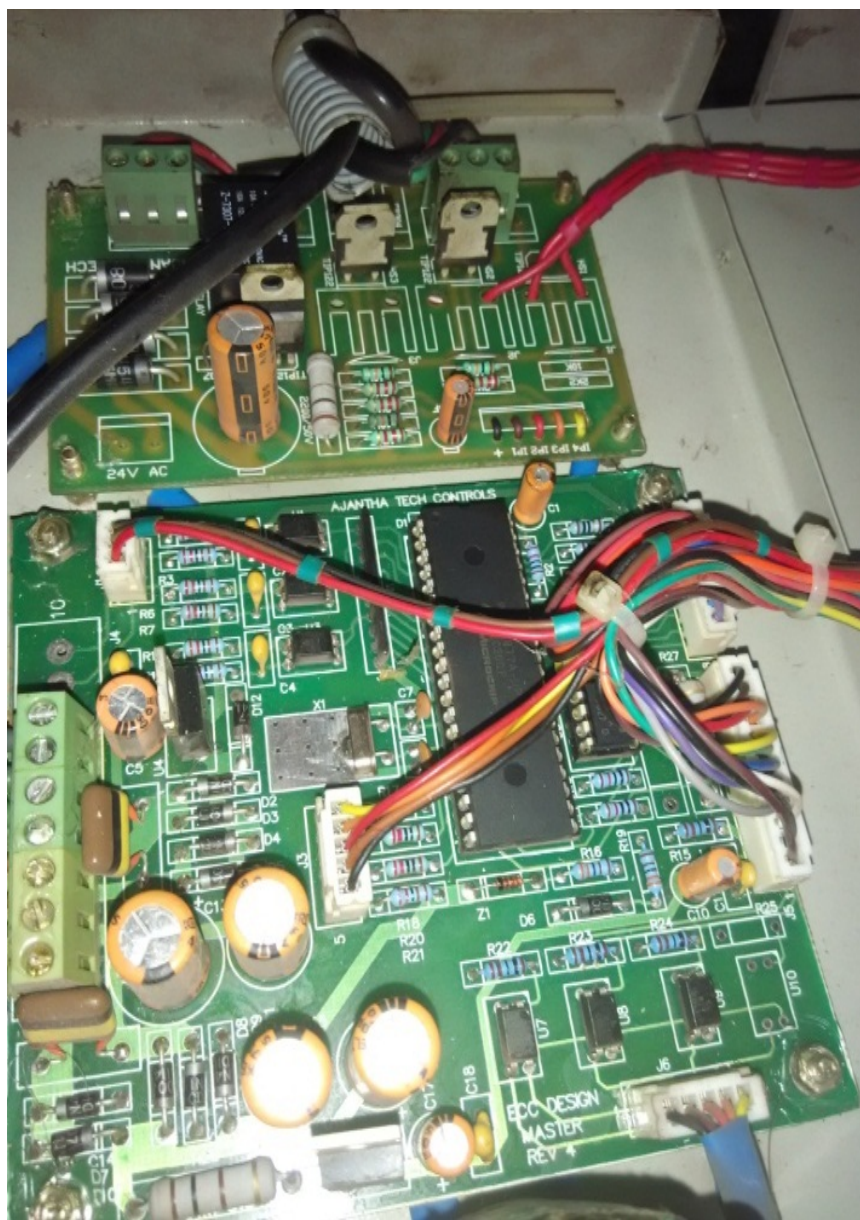| Pin	Function
A0-A2	Address Inputs
SDA	Serial Data
SCL	Serial Clock Input
WP	Write Protect
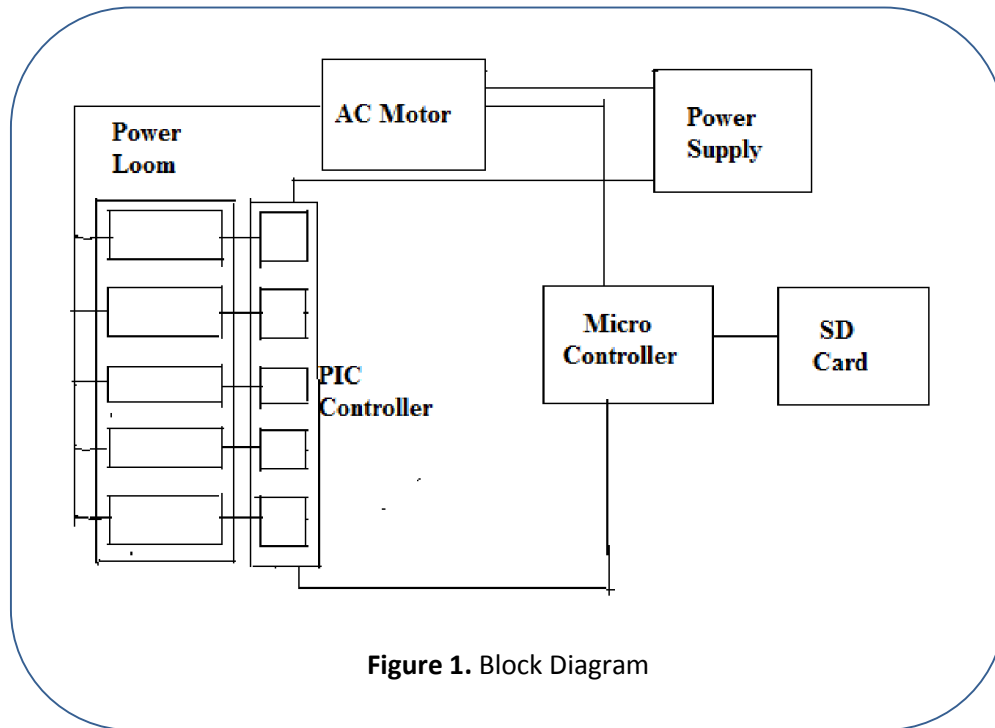
Figure 1. Block Diagram

Figure 2. Internal circuit of Design box
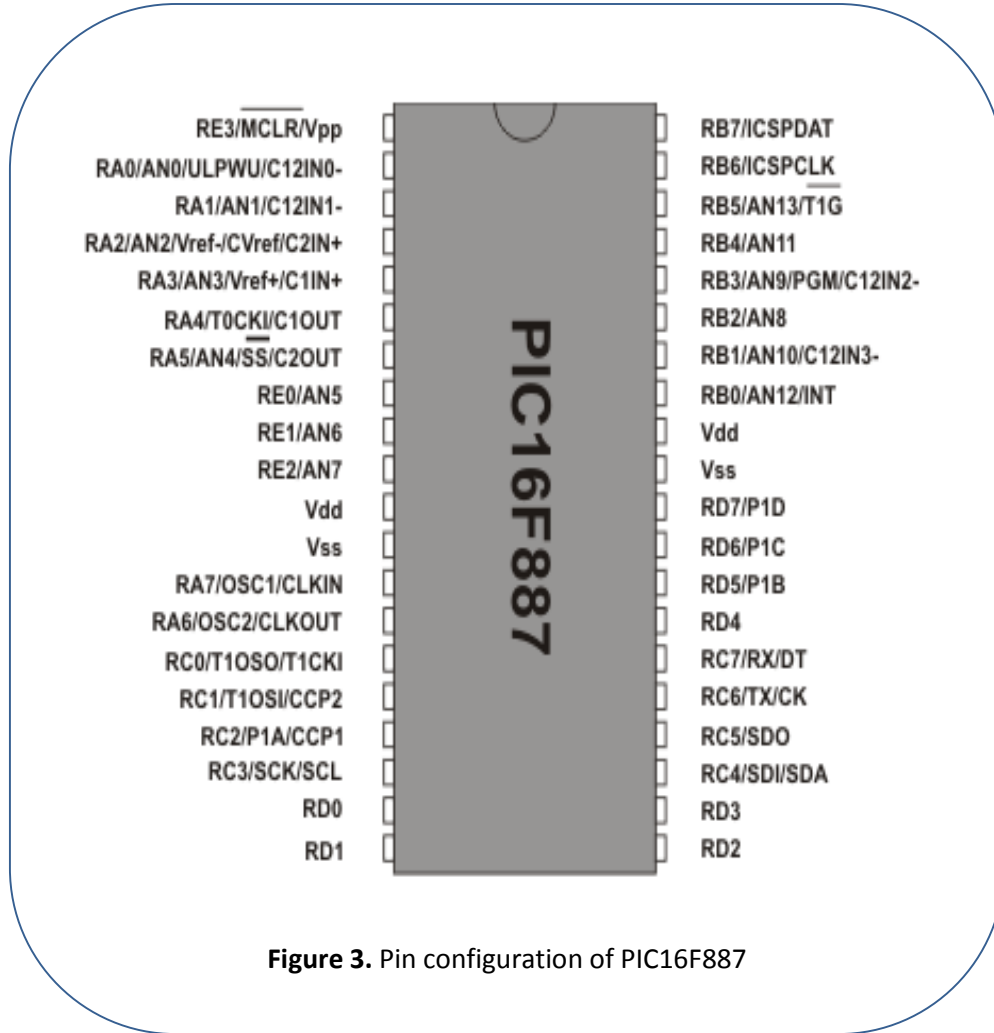
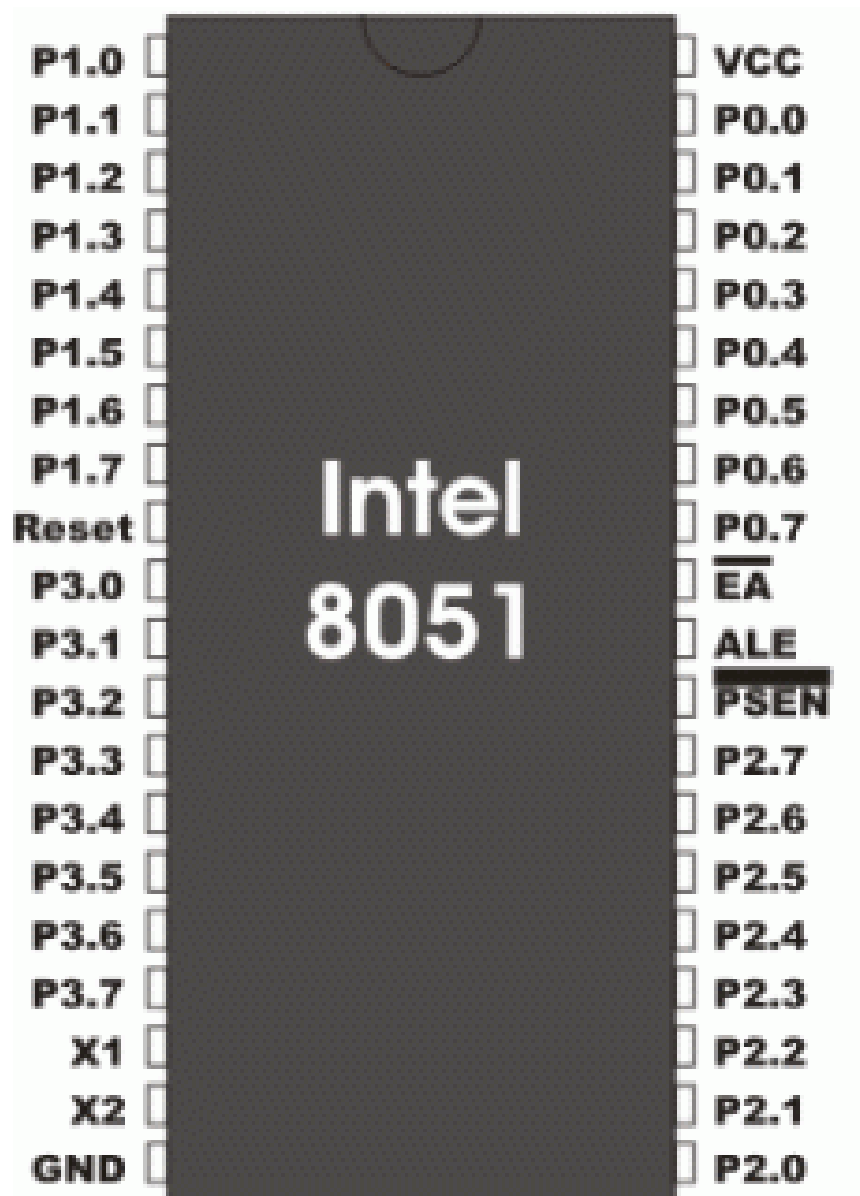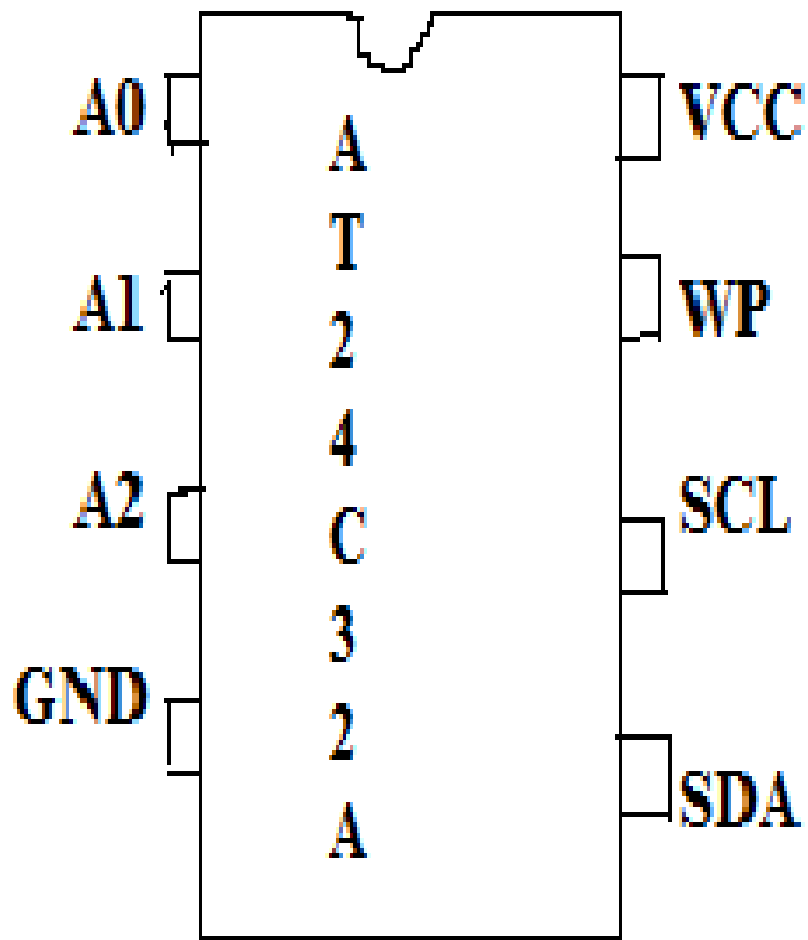**Figure 3.** Pin configuration of PIC16F887

Figure 4. Pin configuration of 8051

Figure 5. Pin configuration of AT24C32A