PROJECT REPORT

ON

ANDROIDIC ARM

A PROJECT REPORT

to be submitted by

NEHA GAUR

Under the Supervision of

SUSHIL SONI

Sr. Embedded Developer and trainer

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DOF degree of freedom

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We would like to thanks to parents, teachers, and my friends who’s ever helping nature and suggestion has helped me to complete this present work.

CERTIFICATE

This is to certify that the project report entitled "**ANDROIDIC ARM"** that is being submitted by NEHA GAUR fulfilment for the award of the Degree of **Bachelor of Technology in Electronics & communication** to the **Banasthali University** is a record of bonafide work carried out under my guidance and supervision. The results embodied in this project report have not been submitted to any other University or Institute for the award of any Graduation degree.

SUSHIL SONI

Sr. Embedded

Developer & Trainer

CMC Academy, CMC Ltd.

JAIPUR

COMPANY PROFILE

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ABSTRACT

In today's world there is an increasing need to create artificial arms for different in human situations where human interaction is difficult or impossible . they may involve taking readings from an active volcano to diffusing a bomb . robotic has been acknowledged as a mainstay in the industrial automation domain for decades. It is gradually making its headway in to the domain of military medical and vehicle application domain. But the only problem we might face is controlling.

In this project work pick and place robotic arm is designed and implemented. This robotic arm is based on android application controller for remote operation. Commands are send to the receiver to control the movement of the robot either to move forward , backward and left and right etc using android application device four motors are interfaced to the microcontroller . the android application device transmitter acts as a remote control that has advantage of adequate range, while the receiver end Bluetooth device is fed to the microcontroller to drive dc motor via motor driver IC for necessary work remote operation is achieved by any smart phone/ tablet etc. With Android OS ; upon a GUI based touch screen operation. This system can enhanced by interfacing it with a wireless Bluetooth device which is set within a circuit.

CHAPTER -1

INTRODUCTION

1.1 GENERAL

Robotics is the branch of mechanical engineering, electrical engineering, electronics engineering, computer science engineering that deals with the design , construction ,operation and application of robots as well as computer system for their control sensory feedback and information processing .These technologies deal with automated machine that can take the place of human in dangerous environment or manufacturing process .Today, robotics is very rapidly growing field, as technological advances continue researching , designing , building ,new robot serve various practical purpose whether domestically, commercially, or militarily. Many robots do jobs that are hazardous to people such as defusing bombs mines and exploring shipwrecks.

Robot is a intelligent a man made device that can move by itself whose motion can be modelled, planned , sensed and controlled and whose motion and behaviour can influenced by programming a robot is general purpose programmable manipulator , in practice it is a electromechanical system which by its movement and appearance convey that it has intent of its own .

Today commercial and industrial robots are widely used performing jobs very cheaply or with greater accuracy and reliability then humans they are also employed for jobs that are too dirty, dangerous or boring for humans. Robots are widely used in manufacturing assembling and packing, earth and space exploration surgery and weaponry laboratory research and mass production of consumer and industrial goods.

As robotic technology develops and becomes cheaper domestic robots for cleaning or mowing the lawns are available along with robotic toys for all age children.

When we talk about the robotic arm that really taking about machine that is used for pick up the things like human beings .these machine mimic the operation of human being or at least certain parts of it. most shop floor robots are the emulation of one arm of human .applied control technology is their motors are the muscles for robotic arm.

The most common robot are used in industry today is the robotic arm these arms are used to weld package, paint, position, and assembles a host of product that we use daily basically a robotic arm is a series of linkages that are connected in a such way that a dc motor connected can be controlled to each joint. The controlling computer the brain of the robot is programmed to control the various motor on the robot that in the way that allow in perform specific tasks.

The robotic arm can be designed as many different way , the size and shape of the arm is critical to the robotic architecture . many arms are reassemble the human arm containing shoulders, elbows, wrists and hands. The design of human arm is exceptional and allows for precise and complicated movement . as a rule you need one motor for each degree of freedom that you want to achieve . a degree of freedom is typically one joint movement so a simple robot with three degree of freedom can move three ways up and down, left and right , forward and back.

The degree of freedom is a very important term to understand each degree of freedom is a joint on the arm a place where it can bend or rotate or translate. You can typically identify the number of degree of freedom by the number of actuator on the robot arm. The Denavit Hardenberg convention is the accepted method of drawing robot arms in FBD. There are only two motions a joint could make translate and rotate. There are only three axes this could happen on: x, y,

z(out of plane) . Between each DOF there is a linkage of some particular length. Sometimes a joint can have multiple DOF in the same location.

The robot workspace is all places that the end effectors can reach. The workspace is dependent on the degree of freedom angle translation limitation the arm link length, the angle at which something must be picked up at etc. here we have Degree of freedom(DOF) configuration

Degree of freedom

The following will demonstrate the degree of freedom using the human arm

FIRST DEGREE: shoulder pitch

Point your arm straight out in front of you move your shoulder up and down . the up and down movement of shoulder is called shoulder pitch.

SECOND DEGREE: arm yaw

Point your arm straight out in front of you move your entire arm side to side. This side to side movement is called arm yaw.

THIRD DEGREE: shoulder roll

Point your arm straight out in front of you now roll your entire arm from the shoulder as if you were screwing in a light bulb this rotating movement called as shoulder roll.

FOURTH DEGREE: elbow pitch

Point your arm straight out in front of you hold your arm still, then bend only your elbow, your elbow only move can up and down this up and down movement of shoulder is called elbow pitch.

FIFTH DEGREE: wrist pitch

Point your arm straight out in front of you. Without moving your shoulder and elbow , flex your wrist up and down . this up and down movement of wrist is called wrist pitch.

SIXTH DEGREE: wrist yaw

Point your arm straight out in front of you. Without moving your shoulder and elbow , flex your wrist side to side . this side to side movement of wrist is called wrist yaw.

SEVENTH DEGREE: wrist roll

Point your arm straight out in front of you. Without moving your shoulder or elbow , rotate your wrist from side to side as if you were turning a doorknob . the rotation of wrist called the wrist roll.

1.2 OBJECTIVE OF THE PROJECT:

The main objectives of the project are:

1. To design a circuit of an electronic and mechanical robotic arm
2. To study the circuitry and different type of component.
3. Robotic technology has matured to a point where these have many application.
4. Robotic arm have been used to replace people and they are ideally suited for repetitive work.

CHAPTER -2

LITERATURE REVIEW

in this modern era the industrial robot arms are extensively adopted in several application areas where the work is complex, critical and repetitive. Industrial robot applications includes pick and place operations of the objects to the desired location, assembling of spares in automobile industries, process control operations in nuclear industries. The competitive edge of manufacturing industrial robot arm to outfit for multiple applications from welding, material handling and thermal spraying to painting and drilling is its de-signing and programming.

The knowledge of robot comprises of three main engineering areas; electrical, mechanical and computing. The electrical contains the sensing, amplifying, filtering, displaying and controlling schemes; mechanical composes of mathematical modelling of dynamics and kinematics of robot arm, computing consists of another two important fields in the form of hardware and software to design an electronic controller through programming for specified application in a time domain constrain which can also called as embedded system. Robots show many advantages when it is networked using wireless communication, automated by providing vision and controlled through an embedded system.

The present work is aimed on providing the survey and design aspects of wireless control robotic arm system which comprises of two stations, transmission station and reception station. Depending upon the object type and robot arm position, system finds the solution for the forward and inverse kinematic problems of robot arm for pick and place operation of the object to its dedicated container. System calculates the position and orientation of the robot arm's end effectors using forward kinematics and joint angles by using inverse kinematics to pick the object. Calculated joint angles are transmitted to the receiver station by using wireless communication (Bluetooth).

Reception station is an embedded system with a wireless network module and the robot arm. Wireless module is meant to receive the joint angles from the transmission station. The received joint angles is converted into Pulse Width Modulation signals to control the robot arm. Since robot arm is designed by using DC motors, no feedback sensors are required to find out the position of the motor, because signal will decide the position of the servo motor as well as robot arm.

Since, the above work constitutes vision system, robot arm modeling and wireless embedded control for object sorting, literature review was extensively done on the above said are-as.

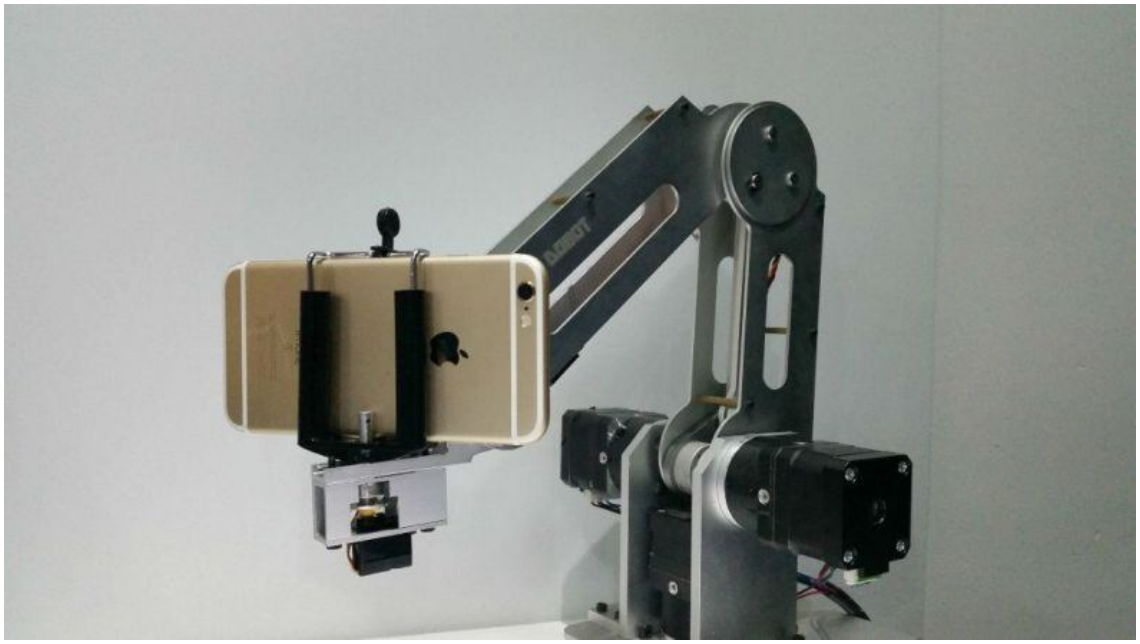


Fig 2.1

CHAPTER -3

WORKED CARRIED OUT

3.1 THE HARDWARE DESIGN AND DESCRIPTION

The basic control circuitry consist of

1. 1 piece of Atmel 8051 series 89C51 microcontroller
2. 2 piece of bidirectional motor driver / H bridge (L293D),
3. 4 piece of DC motor ,
4. 1 piece of 3 Terminal voltage regulator (7805)
5. Bluetooth device
6. Aluminium rectangular bar

3.1.1 Microcontroller 8051

FEATURES:

- 4K bytes of flash
- 128 bytes of RAM
- 32 I/O lines
- 2 16 bit timer/ counters
- A full duplex serial port
- On chip oscillator and clock circuitry

DESCRIPTION:

The AT89C51 is a low-power, high-performance CMOS 8-bit microcomputer with 4Kbytes of Flash Programmable and Erasable Read Only Memory (PEROM). The device is manufactured using Atmel's high density non-volatile memory technology and is compatible with the industry standard MCS-51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in system or by a conventional non-volatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C51 is a powerful microcomputer which provides a highly flexible and cost effective solution to many embedded control applications. The AT89C51 provides the following standard features: 4 Kbytes of Flash, 128 bytes of RAM, 32 I/O lines, two 16-bit timer/counters, five vector two-level interrupt architecture, a full duplex serial port, and on-chip oscillator and clock circuitry. In addition, the AT89C51 is designed with static logic for operation

down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port and interrupt system to continue functioning. The Power down Mode saves the RAM contents but freezes the oscillator disabling all other chip functions until the next hardware reset

Port 0

Port 0 is an 8-bit open drain bi-directional I/O port. As an output port each pin can sink eight TTL inputs. When 1s are written to port 0 pins, the pins can be used as high-impedance inputs. Port 0 may also be configured to be the multiplexed low order address/data bus during accesses to external program and data memory. In this mode P0 has internal pull-ups. Port 0 also receives the code bytes during Flash programming, and outputs the code bytes during program verification. External pull-ups are required during program verification.

Port 1

Port 1 is an 8-bit bi-directional I/O port with internal pull-ups. The Port 1 output buffers can sink/source four TTL inputs. When 1s are written to Port 1 pins they are pulled high by the internal pull-ups and can be used as inputs. As inputs, Port 1 pins that are externally being pulled low will source current (IIL) because of the internal pull-ups. Port 1 also receives the low-order address bytes during Flash programming and program verification.

Port 2

Port 2 is an 8-bit bi-directional I/O port with internal pull-ups. The Port 2 output buffers can sink/source four TTL inputs. When 1s are written to Port 2 pins they are pulled high by the internal pull-ups and can be used as inputs. As inputs, Port 2 pins that are externally being pulled low will source current (IIL) because of the internal pull-ups. Port 2 emits the high-order address byte during fetches from external program memory and during accesses to external data memory that uses 16-bit addresses (MOVX @DPTR). In this application it uses strong internal pull-ups when emitting 1s. During accesses to external data memory that uses 8-bit addresses (MOVX @ RI), Port 2 emits the contents of the P2 Special Function Register. Port 2 also receives the high-order address bits during Flash programming.

Port 3

Port 3 is an 8-bit bi-directional I/O port with internal pull-ups. The Port 3 output buffers can sink/source four TTL inputs. When 1s are written to Port 3 pins they are pulled high by the internal pull-ups and can be used as inputs. As inputs, Port 3 pins that are externally being pulled low will source current (IIL) because of the pull-ups. Port 3 also serves the functions of various special features.

RST

Reset input. A high on this pin for two machine cycles while the oscillator is running resets the device.

ALE/PROG

Address Latch Enable output pulse for latching the low byte of the address during accesses to external memory. This pin is also the program pulse input (PROG) during Flash programming. In normal operation ALE is emitted at a constant rate of 1/6 the oscillator frequency, and may be used for external timing or clocking purposes. Note, however, that one ALE pulse is skipped during each access to external Data Memory. If desired, ALE operation can be disabled by setting bit 0 of SFR location 8EH. With the bit set, ALE is active only during a MOVX or MOVC 9 instruction. Otherwise, the pin is weakly pulled high. Setting the ALE-disable bit has no effect if the micro controller is in external execution mode.

PSEN

Program Store Enable is the read strobe to external program memory. When the AT89C51 is executing code from external program memory, PSEN is activated twice each machine cycle, except that two PSEN activations are skipped during each access to external data memory.

EA/VPP

External access enables. EA must be strapped to GND in order to enable the device to fetch code from external program memory locations starting at 0000H up to FFFFH. Note, however, that if lock bit 1is programmed, EA will be internally latched on reset. EA should be strapped to VCC for internal program executions. This pin also receives the 12-volt programming enable voltage (VPP) during Flash programming, for parts that require 12-volt VPP.

XTAL1

Input to the inverting oscillator amplifier and input to the internal lock operating circuit.

XTAL2

Output from the inverting oscillator amplifier. Oscillator Characteristics XTAL1 and XTAL2 are the input and output, respectively, of an inverting amplifier which can be configured for use as an on-chip oscillator. Either a quartz crystal or ceramic resonator may be used. To drive the device from an external clock source, XTAL2 should be left unconnected while XTAL1 is driven. There are no requirements on the duty cycle of the external clock signal, since the 10 input to the internal clocking circuitry is through a divide-by-two flip-flop, but minimum and maximum voltage high and low time specifications must be observed.

Flags and the Program Status Word (PSW)

Flags may be conveniently addressed, they are grouped inside the program status word (PSW) and the power control (PCON) registers. The 89C51 has four math flags that respond automatically to the outcomes of math operations and three general purpose user flags that can be set to 1 or cleared to 0 by the programmer as desired. The math flags include Carry (C), Auxiliary Carry (AC), Overflow (OV), and Parity (P). User flags are named F0 and F1; they are general-purpose flags that may be used by the programmer to record some event in the program.

Counters and Timers

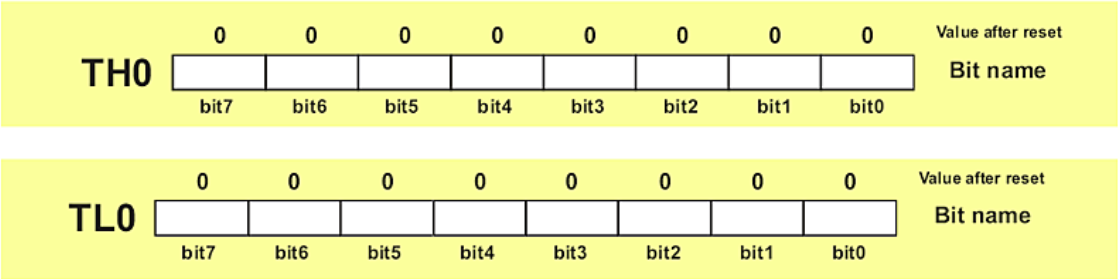
As you already know, the microcontroller oscillator uses quartz crystal for its operation. As the frequency of this oscillator is precisely defined and very stable, pulses it generates are always of the same width, which makes them ideal for time measurement. Such crystals are also used in quartz watches. In order to measure time between two events it is sufficient to count up pulses coming from this oscillator. That is exactly what the timer does. If the timer is properly programmed, the value stored in its register will be incremented (or decremented) with each coming pulse, i.e. once per each machine cycle. A single machine-cycle instruction lasts for 12 quartz oscillator periods, which means that by embedding quartz with oscillator frequency of 12MHz, a number

stored in the timer register will be changed million times per second, i.e. each microsecond.

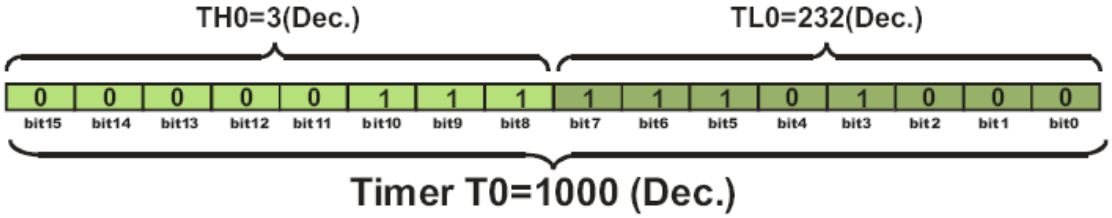
The 8051 microcontroller has 2 timers/counters called T0 and T1. As their names suggest, their main purpose is to measure time and count external events. Besides, they can be used for generating clock pulses to be used in serial communication, so called Baud Rate.

Timer T0

As seen in figure below, the timer T0 consists of two registers – TH0 and TL0 representing a low and a high byte of one 16-digit binary number.



Formula used to calculate values in these two registers is very simple:
TH0 × 256 + TL0 = T
Matching the previous example it would be as follows:
3 × 256 + 232 = 1000



TMOD Register (Timer Mode)

The TMOD register selects the operational mode of the timers T0 and T1. As seen in figure below, the low 4 bits (bit0 - bit3) refer to the timer 0, while the high 4 bits (bit4 - bit7) refer to the timer 1. There are 4 operational modes and each of them is described herein.

Bits of this register have the following function:

- **GATE1** enables and disables Timer 1 by means of a signal brought to the INT1 pin (P3.3):
  - **1** - Timer 1 operates only if the INT1 bit is set.
  - **0** - Timer 1 operates regardless of the logic state of the INT1 bit.
- **C/T1** selects pulses to be counted up by the timer/counter 1:
  - **1** - Timer counts pulses brought to the T1 pin (P3.5).
  - **0** - Timer counts pulses from internal oscillator.

T1M1,T1M0 These two bits select the operational mode of the Timer 1.

T1M0	**T1M1**	**MODE**	**DESCRIPTION**
0	0	0	13 bit timer
0	1	1	16 bit timer
1	0	2	8 bit auto reload
1	1	3	Split mode

Fig 3.1 table

- **GATE0** enables and disables Timer 1 using a signal brought to the INT0 pin (P3.2):
  - **1** - Timer 0 operates only if the INT0 bit is set.
  - **0** - Timer 0 operates regardless of the logic state of the INT0 bit.
- **C/T0** selects pulses to be counted up by the timer/counter 0:
  - **1** - Timer counts pulses brought to the T0 pin (P3.4).
  - **0** - Timer counts pulses from internal oscillator.
- **T0M1,T0M0** These two bits select the opertaional mode of the Timer 0.

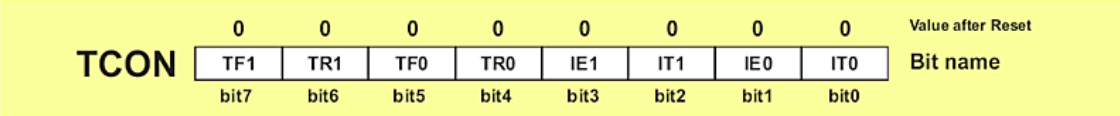
T0M0	**T0M1**	**MODE**	**DESCRIPTION**
0	0	0	13 bit timer
0	1	1	16 bit timer
1	0	2	8 bit auto reload

1	1	3	Split mode

Fig 3.2 table

Timer Control (TCON) Register

TCON register is also one of the registers whose bits are directly in control of timer operation.
Only 4 bits of this register are used for this purpose, while rest of them is used for interrupt control to be discussed later.



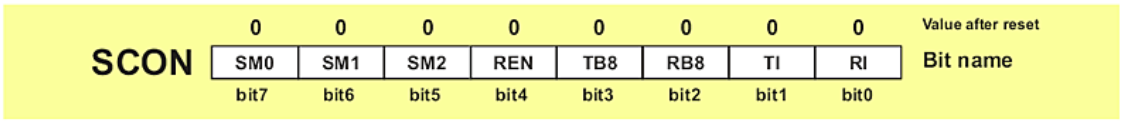
- **TF1** bit is automatically set on the Timer 1 overflow.
- **TR1** bit enables the Timer 1.
  - **1** - Timer 1 is enabled.
  - **0** - Timer 1 is disabled.
- **TF0** bit is automatically set on the Timer 0 overflow.
- **TR0** bit enables the timer 0.
  - **1** - Timer 0 is enabled.
  - **0** - Timer 0 is disabled.

UART (Universal Asynchronous Receiver and Transmitter)

One of the microcontroller features making it so powerful is an integrated UART, better known as a serial port. It is a full-duplex port, thus being able to transmit and receive data simultaneously and at different baud rates. Without it, serial data send and receive would be an enormously complicated part of the program in which the pin state is constantly changed and checked at regular intervals. When using UART, all the programme has to do is to simply select serial port mode and baud rate. When it's done, serial data transmit is nothing but writing to the SBUF register, while data receive represents reading the same register. The microcontroller takes care of not making any error during data transmission.

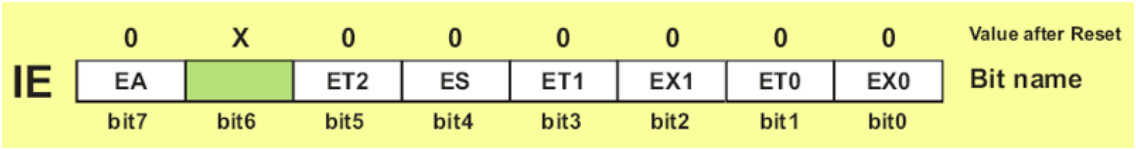
Serial port must be configured prior to being used. In other words, it is necessary to determine how many bits is contained in one serial “word”, baud rate and synchronization clock source. The whole process is in control of the bits of the SCON register (Serial Control).

Serial Port Control (SCON) Register



- **SM0** - Serial port mode bit 0 is used for serial port mode selection.
- **SM1** - Serial port mode bit 1.
- **SM2** - Serial port mode 2 bit, also known as multiprocessor communication enable bit. When set, it enables multiprocessor communication in mode 2 and 3, and eventually mode 1. It should be cleared in mode 0.
- **REN** - Reception Enable bit enables serial reception when set. When cleared, serial reception is disabled.
- **TB8** - Transmitter bit 8. Since all registers are 8-bit wide, this bit solves the problem of transmiting the 9th bit in modes 2 and 3. It is set to transmit a logic 1 in the 9th bit.
- **RB8** - Receiver bit 8 or the 9th bit received in modes 2 and 3. Cleared by hardware if 9th bit received is a logic 0. Set by hardware if 9th bit received is a logic 1.
- **TI** - Transmit Interrupt flag is automatically set at the moment the last bit of one byte is sent. It's a signal to the processor that the line is available for a new byte transmite. It must be cleared from within the software.
- **RI** - Receive Interrupt flag is automatically set upon one byte receive. It signals that byte is received and should be read quickly prior to being replaced by a new data. This bit is also cleared from within the software.

IE REGISTER (INTURRUPT ENABLE)



- **EA** - global interrupt enable/disable:
  - 0 - disables all interrupt requests.
  - 1 - enables all individual interrupt requests.
- **ES** - enables or disables serial interrupt:
  - 0 - UART system cannot generate an interrupt.
  - 1 - UART system enables an interrupt.
- **ET1** - bit enables or disables Timer 1 interrupt:
  - 0 - Timer 1 cannot generate an interrupt.
  - 1 - Timer 1 enables an interrupt.
- **EX1** - bit enables or disables external 1 interrupt:
  - 0 - change of the pin INT0 logic state cannot generate an interrupt.
  - 1 - enables an external interrupt on the pin INT0 state change.
- **ET0** - bit enables or disables timer 0 interrupt:
  - 0 - Timer 0 cannot generate an interrupt.
  - 1 - enables timer 0 interrupt.
- **EX0** - bit enables or disables external 0 interrupt:
  - 0 - change of the INT1 pin logic state cannot generate an interrupt.
  - 1 - enables an external interrupt on the pin INT1 state change.

Interrupt Priorities

1. External interrupt INT0
2. Timer 0 interrupt
3. External Interrupt INT1
4. Timer 1 interrupt
5. Serial Communication Interrupt

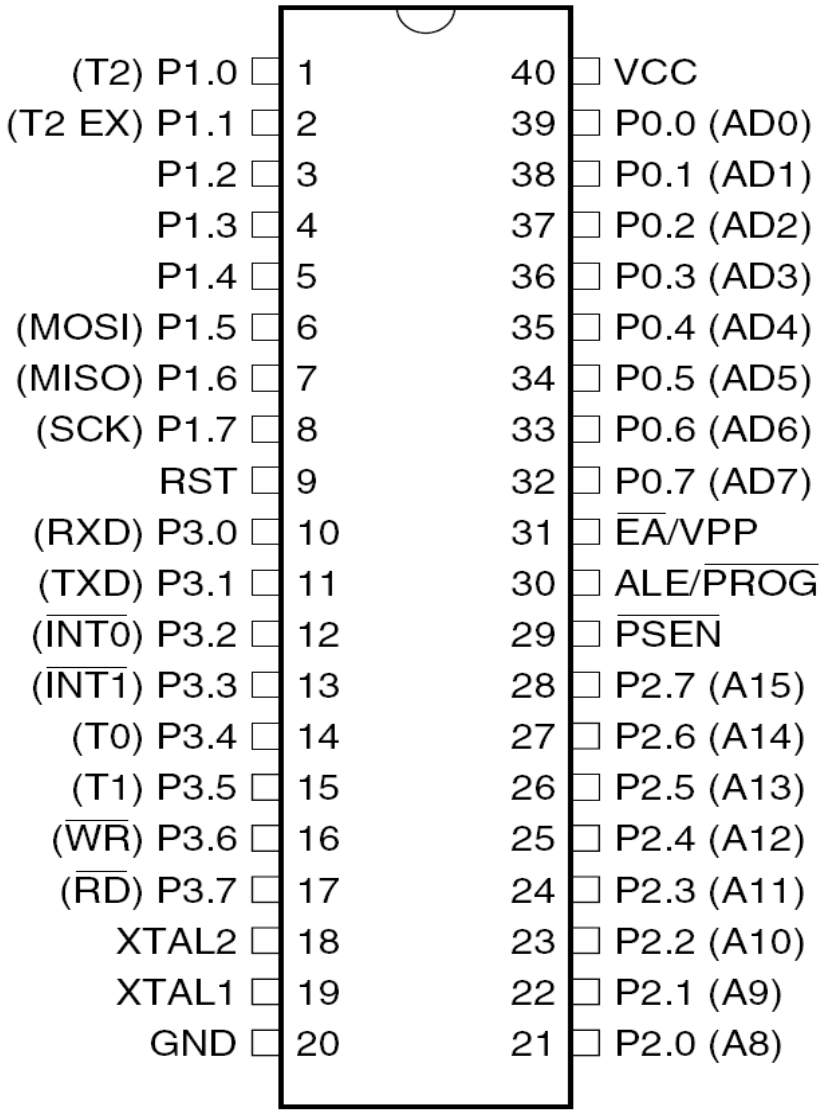

(T2) P1.0 1
(T2 EX) P1.1 2
P1.2 3
P1.3 4
P1.4 5
(MOSI) P1.5 6
(MISO) P1.6 7
(SCK) P1.7 8
RST 9
(RXD) P3.0 10
(TXD) P3.1 11
(INT0) P3.2 12
(INT1) P3.3 13
(T0) P3.4 14
(T1) P3.5 15
(WR) P3.6 16
(RD) P3.7 17
XTAL2 18
XTAL1 19
GND 20
40 VCC
39 P0.0 (AD0)
38 P0.1 (AD1)
37 P0.2 (AD2)
36 P0.3 (AD3)
35 P0.4 (AD4)
34 P0.5 (AD5)
33 P0.6 (AD6)
32 P0.7 (AD7)
31 EA/VPP
30 ALE/PROG
29 PSEN
28 P2.7 (A15)
27 P2.6 (A14)
26 P2.5 (A13)
25 P2.4 (A12)
24 P2.3 (A11)
23 P2.2 (A10)
22 P2.1 (A9)
21 P2.0 (A8)

Fig 3.1

Fig 3.2

RESET

Reset occurs when the RS pin is supplied with a positive pulse in duration of at least 2 machine cycles (24 clock cycles of crystal oscillator). After that, the microcontroller generates an internal reset signal which clears all SFRs, except SBUF registers, Stack Pointer and ports (the state of the first two ports is not defined, while FF value is written to the ports configuring all their pins as inputs). Depending on surrounding and purpose of device, the RS pin is usually connected to a power-on reset push button or circuit or to both of them. Figure below illustrates one of the simplest circuit providing safe power-on reset. Basically, everything is very simple: after turning the power on, electrical capacitor is being charged for several milliseconds through a resistor connected to the ground. The pin is driven high during this process. When the capacitor is charged, power supply voltage is already stable and the pin remains connected to the ground, thus providing normal operation of the microcontroller. Pressing the reset button causes the capacitor to be temporarily discharged and the microcontroller is reset. When released, the whole process is repeated.

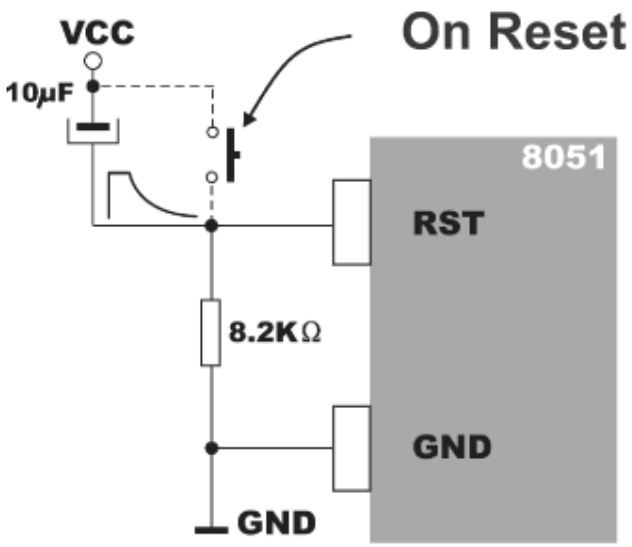


Fig 3.3

3.1.2 Motor driver IC(L293D)

L293D is a typical Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. Dual H-bridge *Motor Driver integrated circuit* (*IC*).

The l293d can drive small and quiet big motors as well, it works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. As you know voltage need to change its direction for being able to rotate the motor in clockwise or anticlockwise direction, Hence H-bridge IC are ideal for driving a DC motor.

In a single l293d chip there two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due its size it is very much used in robotic application for controlling DC motors. Given below is the pin diagram of a L293D motor controller.

Features

- Easily compatible with any of the system.
- Easy interfacing through FRC (Flat Ribbon Cable).
- External Power supply pin for Motors supported.
- Onboard PWM (Pulse Width Modulation) selection switch.
- 2pin Terminal Block (Phoenix Connectors) for easy Motors Connection.
- Onboard H-Bridge base Motor Driver IC (L293D).

Technical Specification

- Power supply : Over FRC connector 5V DC External Power 9V to 24V DC.
- Dimensional Size : 44mm x 37mm x 14mm (l x b x h).
- Temperature range : 0°C to +70 °C.

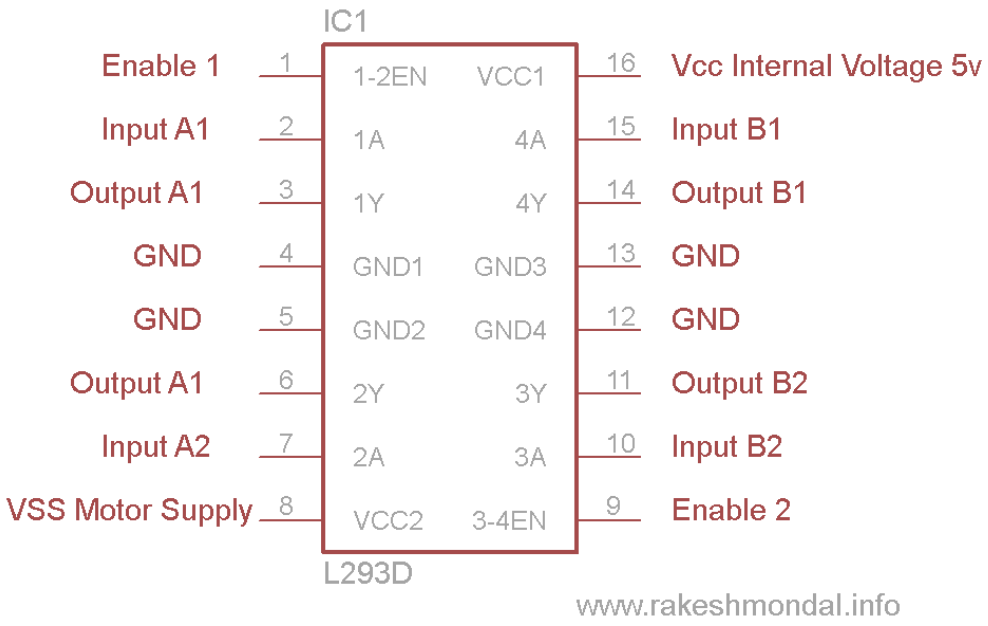

IC1
Enable 1
1
1-2EN
VCC1
16
Vcc Internal Voltage 5v
Input A1
2
1A
4A
15
Input B1
Output A1
3
1Y
4Y
14
Output B1
GND
4
GND1
GND3
13
GND
GND
5
GND2
GND4
12
GND
Output A1
6
2Y
3Y
11
Output B2
Input A2
7
2A
3A
10
Input B2
VSS Motor Supply
8
VCC2
3-4EN
9
Enable 2
L293D
www.rakeshmondal.info

Fig3.4

Fig 3.5

3.1.3 DC MOTOR

Electrical motors are everywhere around us. Almost all the electro-mechanical movements we see around us are caused either by an A.C. or a **DC motor**. Here we will be exploring this kind of motors. This is a device that converts DC electrical energy to a mechanical energy.

Principle of DC Motor

This DC or direct motor works on the principal, when a current carrying conductor is placed in a magnetic field, it experiences a torque and has a tendency to move. This is known as motoring action. If the direction of current in the wire is reversed, the direction of rotation also reverses. When magnetic field and electric field interact they produce a mechanical force, and based on that the working principle of dc motor established. The direction of rotation of a this motor is given by Fleming's left hand rule, which states that if the index finger, middle finger and thumb of your left hand are extended mutually perpendicular to each other and if the index finger represents the direction of magnetic field, middle finger indicates the direction of current, then the thumb represents the direction in which force is experienced by the shaft of the dc motor. Structurally and construction wise a direct current motor is exactly similar to a DC generator, but electrically it is just the opposite. Here we unlike a generator we supply electrical energy to the input port and derive mechanical energy from the output port.

Fig 3.6

3.1.4 7805 POWER SUPPLY

Voltage regulator:

As we require a 5V we need LM7805 Voltage Regulator IC.

7805 IC Rating :

- Input voltage range 7V- 35V
- Current rating $I_{c=}$ 1A
- Output voltage range $V_{Max=5.2V}$, $V_{Min=4.8V}$

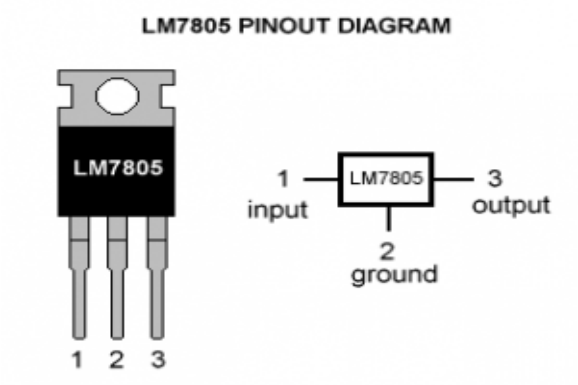


Fig 3.7

3.1.5 BLUETOOTH DEVICE

Technology standard for exchanging data over short range (using short wavelength UHF radio waves in the ISM bands from 2.4 to 2.485 GHz)from fixed and mobile devices and building personal area networks (PANs). It was originally conceived as a wireless alternative to RS232 data cables. It can connect several devices , overcoming the problem of synchronization .the IEEE standardized Bluetooth as IEEE 802.15.1, but no longer maintain the standard. Bluetooth divides transmitted data in to packets, Each channel has bandwidth of 1 MHz .

Bluetooth is a standard wire replacement communication protocol primarily designed for low power consumption with a short range based on low cost transceiver microchips in each device because the device use a radio communication system they do not have to be in visual line of sight of each other.

The wireless communication is between two system . one is the device that runs the android OS, while the second system is the robot with a Bluetooth module attached on the android device . every technology has its limits, and Bluetooth technology is the best way to control the robot remotely as long as it is the range of android device. The application has to be able to send the data over Bluetooth module according to the application features.

On the robot side you have to add a Bluetooth module connected to the robotic arm controller. The Bluetooth module is a little device designated to transmit data between peripheral devices.

Here in this project Androidic Arm I am using the electronic brick HC06 serial Bluetooth module with a signal range less than 20 METERs, this wireless module is cheap and easy to use.

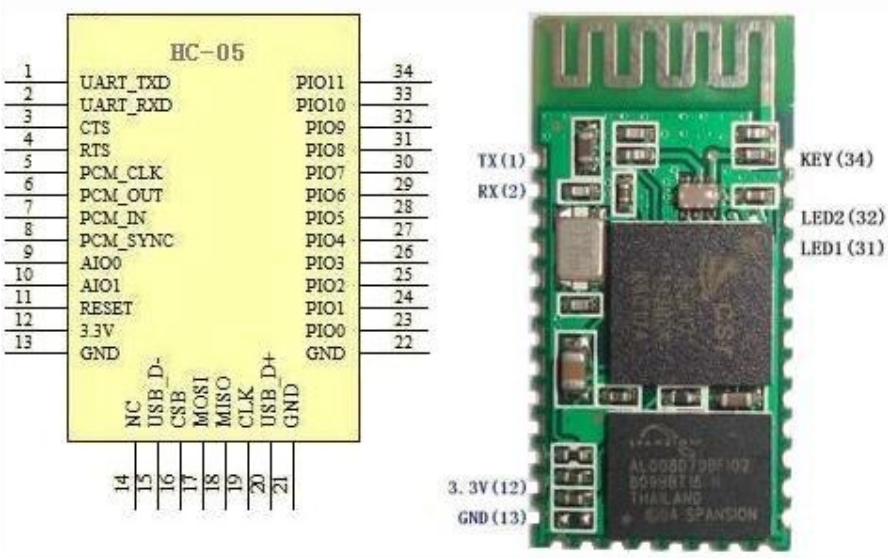

HC-05
1 UART_TXD
2 UART_RXD
3 CTS
4 RTS
5 PCM_CLK
6 PCM_OUT
7 PCM_IN
8 PCM_SYNC
9 AIO0
10 AIO1
11 RESET
12 3.3V
13 GND
34 PIO11
33 PIO10
32 PIO9
31 PIO8
30 PIO7
29 PIO6
28 PIO5
27 PIO4
26 PIO3
25 PIO2
24 PIO1
23 PIO0
22 GND
14 NC
15 USB_D-
16 CSB
17 MOSI
18 MISO
19 CLK
20 USB_D+
21 GND
TX (1)
RX (2)
KEY (34)
LED2 (32)
LED1 (31)
3. 3V (12)
GND (13)

Fig 3.8

3.1.6 RESISTOR

The principal job of a resistor within an electrical or electronic circuit is to "resist" (hence the name **Resistor**), regulate or to set the flow of electrons (current) through them by using the type of conductive material from which they are composed. Resistors can also be connected together in various series and parallel combinations to form resistor networks which can act as voltage droppers, voltage dividers or current limiters within a circuit.

Fig 3.9

Resistor that contain no source of power or amplification but only attenuate or reduce the voltage or current signal passing through them. This attenuation results in electrical energy being lost in the form of heat as the resistor resists the flow of electrons through it.

Then a potential difference is required between the two terminals of a resistor for current to flow. This potential difference balances out the energy lost. When used in DC circuits the potential difference, also known as a resistors voltage drop, is measured across the terminals as the circuit current flows through the resistor.

Most types of resistor are linear devices that produce a voltage drop across themselves when an electrical current flows through them because they obey Ohm's Law, and different values of resistance produces different values of current or voltage. This can be very useful in Electronic circuits by controlling or reducing either the current flow or voltage produced across them we can produce a voltage-to-current and current-to-voltage converter.

There are many thousands of different **Types of Resistor** and are produced in a variety of forms because their particular characteristics and accuracy suit certain

areas of application, such as High Stability, High Voltage, High Current etc, or are used as general purpose resistors where their characteristics are less of a problem.

The Resistor Colour Code Table.

Colour	Digit	Multiplier	Tolerance
Black	0	1	
Brown	1	10	± 1%
Red	2	100	± 2%
Orange	3	1,000	
Yellow	4	10,000	
Green	5	100,000	± 0.5%
Blue	6	1,000,000	± 0.25%
Violet	7	10,000,000	± 0.1%
Grey	8		± 0.05%
White	9		
Gold		0.1	± 5%
Silver		0.01	± 10%
None			

Fig 3.3 table

3.1.7 CAPACITOR

Capacitors are two-terminal electrical elements. Capacitors are essentially two conductors, usually conduction plates - but any two conductors - separated by an insulator - a dielectric - with connection wires connected to the two conducting plates.

Capacitors occur naturally. On printed circuit boards two wires running parallel to each other on opposite sides of the board form a capacitor. That's a capacitor that comes about inadvertently, and we would normally prefer that it not be there. But, it's there. It has electrical effects, and it will affect your circuit. You need to understand what it does.

At other times, you specifically want to use capacitors because of their frequency dependent behavior. There are lots of situations where we want to design for some specific frequency dependent behavior. Maybe you want to filter out some high frequency noise from a lower frequency signal. Maybe you want to filter out power supply frequencies in a signal running near a 60 Hz line. You're almost certainly going to use a circuit with a capacitor.

Ceramic Capacitors

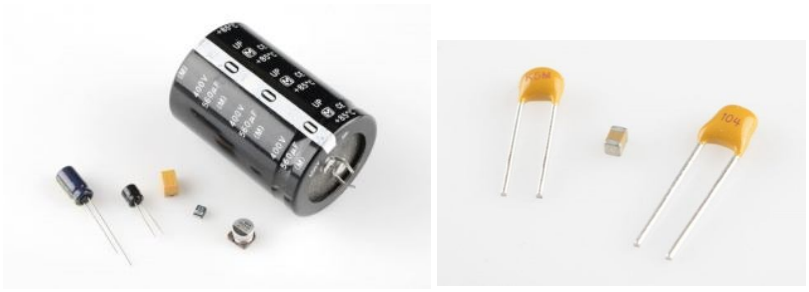


Fig 3.10

3.1.8 LED

Light-Emitting Diode play an indispensable role today in many electrical and electronic devices. It is used in electronics test equipment, TVs, radios, calculators, watches etc. They can also be used in form of lamp as the source of light, because LED lamps offer long service life and high energy efficiency as compared to fluorescent and incandescent lamps.

Features of LED :-

- Low power requirement : It requires less power for ex in TV sets as compared to LCD TVs.
- Long life : When properly installed, an LED can function for decades with very low maintenance cost.
- High efficiency : Light-Emitting Diode produces less heat as compared to normal LCD TVs and fluorescent lamps thus increasing the efficiency.
- Image Quality : They offer better image quality as compared to LCD TVs.

3.2 THE SOFTWARE DESIGN AND DESCRIPTION

3.2.1 PCB Design

Steps in PCB designing:-

1. Cut out a PCB of approximate size of the circuit.
2. Trace the PCB design on the PCB using an electric iron and darken the lines of the circuit using permanent marker.
3. Dip the PCB in ferric chloride solution and removes the exposed parts of the copper from the board using this solution in a process called etching.
4. Wash the PCB plate thoroughly with water and remove the marker lines using acetone to expose copper lines of the circuit.
5. Drill holes in the PCB wherever required using a drilling machine.
6. Insert the components on the PCB as seen in the circuit diagram.
7. Solder all the components on the PCB board using a soldering machine.
8. Give the power supply and ground level to the PCB.
9. The PCB is ready to use.

3.2.2 SOFTWARE DESIGN

Many companies provide the 8051 assembler, some of them provide shareware version of their product on the Web, Kiel is one of them. We can download them from their Websites. However, the size of code for these shareware versions is limited and we have to consider which assembler is suitable for our application.

CREATING YOUR OWN APPLICATION IN UVISION2

To create a new project in uVision2, you must:

- Select Project - New Project.
- Select a directory and enter the name of the project file.
- Select Project - Select Device and select an 8051, 251, or C16x/ST10 device
  from the Device.
- Database.
- Create source files to add to the project.
- Select Project - Targets, Groups, and Files. Add/Files select Source group1, add the
  source files to project.
- Select Project - Options and set the tool options. Note when you select the target device from the Device Database all-special options are set automatically. You only need to configure the memory map of your target hardware. Default memory model settings are optimal for most.

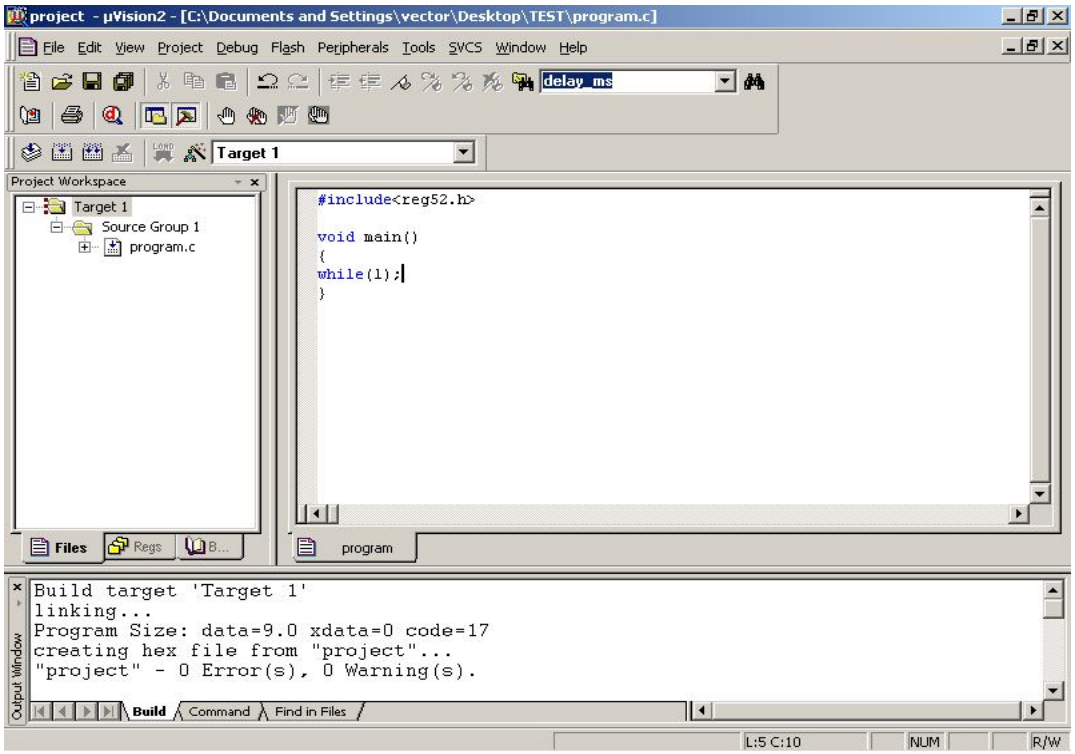


Fig 3.11

APPLICATIONS

- Select Project - Rebuild all target files or Build target.

DEBUGGING AN APPLICATION IN UVISION2

To debug an application created using uVision2, you must:

- Select Debug - Start/Stop Debug Session.
- Open the Serial Window using the Serial #1 button on the toolbar.
- Debug your program using standard options like Step, Go, Break, and so on.

3.2.3 PROGRAM-

```
#include<reg51.h>

sbit B1= P0^0;
sbit B2= P2^7;
sbit B3= P0^1;
sbit B4= P2^6;
sbit B5= P0^2;
sbit B6= P2^5;
sbit B7= P0^3;
sbit B8= P2^4;
sbit B9= P0^4;
sbit M1_1= P1^2;
sbit M1_2= P1^3;
sbit M2_1= P1^0;
sbit M2_2= P1^1;
sbit M3_1= P1^6;
sbit M3_2= P1^7;
sbit M4_1= P1^4;
sbit M4_2= P1^5;

void serialcom()
{
SCON=0x50;
TMOD=0X20;
TH1=0XFD;
TR1=1;
}

void delay(int value)

{
        int i,j;
         for(i=0;i<value;i++)
         for(j=0;j<1275; j++);
```

```
}

void main()
{
              serialcom();
              for(;;)
             {
              while(RI==0);
              RI=0;
              P2=SBUF;


             if(SBUF=='A')
                    {
                     M1_1=1;
                     M1_2=0;

                       }
              else if(SBUF=='B')
                    {
                     M1_1=0;
                     M1_2=1;
                    }

              else if(SBUF=='C')
                     {
                     M2_1=1;
                     M2_2=0;
                       }

             else if(SBUF=='D')
                     {
                     M2_1=0;
                     M2_2=1;
                        }

             else if(  SBUF=='E')
```

```
                    {
                    M3_1=1;
                    M3_2=0;
                     }
                else if(SBUF=='F')
                    {
                    M3_1=0;
                    M3_2=1;
                   }
              else if(SBUF=='G')
                    {
                    M4_1=1;
                    M4_2=0;
                    }
               else if(SBUF=='H')
                     {
                    M4_1=0;
                    M4_2=1;
                     }
              else if(SBUF=='I')
                    {
                    M1_1=0;
                    M1_2=0;
                    M2_1=0;
                    M2_2=0;
                    M3_1=0;
                    M3_2=0;
                    M4_1=0;
                    M4_2=0;
}     }       }
```

3.3 IMPLIMANTATION

A robot arm is known manipulator. It is composed of a set of joints separated in space by the arm links. The joints are where the motion in the arm occurs. In basic, a robot arm consists of the parts: base, joints, links, and a gripper. The base is the basic part over the arm, It may be fix or active. The joint is flexible and joins two separated links. The link is fix and supports the gripper. The last part is a gripper. The gripper is used to hold and move the objects.

A arm is made up of aluminium rectangular bar firstly that arm is approx 100 cm of length that arm is powered by DC motor which have 360 degree of rotation that is based on the forward and inverse kinematics. forward kinematics to compute the position of end effectors for joint parameters. Inverse kinematics is refer to determine the joint parameters that provide the desired position of end effectors.

Jaw of the arm is perpendicular to the elbow same as wrist of arm is perpendicular to the elbow . the dimension of arm as 3.5 inch..

A typical robotic arm joined by SIX joints. But in this arm controlled by 4 motors that means only 4 joints are available . The computer controls the robot by rotating individual step motor connected to each joint. Unlike ordinary motor step motor moves in exact increment, this allows to move the arm very precisely, repeating exactly the same movement again and again here we transmit the data through wireless or via remote base station . here in this the robotic arm controlled by serial communication through the Bluetooth technology (Bluetooth controller application) which is installed in android phone .

Firstly we turn on the Bluetooth technology of both device and as the safety precaution to ensure that the data is transferring is a communal effort between

both of device create the necessitated passkey by choosing any number and pushing OK and device show the pairing to will show on screen.we save the controlling of the motors in Bluetooth controller firstly save the keys of every motor like rotation like motor key one is for shoulder move from right and left another key for up and down movement of shoulder next key for elbow movement of forward and backward and next for up and down movement of elbow and wrist also the use for firstly forward and backward and next one for up and down movement

BLOCK DIAGRAM

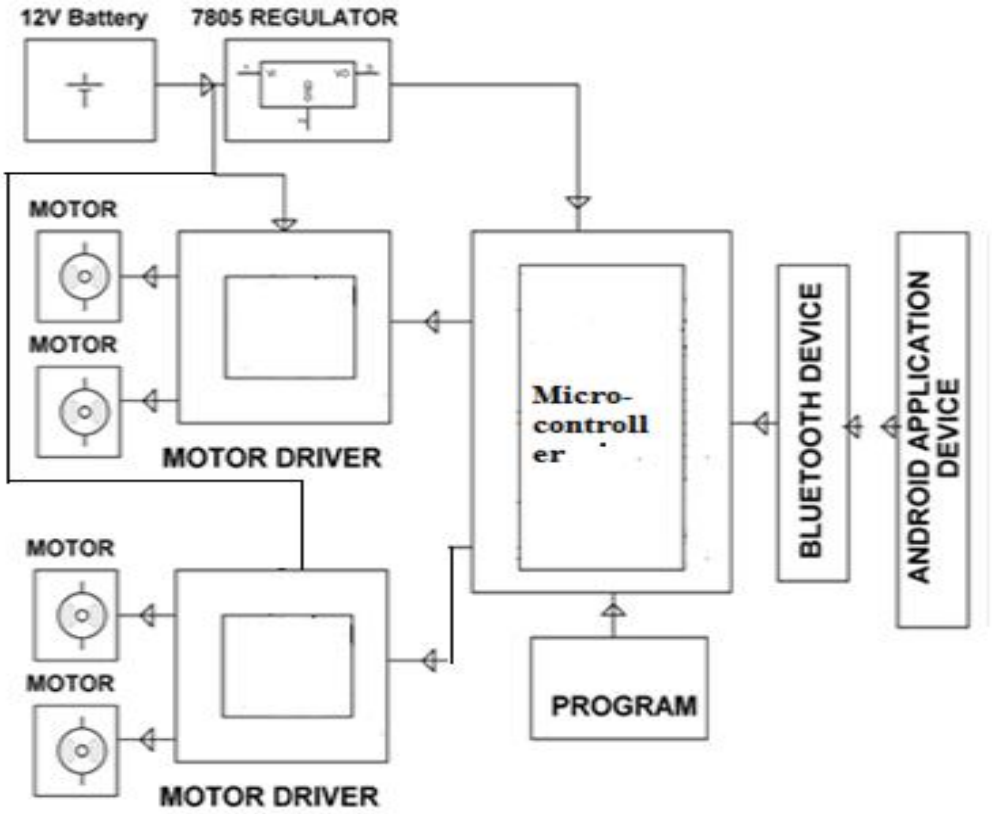


Fig 3.12

CHAPTER -4

RESULT AND DISCUSSION

4.1 APPLICATION OF ANDROIDIC ARM:

- The robotic arm can be designed to perform any desired task such as welding ,gripping , spinning weight lifting etc. depending on the application for example robotic arms in automotive assembly line perform a variety of tasks such as welding and parts rotation and placement during assembly.
- In space the space shuttle remote manipulator system have multi degree of freedom robotic arms that have been used to perform a variety of task such as inspections of the space shuttle using a specially deployed boom with cameras and sensors attached at the end effector.
- The a robotic arms can be autonomous or controlled manually and can be used to perform a variety of tasks with great accuracy the robotic arm can be fixed or mobile (i.e. wheeled) and can be design for industrial or home applications .
- In medical science ” neuro arm” use as miniaturized tools such as laser ,scalpels , pin point accuracy and it can also perform soft tissue manipulation , needle insertion , suturing and cauterization.

4.2 ADVANTAGES AND DISADVANTAGES

Advantages-

Robotic arm are widely used because they have serval advantages

- That can carry out simple and repetitive work for human beings.
- This one can not take rest and so can work continuously for a longer period.
- The productivity is raised'
- They can be used in assembly work with high precision and density.the quality of product is enhanced.
- Minimize the wasting of material using this robotic arm we can do our work through the mobile phone or remote both.
- They can work in unfavourable circumstances, eg. Removing the high temperature artefact from a casting machine welding task etc.

Disadvantages-

- There are limitation in this sense of robots.therefor it is difficult for them to accomplish task with a lot of observation like identifying the object which want to pick up.
- That robotic arm can not differentiate whicjh are to precise or delicate for instance grinding of small gold jewellery .
- If your Bluetooth device does not work then you can not do any work through the arm. That only can possible if you have remote of robotic arm.
- It is very time consuming to complete the operation program of robot.each degree of freedom should be tested repetadlyand the position should be set therefore this one is more suitable to be used in large scale in production line.

4.3 RESULT

In recent years with the increase usage of wireless application the demand for a system that could easily connect device for transfer of data over a long distance without cable , grew stronger. This arm function to pick and place operation, can be controlled using android through the Bluetooth it can move there arm forward, reverse for a specific distance according to specifications of wireless device the development of androidic arm is based on Atmel series 8051 microcontroller. Finally this prototype of the robotic arm is expected to overcome the problem such as placing or picking object in the fastest and easiest way.

CHAPTER- 5

CONCLUSION AND FUTURE SCOPE

5.1 CONCLUSION

Robotics is a rapidly growing field ,as we continue to research , design, and build new robots that's are various practical purpose, domestically, commercially or defence robotic arms are used in most industries such as material handling, welding, medical fields, agricultural activities

Companies such as Hitachi group Honda motor co-oprative limited Hansen medical inc. Are amongst the leaders with the largest patent portfolios.

This major project graphically analysed robotic arm technologies using android interfacing from various perspectives categorizes and highlights the key companies involved define one unique category that is weight lifting or pick up the things

5.2 FUTURE SCOPE OF THE PROJECT

- Increasing the degree of freedom of the robotic arm by implanting more motors.
- Implementing the inverse kinematics technique in robotic arm.
- Equipping the robotic arm with tactile sensor , proximity sensors.
- Developing the graphical user interface for making the arm more user friendly .

REFERENCES

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