WIRELESS SPEED SYNCHRONIZATION OF MULTIPLE MOTORS IN INDUSTRIAL APPLICATION USING ATMEL

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Abstract: **Operation of many motor at a synchronism to perform well and to get the desire operation at a higher effectiveness is important in many industries such as steel industries, textile industry, rolling mills, paper mills etc. So there needs to be a common synchronization between the motors. The motors like DC, AC, stepper or SERVO can be used depend on the application. In traditional system synchronization is done through conveyor belts, line shaft gears, pullers etc., but in this project wireless technology for speed synchronization are used by using RF module. Master slave concept will be used here AT89C5S2 Atmel family microcontroller will be used for the development of the project. By implementing this project we can reduce the manpower, labor cost and also time can be saved since it is wireless and automatic control can possible.**

Keywords: Microcontroller, Radio frequency, wireless, synchronization

1. INTRODUCTION

In traditional/conventional system for speed synchronization we use mechanical transmission system which consists of conveyor belt, line shaft and pullers but it has lots of drawback so to overcome from this in this project we are using the wireless technology for speed synchronization of multiple motors. In earlier concept of conveyor belt, the motors are only kept in series, parallel or mixed with each other, but in this project we can kept the motor in any position, since there will be wireless connection between the motors. For wireless technology we using RF (Radio frequency) module. As this system is wireless it is easy to operate and control the system.

In this project one motor acts as transmitter and rest of all acts as receivers if particular speed is set in transmitter then the receiver also run at the same speed of transmitter. And we can enter the different required speed using keypad and LCD display unit is connected to display the speed in rpm. PWM (pulse width modulation) is the main technique in our project to synchronize the speed of motors. To produce PMW pulse AT89S52 microcontroller exhibits low power and high frequency.

The pulse width from the microcontroller are generated according to speed and motor is adjust to that speed. With the help of PWM (pulse width modulation) speed synchronization is provided.

The microcontroller is provided with a potentiometer to set the speed of master motor and also it vary or controls the amount of current that flows through the system.IR sensor are used to sense the speed of the motor. The microcontroller is connected to a motor through an opto coupler, which is used to isolate and avoids the reverse current from the motor.

This system is used in many industries like textile mills, steel plant, paper mills, rolling mills where conveyor belts are used for synchronization of multiple motors. In textile mills where all the motors run at same speed to draw the clothes, so that balanced tension can be achieved to avoid the damage of cloths. By implementing this project we can reduces the manpower, labor cost and also time of operation.
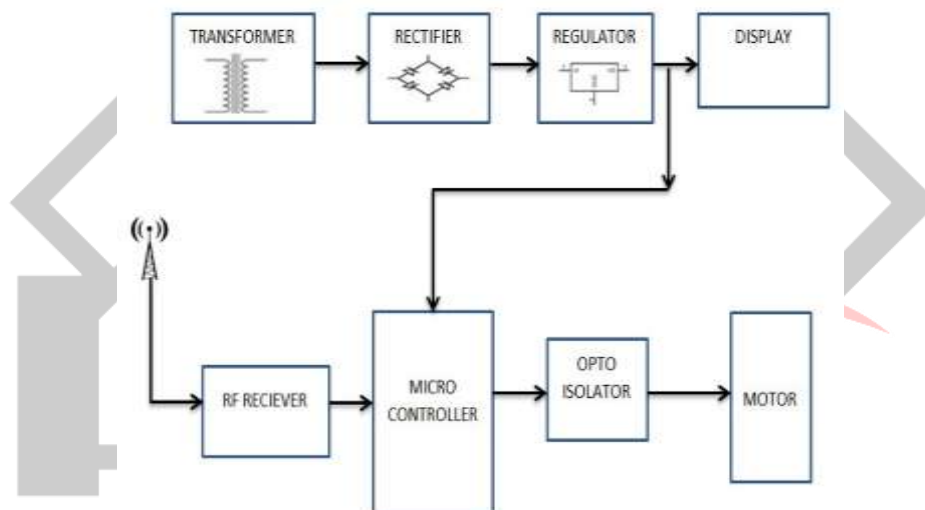
2. BLOCK DIAGRAMS

- **Block diagram of transmitter:**
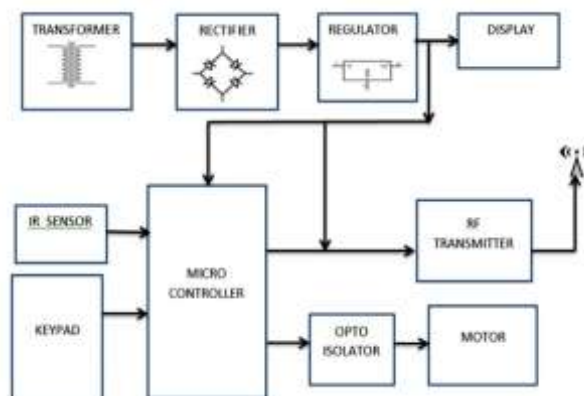
- **Block diagram of receiver 1:**
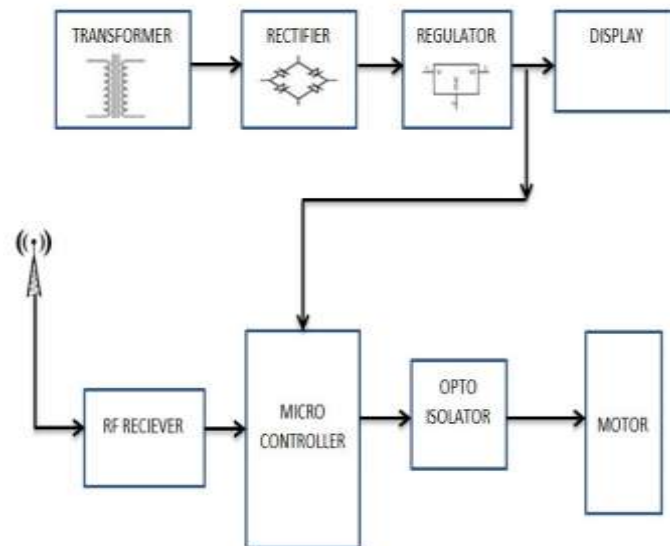
- **Block diagram of receiver 2:**


3. METHODOLOGY:

AC supply of 230V is given to the system, which is stepped down to 12V AC supply and then converted to 12V DC supply using rectifier. AC ripples are removed by using fitter and then given to input pin of 7805 regulator. At output pin of this regulator we get a constant 5V DC which is given to microcontroller.

The required speed is entered using keypad in transmitter side which is interfaced with microcontroller.

The motor at transmitter side start rotating and the speed is sensed by an IR pair and is displayed on LCD and also fed to microcontroller.

PWM pules are generated from microcontroller according to the entered speed and the motor is adjusted to the speed.

Motor is interfaced with microcontroller through opto-coupler which drives the motor. Once the transmitter is switched on IR sensor senses the speed and given to microcontroller, which is compared with speed switches output then transmit as an RF signal which is received by receiver motors where all motors run at same speed of the transmitter thus speed is synchronized.

4. FLOW CHART:
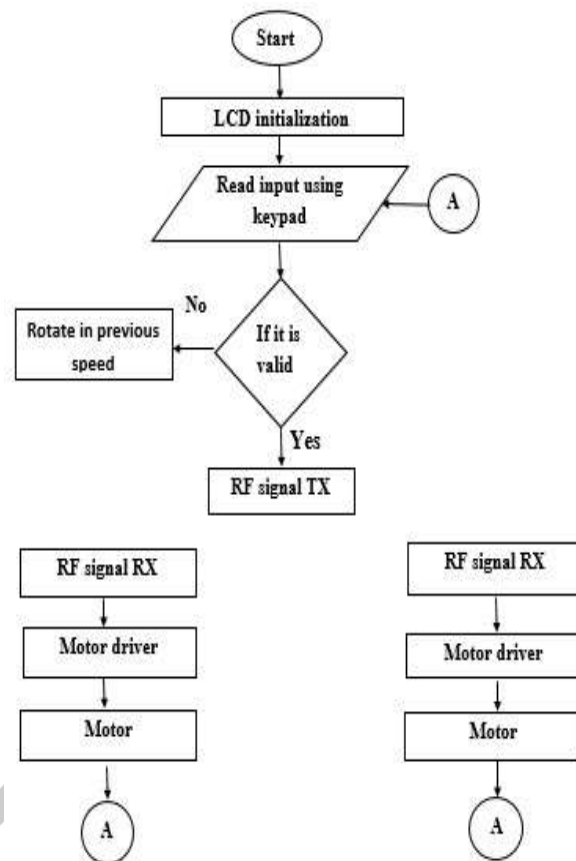
- Start the system.
- Initialize the LCD.
- Enter the required speed using keypad, read that input.
- If the entered input is valid. The RF transmitter transfer the signal to receiver. If not it rotate in the previous speed.
- The RF receiver receive the signal from RF transmitter and that signal passes to motor drivers from the motor driver the motor will be run.
- If we want to increase or decrease the speed go for step 2.
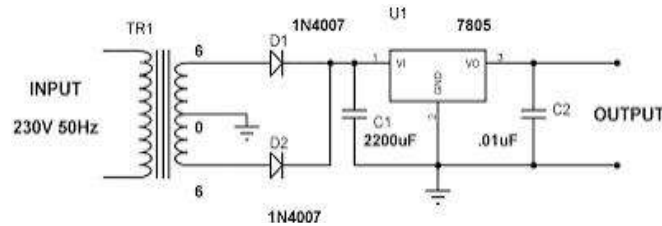
5. HARDWARE REQUIRMENT:
- Power supply system.
- RF module.
- Atmel.
- IR sensor.
- Keypad.
- Opto isolator.

6. SOFTWARE REQUIREMENT:
- Embedded C.
- Keil.
- Dip trace.

7. HARDWARE DESCRIBTION:

Power supply system:

To produce constant DC voltage across load terminals, power supply system is designed.

The circuit consists of following components:

- Transform
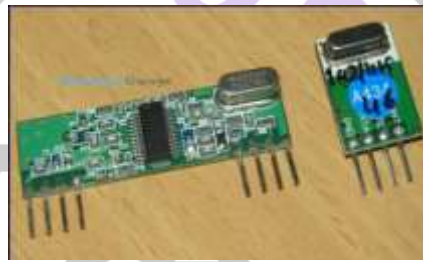- Rectifier
- Filter
- Regulator

Transformer: It is used to step down the 230V Ac supply to 12V AC supply.
Rectifier: It is used to convert 12V AC supply to 12V DC supply.
Filter: It is used to remove the AC ripple contents.
Regulator: used to convert variable 12V DC to constant 5V DC.

RF Module:

The RF (radio frequency) has corresponding frequency range varies between 30 kHz & 300 GHz. When compare to IR transmission through RF is better as in RF, signals travel at larger distance where as in IR travel at smaller distance.hence RF is suitable for long range applications. Even if any obstructions are present between the transmitter and receiver this RF can travel. RF module has two forms i.e.., RF transmitter and RF receiver.
TheTransmitter(Tx)/ Receiver(Rx) pair operates at a frequency of 434 MHz's. An RF transmitter receives data and transmits it wirelessly through its antenna which is connected to pin4. The data which is transmitted is received by an RF receiver which is operating at the same frequency as that of the transmitter.

ATMEL: In the field of manufacturing, designing, and marketing and nonvolatile memory this Atmel plays important role. Atmel meets the evolving and growing needs of today's electronic system design by combing these core technologies.
Atmel AT89C52: The AT89C52 is an 8051 based, and it has 32 input/output lines, 3timers/counters, 8 interrupts and 2priority levels, 8K Bytes Flash Memory, 128 Bytes On chip RAM.
Features:
- Compatible with MCS-51 products.
- 8K Bytes of In-system Reprogrammable Flash Memory.
- Fully Static Operation:0Hz to 24MHz.
- Three-level Program Memory Lock.
- 256*8-bit Internal RAM.
- 32 Programmable input/output.
- Three 16-bit timer/counter.
- Eight Interrupt Sources.
- Programmable Serial Channel.
- Low-power Idle and Power-down Modes.
- 40-pin DIP.

Keypad:
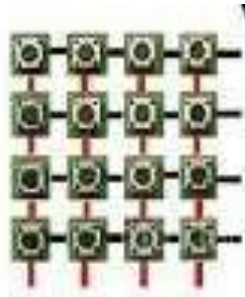
The keypad 4*4 board features 16 push buttons arranged in 4*4 matrix to form standard alphanumeric keypad. Some embedded systems that require user input in form of numbers (decimal or hexadecimal) can use this board as a solution. To read a digital input into controller one pin port is required. If we want to read a lot of digital inputs then it is not possible to allocate one pin for each of them. Hence increases in the matrix order decreases the number of pins which are required to interface.

Opto Isolator:

Opto isolator or opto coupler is a safety component that transfers electrical signals between two isolated circuits by using light signals. Opto isolator are mainly used in delicate system. Opto isolator functions as a galvanic isolation component. That is it maintains the connection between two devices or component without any direct conduction. The opto isolator are mainly used to block high voltage and voltage transient hence one part of the system will not destroy the other parts.

Motor:

Figure3.7: 12v 150 rpm Geared Motor

The geared motor is a high quality and low cost motor. It contains Brass gears and steel pinions to ensure longer life and better wear and tear properties. The spindles rotate between bronze plates which reduces the noise. The output shaft rotates in a sintered bushing. The whole assembly is covered with a plastic ring. All the bearings are permanently lubricated and therefore require no maintenance.

8. SOFTWARE REQUIRMENT:

Embedded C:

To identify a suitable language for embedded systems, the following observations are made:

➢ Computers(such as MC, MP or DSP chips) only accept instructions in 'machinecode' ('object codes').

➢ All software, whether in assembly, C, C++, Java must ultimately be translated into machine code in order to be executed by the computer.

- Embedded processors – like the 8051 – have limited processor power and very limited memory available: the language used must be efficient.
- It is able to read and write ta a particular memory location. So we have to access low level to hardware.
- It is not possible to generate new code for every project if so then no company remains for long time.
- The language chosen should be in common use. This will ensure that you can continue to recruit experienced developers who have knowledge of the language.
- Only machine code is safe from one point of view, since every other language involves a translator.

Embedded C is lies between high level and low level language hence most of the systems use embedded C as a programming language. Embedded C requires less resources to run compare to other high level languages, hence it is not complex. It is easy to debug.

Keil:

The KEIL software development tools helps to compile our C code, assemble the assembly source files, link and locate object modules and libraries, creates HEX files, and debug our target program. The KEIL tool chain contains the following executables.

- **µVision2**- It is an integrated development for window environment that combines project management, source code editing and program debugging in one single powerful environment.

- **C51 Cross Compiler -**Creates re locatable object modules from the source C code.
- **A51 Macro Assembler -**Creates re locatable object modules from the assembly source code.
- **BL51 Linker -**Combines re locatable object modules created by the C51 Compiler and the A51 Assembler into absolute object modules.
- **LIB51 Library Manager -**Combines object modules into libraries that may be used by linker.
- **OH51 Object-HEX Converter -** Creates HEX files from absolute object modules.

Dip Trace:

DIPs TRACE is a software for creating schematic diagrams and printed circuit boards.

DIP TRACE has 4 modules they are:

➢ Schematic capture editor.

➢ PCB layout editor with built in shape based auto router.

➢ 3D preview and export, component editor.

➢ Pattern editor

9.   CONCLUSION

As we enter the required speed from the keypad the motor which are running at different levels are become uniform speed motors i.e. speed synchronization.Whatever speed we enter in transmitter system that speed can be observed at receiving system by that we obtain a synchronous speed of a connected multiple motors. Here we are using wireless transmission through RF communication to control the speed of multiple motors. Hence the operation becomes easier by using this technology.

REFERENCES:

[1] A.A.Thorat, P.D.Pange, V.S.Doijad has proposed in the year 2014. The paper conveysPID (proportional based controller) and fuzzy logic controller (FLC)s. have been developed for speed controller of DC motor.

[2] Rajesh Singh, Saurabh Kumar, Ravi Kumar, and Vivek Kumar. Has published. The paper describes the synchronisation, speed and direction control of DC motor using P.W.M (pulse width modulation).

[3] Dr. Steve C. Hsiung has proposed " THE USE OF PIC MICROCONTROLLERS IN MULTIPLE DC MOTORS CONTROL APPLICATIONS" in the year 2007, vol 23, number 0. This paper is designed with modern upgraded technology of PIC μc. Using simple with serial communication protocols in a microprocessor/controller.

[4] AnkurShukla, Ankitkumar, Anil kumarrajak, Vivekkumarsing, Santosh S has proposed in the year 2015. The paper describes the   speed   control   and   direction   of   D.c   motor   using   Master-Slave.

[5] Ankesh N.Nichat,Sheikh Kadir Ali,Yogesh D. Solanke,Amit M. Dodke 'Wireless Speed and Direction Control of Dc Motor by Using Radio Frequency Technology' in the year 2015, IJETT, Volume20, Issue 2, PP 48-51.