

IMPLEMENTATION OF WATER LEVEL FILLING STRATEGY BY USING PWM TECHNIQUE

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Abstract - Now a day's many industrial applications demand remote speed control and feedback monitoring of DC motors. Also speed control has to be accurate enough for many practical purposes. In present project we employ GSM technology for sending control commands and monitoring speed. The desired speed control is achieved by using PWM technique. A pulse width modulator (PWM) is a device that may be used as an efficient DC motor speed controller. This project is a versatile device that can control DC devices which draw up to a few amps of current. This device has been used to control the speed of the DC motor. In this project, the DC motor speed can be controlled by sending predefined messages to the mode.

Key Words: GSM Modem, PWM, H-BRIDGE, Power Supply block, Liquid Sensor

1.INTRODUCTION

In a modern industrial situation, DC motor is widely used which is due to the low initial cost, excellent drive performance, low maintenance and the noise limit. As the electronic technology develops rapidly, its provide a wide scope of applications of high Performance of DC motor drives in areas such as rolling mills, electric vehicle tractions, electric trains, electric bicycles, guided vehicles, robotic manipulators, and home electrical appliances. Motor application is not completed without a control system. The inventions of microprocessor[1][2] and microcontroller[2] make the control system become easier. This control system is basically controlling the switch, speed, and direction of motor. In order to control and monitor the motor, user need to be at the place where the switch is located. DC motors have some control capabilities, which means that speed, torque and even direction of rotation can be changed at anytime to meet new condition. In this system, mobile phone is used as a control switch. By sending text message using short message service (SMS) which is a part of the Global System for Mobile Communications (GSM)[10], control signal is sent wirelessly to the control circuit. By implementing GSM module on the control circuit of motor, it

can enable the user to send text message that contain command from any mobile phone to that GSM module. The GSM module will receive the text command and send it to the microcontroller to be processed and converted into desired control signal.

1.1 Objectives

The main objective of this project is to control the direction and vary the speed of DC motor by using cell phone. By using the GSM technology, varying the speed of the DC motor for our requirement is done and direction can also be controlled in this project

1.2 Introduction to GSM

Global system for mobile communication (GSM) is a wide area wireless communications system that uses digital radio transmission to provide voice, data, and multimedia communication services. A GSM system coordinates the communication between a mobile telephones (mobile stations), base stations (cell sites), and switching systems. GSM is a global system for mobile communication.

1.3 GSM Modem

GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate. This GSM modem is interfaced to 8051[9] microcontroller using the level shifter MAX232. And the dc motor is interfaced to 8051 through L293D driver.

1.4 Pulse Width Modulation

The new method, which extensively used in motor controller, is pulse width modulation (PWM). PWM[11][13] switching technique is a best method to control the speed of DC motor compare to another method. The duty cycle can be

varied to get the variable output voltage. The concept of this system is same like DC-DC converter which is the output voltage depends on their duty cycle. Digital-to-analog conversion is not necessary because PWM[12] itself is a signal that remains digital all the way from processor to control the overall system

2. EXISTING SYSTEM

2.1 Speed of a Dc Motor

We know, back emf of a DC motor[7][11] E_b is the induced emf due to rotation of the armature in magnetic field. Thus value of the E_b can be given by the EMF equation of a DC generator.

$$E_b = \frac{P \phi N Z}{60 A}$$

(where P=no of poles, ϕ =flux/pole, N=speed in rpm, Z=no. of armature conductors, A=parallel paths) But for a DC motor A,P,Z are constants. Thus, it shows speed is directly proportional to back emf and inversely proportional to the flux per pole.

2.2 H-Bridge

An H bridge is an electronic circuit that enables a voltage to be applied across a load in either direction. These circuits are often used in robotics and other applications to allow DC motors to run forwards and backward. The motor forms the cross-piece in the "H". Speed and direction are controlled as current flows through the motor in the direction which is determined by the position (On or Off) of the switches in the bridge. These circuits are often used in robotics and other applications to allow DC motors to run forwards and backwards. H-bridge driver are constructed by combining a four switches. Thus by using PWM technique speed control is done and by using concept of H-BRIDGE rotation of direction of DC motor is controlled. The whole process is controlled by using micro controller. GSM technology is used to control the motor from anywhere. The following components are used in the present project to overcome the above disadvantages.

2.3 Voltage Regulator

The LM 78XXX series of the three terminal regulations is available with several fixed output voltages making them useful in a wide range of applications. One of these is local on card regulation. The voltages available allow these regulators to be used in logic systems, instrumentation and other solid state electronic equipment. Although designed primarily as fixed voltage regulators, these devices can be

used with external components to obtain adjustable voltages and currents. The LM78XX series is available in aluminum to 3 packages which will allow over 1.5A load current if adequate heat sinking is provided. Current limiting is included to limit the peak output current to a safe value. The LM 78XX is available in the metal 3 leads to 5 and the plastic to 92. The regulator can deliver 100mA output current. The advantage of this type of regulator is, it is easy to use and minimize the number of external components.

3. PROPOSED SYSTEM

3.1 Introduction

The main aim of the dc motor speed control using pwm is after power on the power supply generates +5v dc, +12v dc, the logic section works on +5v dc and the motor and motor driven sections are working on +12v dc. The explanations of the power supply is given in the power supply module. Using the dc motor power we will implement water level filling[14] strategy in addition to GSM technology. After power on the micro controller generates oscillations at the rate of 11.059-12Mhz. frequency sine wave i.e. internally converted into square wave with the help of internal oscillator. The oscillator section is given bellowing the oscillator module.

3.2 Microcontroller

Micro controller[5][6] is a true computer on a chip. Microprocessors are intended to be general-purpose digital computers whereas micro controllers are intended to be special purpose digital controllers. Generally microprocessors contain a CPU, memory- addressing units and interrupt handling circuits. Like the microprocessor, a microcontroller[5][6] is a general-purpose device, but one that is meant to read data, and control its environmental based on those calculations. The contrast between a micro controller and a microprocessor is best exemplified by the fact that microprocessors have many operational codes for moving data from external memory to CPU; microcontrollers may have one or two.

3.3 On-Chip Memory

This refers to any memories (Code, RAM or other) that physically exist on the Microcontroller itself. On-Chip memory can be of several types. The 8051 has a bank of 128 bytes of Internal RAM. This internal RAM is available and it is also the most flexible in terms of reading, writing, and modifying its contents. Internal RAM[6] is volatile, so when the 8051 is reset this memory is cleared. The first 8 bytes (00h-07h) are "register bank 0". By manipulating certain SFRs, a program may choose to use register banks 1, 2 or 3. These alternative register banks are located in internal RAM in addresses 08h through 1Fh. Bit memory also lives and is part of internal RAM. The 80bytes remaining of Internal RAM, from addresses 30h through 7Fh, may be used by user

variables that need to be accessed frequently or at a high speed.

3.4 External RAM

This RAM memory resides off-chip. This is often in the form of standard static RAM or flash RAM. As an obvious of Internal RAM [6], the 8051 [1][2] also supports what is called External RAM. As the name suggests, External RAM is any random access memory which is found off-chip. Since the memory is off-chip it is not as flexible in terms of accessing, and is also slower. For example, to increment an Internal RAM location by 1 requires only 1 instruction and 1 instruction cycle. To increment a 1-byte value stored in External RAM requires 4 instructions and 7 instruction cycles. In this case, external memory is 7 times slower. What external RAM loses in speed and flexibility it gains in quantity. While internal RAM is bytes with an 8052, the 8051 supports External RAM up to 64K.

3.5 Features

- Compatible with MCS-51 Products.
- 8K Bytes of In-System Reprogrammable Flash Memory.
- Endurance: 1,000 Write/Erase Cycles.
- Fully Static Operation: 0 Hz to 24 MHz
- Three-level Program Memory Lock.
- 256 x 8-Bit Internal RAM.
- 32 Programmable I/O Lines.
- Three 16-bit Timer/Counters.
- Eight Interrupt Sources.
- Programmable Serial Channel

3.6 Max 232 IC (Level Shifting device)

To simplify all the DLD we have used a microcontroller instead that has a built-in UART (Universal Asynchronous Receiver and Transmitter). All it requires is programming that sets the baud rate for communication. One important hardware issue is that most microcontrollers are TTL/CMOS logic and are not compatible with modern computers; therefore a logic translation is required to perform a successful communication. One such translator is MAX232. The MAX232 is an integrated circuit that converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits. The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals and typically converts the RX, TX, CTS and RTS signal.

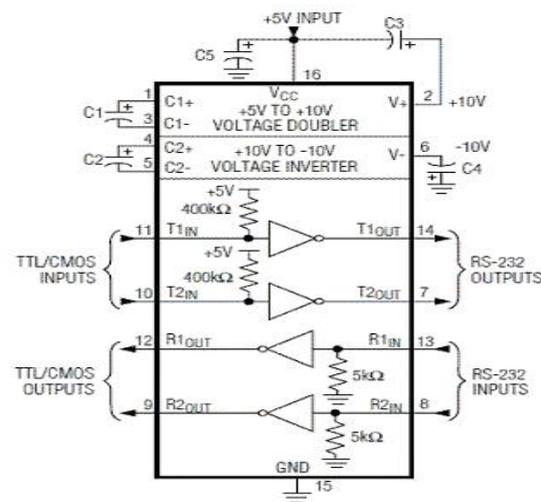


Fig 3.1 MAX232 IC internal circuit.

3.7 GSM Modem

A GSM modem [3][4] is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone.

When a GSM modem [3][4] is connected to a computer, this allows the computer to use the GSM modem [3][4] to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages.



Fig 3.2 GSM Modem

3.8 Power supply

3.8.1 Circuit Diagram

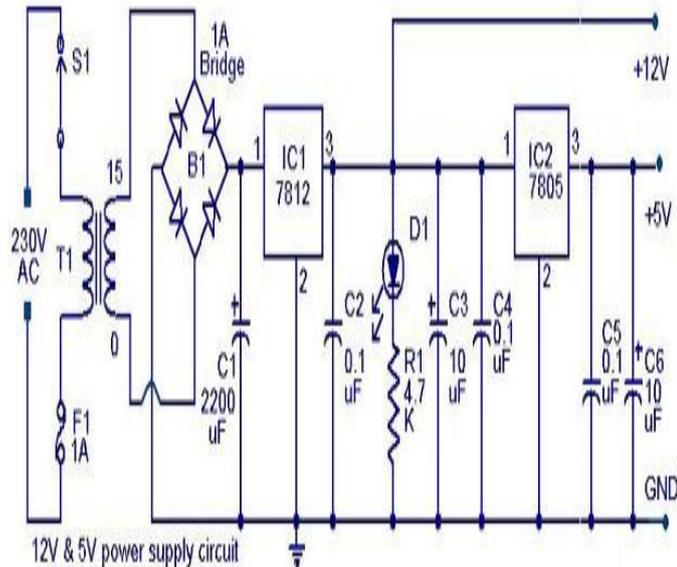


Fig 3.3 Block diagram of Power Supply

3.9 Water Level Controller

This system monitors the water level of the tank and automatically switches OFF the motor when ever tank is full.. Using this system, we can avoid the overflow of the water. Here we are designing the circuit which is used to detect and control the water level automatically in overhead tank using microcontroller. Generally we all know that water is more precious resource and also there exist less amount of useful(drinking) water sources in the nature. So it is our responsibility to control the wastage of water. In order to over comes the wastage of water we had developed a new project i.e. "water level controller using gsm." Depending upon the received information user may ON/OFF the motor.

4.RESULTS

4.1 Project Overview

Our project deals with the speed and direction control of DC motor by using Microcontroller 8051[1][2], at the same time by utilizing the speed of a motor we are going to fill up a water tank without wasting the power. When we send SMS from the mobile phone it is received by the GSM modem and based on the AT commands and the program in the micro controller the data is received and the output is generated.

This signal is sent to the microcontroller which decodes the signal and performs the corresponding action for the respected output. At the same time Microcontroller sends the signals to LCD monitor which displays the set speed and direction of DC motor. Here we have used 16x2 LCD which has 16 bit length and 8 bit characters. We have used L293D driver for voltage amplification and H-Bridge circuit. Depending up on the outputs of the microcontroller, speed & direction of rotation of a motor can be rotated and we can also fill up a water tank from the motor speed. This avoids from wastage of power by the motor and taking advantage of filling up a water tank, as water is more precious for human resources.

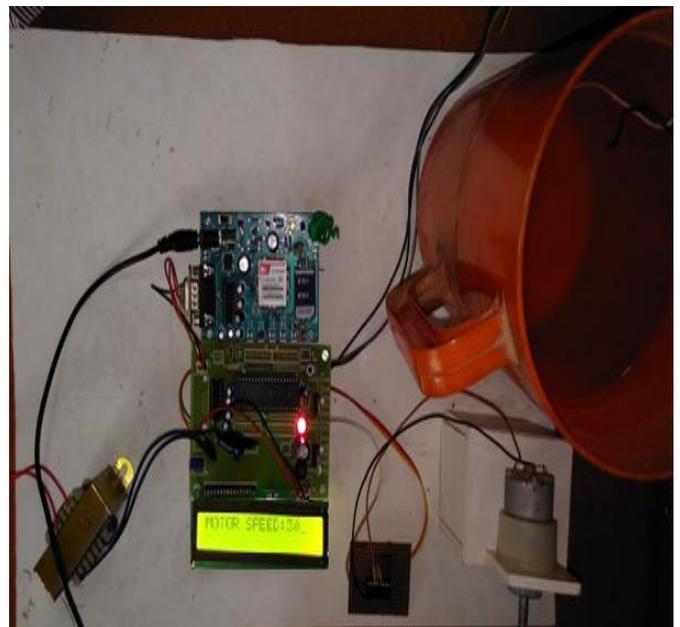


Fig 4.1 Project Overview

4.2 Water Level Controller Circuit Advantages

- Human effort is reduced as the system controls the motor automatically based on the water level controller .
- This system consumes less power.
- Simple
- More efficient
- Avoids Overflow of water
- More Reliable
- Ease to operate using GSM

4.2 Table Representing the Control Commands

COMMANDS	SPEED	DIRECTION
@1	30	FORWARD
@2	30	REVERSE
@3	50	FORWARD
@4	50	REVERSE
@5	100	FORWARD
@6	100	REVERSE

5.CONCLUSION

This paper has presented an “Implementation of Water level filling strategy by using PWM technique in which we had controlled the water level by keeping water level sensor[14] in a tank. This Liquid sensor senses the level of water i.e 1/4th, 1/2nd ,3/4th& full level corresponding to the liquid sensor level which is placed in a tank. This avoids the wastage of water and at the same time power too.

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BIOGRAPHIES



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