

USE OF GSM TECHNOLOGY TO CONTROL THE SPEED OF STEPPER MOTOR

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Abstract:- Stepper motor is found in a lot of applications such as computer peripherals, business, machines, process control, machine tools and robotics. Especially in different areas of robotics, process control like silicon processing, in Nuclear laboratory, I.C. Bonding and Laser trimming application, it is necessary to control stepper motor from remote places. In this paper, the design aspects of an embedded device which can control stepper motor by sending a specific message from a mobile phone are presented. This controller is extremely handy at place where we have to control the ON and OFF switching of the device but no wired connection to that place available. GSM controller stepper motor is automatic control system which is capable of receiving a set of command instructions from any place where GSM signals are available in the form of Short Message Service and perform the necessary action like start, stop and speed control.

Keywords:- Short message services (SMS), Global System for Mobile Communication (GSM), Proteus software, keil software, AT command.

1. INTRODUCTION

Stepper motor is widely used in motion system due to their reliable structure and control simplicity. Therefore control the speed of stepper motor is very essential in industry and other technical field [1]. Especially in Robotics and process control like silicon processing and I.C. Bonding [3] it is necessary to control the speed of stepper motor from remote places, so for this reason different control methods of stepper motor are invented. This method is one of them. This is a stepper motor control device which controls the stepper motor through SMS and GPRS. The microcontroller receives the SMS from the MODEM and performs operation on a stepper motor toolkit [2]. The main aim of this project is to control speed of motor from remote places and perform the desired task. In this project we use a dedicated modem to sending message as input to the controller and microcontroller is used as receiver purpose. Microcontroller is interface with modem so that it receives AT command and take the responsibility to reading the received command perform the predefined task which is given to it such as starting, stopping, and motor rotation and speed control. In this project we are using software name Proteus software for making test kit and Keil software for dumping program in microcontroller.

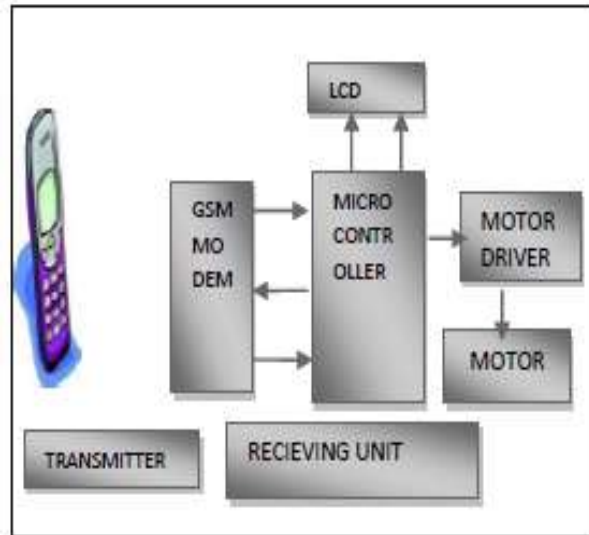


Fig. 1: Introductory Diagram

II STEPPER MOTOR

Highlight advantage of stepper motors make it in the civilian application of a wide range of industrial control. Stepper motor control system is an important component of the system, through its output electrical pulse signal to achieve position control [3]. A stepper motor is brushless, synchronous electric motors that can be device full rotation in to a large number of step. Stepper motor provides means of positioning and speed control without the use of feedback sensor. The basic operation of a stepper motor allow the shaft to move a precise number of degree .Stepper motor speed and the angle of rotation are decided by the input pulse rate and the total number of pulse. Stepper motor operate differential from DC brush motor, which rotates when voltage is applied to their terminal.

FUNDAMENTALS OF OPERATION

The stepper motor uses the theory of operation for the magnets to make the motor shaft turn a precise distance, when a pulse of electricity is provided. When no power is applied , the residual magnetism in the rotor magnets will cause the rotor to align one set of its magnetic poles with the magnetic poles of one of the stator magnets. This means that that rotor will have 24 possible detent positions. When the rotor is in a detent position, it will have enough magnetic force to keep the shaft from moving to the next position. This is that makes the rotor feel like it is clicking from one position to the next as you rotate the rotor by hand with no power applied. When power is applied, it is directed to only one of the stator pairs of winding, which will cause the winding pair to become a magnet. One of the coils for the pair will become the North Pole, and the other will become the South Pole. When this occurs, the stator coil that is the North Pole will attract the closest rotor tooth that has the opposite polarity, and the stator coil that is the South pole will attract the closest rotor tooth that has the opposite polarity. When current is flowing through these poles, the rotor will now have a much stronger attraction to the stator winding, and the increase torque is called the holding torque.

III A BRIEF INTRODUCTION OF GSMSIM300 MODEM

GSM/GPRS module is used to establish communication between a computer and a GSM/GPRS system. Global system for mobile communication (GSM) is an architecture used for mobile communication in most of the countries. Global packet Radio Service (GPRS) is an extension of GSM that enable higher data transmission rate. GSM/GPRS module consists of a GSM/GPRS modem assembled together with power supply circuit and

communication interfaces for computer. The MODEM is the soul of such module. SIM300 is an Trainband GSM/GPRS engine that works on frequencies EGSM 900MHz, DCS 1800MHz and PCS 1900 MHz SIM300 provides GPRS multi-slot class 10 capability and supports the GPRS coding schemes.

BRIEF INTRODUCTION OF AT COMMAND

Command	Description
AT	Check if serial interface and GSM modem is working.
ATE0	Turn echo off, less traffic on serial line.
AT+CNMI	Display of new incoming SMS.
AT+CPMS	Selection of SMS memory.
AT+CMGF	SMS string format, how they are compressed.
AT+CMGR	Read new message from a given memory location.
AT+CMGS	Send message to a given recipient.
AT+CMGD	Delete message.

IV. A BREIF INTRODUCTION TO MICROCONTROLLER

A Microcontroller is a single chip that contains the processor (the CPU), non-volatile memory for the program (ROM or flash), volatile memory for input and output (RAM), a clock and I/O control unit.

AT89S52 MICROCONTROLLER

The AT89S52 is a low power, high performance CMOS 8-bit microcontroller with 8K byte of in-system programmable flash memory. The device is manufactured using Atmel's high-density non-volatile memory technology and is compatible with the industry slandered 80C51 instruction set and pim out. The on chip flash allows the program to be reprogrammed in system or by conventional non volatile memory programmer by combining 8-bit CPU. The At89S52 is a powerful microcontroller which provides a highly flexible and cost effective solution to many embedded control application.

The AT89S52 provides the following slandered features

1. 8K bytes of flash
2. 256 bytes of RAM
3. 32 I/O lines

- 4. 2 data pointer
- 5. Three 16 bits timer/counter, a six-vector two level interrupt architecture, serial port and clock circuitry.

The additional feature of AT89S52 makes it a powerful microcontroller for application that requires pulse width modulation high speed I/O and up/down counting capabilities such as motor control

The pin diagram feature of 8051 showed all of the I/O pins unique to microcontroller.

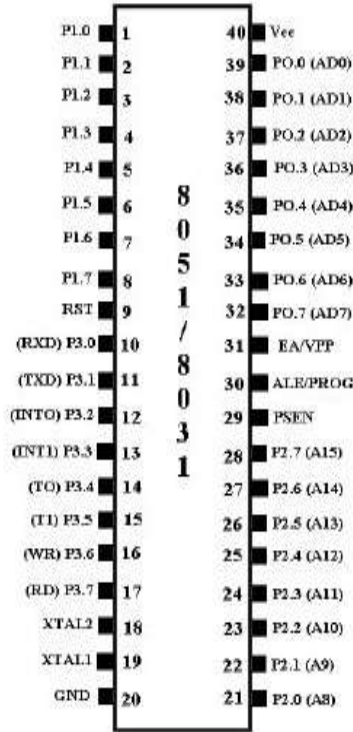


Fig.2:- Pin Diagram of 8085 Microcontroller

V. SYSTEM ARCHITECTURE

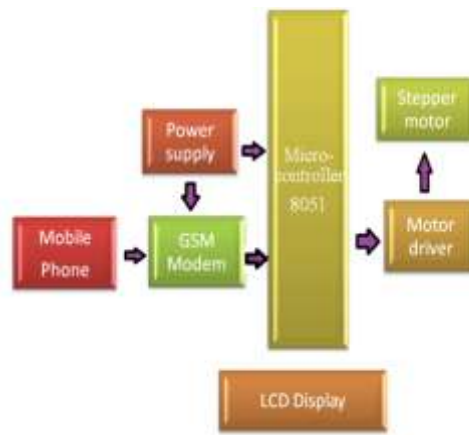
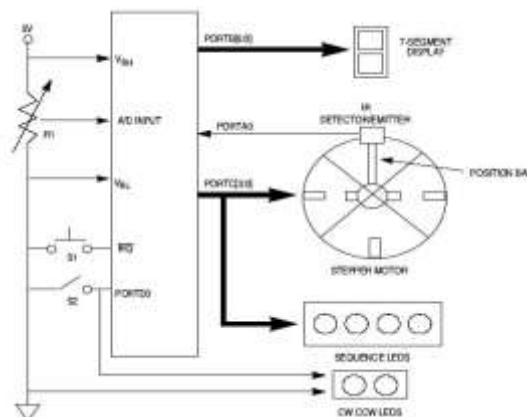


Fig. 3: System Architecture

VI. WORKING

In this project, we are using the GSM technology. A microcontroller is a small computer on a single integrated circuit consisting of a relatively simple CPU combine with support functions such as timer etc. Microcontrollers are use in automatically controlled product and devices such as remote controls, office machines, power tools and toys. The LCD displays the current operation of the system. The microcontroller is use to control the relay drivers depending upon the software program. Major role of this project is to receive the SMS to speed control of stepper motor. Initially, the SMS is receive from the person authorized to use this set up by the GSM modem (SIM300 MODEM) and is transferred to the microcontroller devices kit with the help of a MAX230 chip. As per the AT command given by the microcontroller to the modem, the control signal is extracted and is use to control the devices connected to it. We have to convert the „septets” of the phone to „octets” because the microcontroller needs the bytes with 8 bits length. All this process is necessary to decode the message from SMS. A program is loaded into microcontroller devices kit and then the circuit is connected to the modem. The microcontroller now tries to read the SMS from the first memory location of the modem and keeps trying again until the modem receives any (programmed for every one second). Before implementing the control single part of the SMS, the modem extracts the number from the SMS and verifies if this number has the access to control the device or not. For controlling the devices, the message will be sending in hexadecimal format. The hex data in converted into binary and the particular output is enabled. We have connected LEDs to the ports of microcontroller to show the output and their status indicates whether the ports are set to „ON” or „OFF”. And speed control like send the message in text format like MOTOR SPEED LOW, MOTOR SPEED MEDIUM and MOTOR SPEED HIGH for stepper motor.



VII. RESULT

The stepper motor rotates clockwise and anticlockwise as per the the given command in SMS. SMS send by the sender and it receives by the receiver and the speed of the stepper motor is controlled.

VIII. CONCLUSION

In This paper we have discussed the low cost, secure, ubiquitously accessible remotely controlled speed control of stepper motor is introduced. The approach discuss in this paper is control the speed of stepper motor through massage. Stepper motor control is use in many of industrial purpose, home security and in nuclear power laboratory. If we have to control the stepper motor from remotely then this project is very useful because of low cost.

The GSM technology capable solution has proven to be controlled remotely, provide industrial security has achieve the target to control different industrial appliances remotely using the SMS based system.

The data is feed in the microcontroller in the form of command and mobile and microcontroller is interface and AT command is given for mobile communication. When the SMS is receive by the modem is read by the controller is further work is done by the controller as per the command given in the SMS i.e. start , stop, reverse ,forward command.

IX. REFFERENCES

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