



RESEARCH ARTICLE

GESTURE CONTROLLED ROBOTIC VEHICLE.

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Key words:***Corresponding Author****Prashant Bhagat.****Abstract**

This system is very beneficial for disabled people as it allows movement of a robotic vehicle on the basis of hand movements. The person just has to move his hand in order to move the vehicle in forward, backward, left or right direction. So the user does not have to press any buttons. The system includes a receiver circuit designed which will be mounted on a top of a glove which the user has to wear. The circuit on the vehicle includes RF receiver, 8051 microcontroller and Driver IC to operate the motors.

The receiver circuit that is on the top of a glove includes AT mega family microcontroller interfaced to the accelerometer. The commands that are detected by the IC on this circuit are sent to the RF transmitter which then forwards the commands to the RF receiver. The RF receiver then sends the commands to 8051 microcontroller which processes the commands so that the vehicle moves in the specified direction.

*Copy Right, IJAR, 2016,. All rights reserved.***Introduction:-**

In recent years, robotics is a current emerging technology in the field of science. A number of universities in the world are developing new things in this field. Robotics is the new booming field, which will be of great use to society in the coming years. Though robots can be a replacement to humans, they still need to be controlled by humans itself. Robots can be wired or wireless, both having a controller device. Both have pros and cons associated with them. Beyond controlling the robotic system through physical devices, recent method of gesture control has become very popular. The main purpose of using gestures is that it provides a more natural way of controlling and provides a rich and intuitive form of interaction with the robotic system. These days many types of wireless robots are being developed and are put to varied applications and uses. Human hand gestures are natural and with the help of wireless communication, it is easier to interact with the robot in a friendly way. The robot moves depending on the gesture made by your hand and from a distance. The objective of this paper is to build a wireless gesture control robot using Arduino, accelerometer, RF transmitter and receiver module. The Arduino Uno microcontroller reads the analog output values i.e., x-axis and y-axis values of the accelerometer and converts that analog value to respective digital value. The digital values are processed by the Arduino Uno microcontroller and according to the tilt of the accelerometer sensor mounted on hand, it sends the commands to the RF transmitter which is received by the transmitter and is processed at the receiver end which drives the motor to a particular direction. The robot moves forward, backward, right and left when we tilt our palm to forward, backward, right and left respectively. The robot stops when it is parallel to the ground.

Implementation:-**Software Used:-****Introduction To Keil Micro Vision (IDE):-**

Keil an ARM Company makes C compilers, macro assemblers, real-time kernels, debuggers, simulators, integrated environments, evaluation boards, and emulators for ARM7/ARM9/Cortex-M3, XC16x/C16x/ST10, 251, and 8051 MCU families.

Keil development tools for the 8051 Microcontroller Architecture support every level of software developer from the professional applications engineer to the student just learning about embedded software development. When starting a new project, simply select the microcontroller you use from the Device Database and the μ Vision IDE sets all compiler, assembler, linker, and memory options for you.

Keil is a cross compiler. So first we have to understand the concept of compilers and cross compilers. After then we shall learn how to work with keil.

Concept Of Compiler:-

Compilers are programs used to convert a High Level Language to object code. Desktop compilers produce an output object code for the underlying microprocessor, but not for other microprocessors. I.E the programs written in one of the HLL like 'C' will compile the code to run on the system for a particular processor like x86 (underlying microprocessor in the computer). For example compilers for Dos platform is different from the Compilers for Unix platform So if one wants to define a compiler then compiler is a program that translates source code into object code.

The compiler derives its name from the way it works, looking at the entire piece of source code and collecting and reorganizing the instruction. See there is a bit little difference between compiler and an interpreter. Interpreter just interprets whole program at a time while compiler analyses and execute each line of source code in succession, without looking at the entire program.

The advantage of interpreters is that they can execute a program immediately. Secondly programs produced by compilers run much faster than the same programs executed by an interpreter. However compilers require some time before an executable program emerges. Now as compilers translate source code into object code, which is unique for each type of computer, many compilers are available for the same language.

Concept Of Cross Compiler:-

A cross compiler is similar to the compilers but we write a program for the target processor (like 8051 and its derivatives) on the host processors (like computer of x86). It means being in one environment you are writing a code for another environment is called cross development. And the compiler used for cross development is called cross compiler. So the definition of cross compiler is a compiler that runs on one computer but produces object code for a different type of computer.

Keil C Cross Compiler:-

Keil is a German based Software development company. It provides several development tools like

- ❖ IDE (Integrated Development environment).
- ❖ Project Manager.
- ❖ Simulator.
- ❖ Debugger.

C Cross Compiler, Cross Assembler, Locator/Linker:-

The Keil ARM tool kit includes three main tools, assembler, compiler and linker. An assembler is used to assemble the ARM assembly program. A compiler is used to compile the C source code into an object file. A linker is used to create an absolute object module suitable for our in-circuit emulator.

5.5 Building an Application in μ Vision2:-

To build (compile, assemble, and link) an application in μ Vision2, you must:

1. Select Project –(forexample,166\EXAMPLES\HELLO\HELLO.UV2).
2. Select Project - Rebuild all target files or Build target. μ Vision2 compiles, assembles, and links the files in your project.

5.6 Creating Your Own Application in μ Vision2To create a new project in μ Vision2, you must:-

1. Select Project - New Project.
2. Select a directory and enter the name of the project file.
3. Select Project - Select Device and select an 8051, 251, or C16x/ST10 device from the Device Database™.

4. Create source files to add to the project.
5. Select Project - Targets, Groups, Files. Add/Files, select Source Group1, and add the source files to the project.
6. 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 typically only need to configure the memory map of your target hardware. Default memory model settings are optimal for most applications.
7. Select Project - Rebuild all target files or Build target.

Debugging an Application in μ Vision2:-

To debug an application created using μ Vision2, you must:-

1. Select Debug - Start/Stop Debug Session.
2. Use the Step toolbar buttons to single-step through your program. You may enter G, main in the Output Window to execute to the main C function.
3. 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:-

Starting μ Vision2 and Creating a Project μ Vision2 is a standard Windows application and started by clicking on the program icon. To create a new project file select from the μ Vision2 menu Project – New Project.... This opens a standard Windows dialog that asks you for the new project file name. We suggest that you use a separate folder for each project. You can simply use the icon Create New Folder in this dialog to get a new empty folder. Then select this folder and enter the file name for the new project, i.e. Project1. μ Vision2 creates a new project file with the name PROJECT1.UV2 which contains a default target and file group name. You can see these names in the Project.

Window – Files:-

Now use from the menu Project – Select Device for Target and select a CPU for your project. The Select Device dialog box shows the μ Vision2 device data base. Just select the microcontroller you use. We are using for our examples the Philips 80C51RD+ CPU. This selection sets necessary tool Options for the 80C51RD+ device and simplifies in this way the tool Configuration.

Building Projects and Creating a HEX Files:-

Typical, the tool settings under Options – Target are all you need to start a new application. You may translate all source files and line the application with a click on the Build Target toolbar icon. When you build an application with syntax errors, μ Vision2 will display errors and warning messages in the Output Window – Build page. A double click on a message line opens the source file on the correct location in a μ Vision2 editor window. Once you have successfully generated your application you can start debugging.

After you have tested your application, it is required to create an Intel HEX file to download the software into an EPROM programmer or simulator. μ Vision2 creates HEX files with each build process when Create HEX files under Options for Target – Output is enabled. You may start your PROM programming utility after the make process when you specify the program under the option Run User Program #1.

Database selection:-

You have made when you create your project target. Refer to page 58 for more Information about selecting a device. You may select and display the on-chip peripheral components using the Debug menu. You can also change the aspects of each peripheral using the controls in the dialog boxes.

Start Debugging:-

You start the debug mode of μ Vision2 with the Debug – Start/Stop DebugSession Command. Depending on the Options for Target – Debug Configuration, μ Vision2 will load the application program and run the startup code μ Vision2 saves the editor screen layout and restores the screen layout of the last debug session. If the program execution stops, μ Vision2 opens an editor window with the source text or shows CPU instructions in the disassembly window. The next executable statement is marked with a yellow arrow. During debugging, most editor features are still available.

For example, you can use the find command or correct program errors. Program source text of your application is shown in the same windows. The μ Vision2 debug mode differs from the edit mode in the following aspects.

1. The “Debug Menu and Debug Commands” described on page 28 are available. The additional debug windows are discussed in the following.
2. The project structure or tool parameters cannot be modified. All build commands are disabled.

Disassembly Window:-

The Disassembly window shows your target program as mixed source and assembly program or just assembly code. A trace history of previously executed instructions may be displayed with Debug – View Trace Records. To enable the trace history, set Debug – Enable/Disable Trace Recording.

If you select the Disassembly Window as the active window all program step commands work on CPU instruction level rather than program source lines. You can select a text line and set or modify code breakpoints using toolbar buttons or the context menu commands.

You may use the dialog Debug – Inline Assembly... to modify the CPU instructions. That allows you to correct mistakes or to make temporary changes to the target program you are debugging. Numerous example programs are included to help you get started with the most popular embedded 8051 devices.

The Keil μ Vision Debugger accurately simulates on-chip peripherals (I²C, CAN, UART, SPI, Interrupts, I/O Ports, A/D Converter, D/A Converter, and PWM Modules) of your 8051 device. Simulation helps you understand hardware configurations and avoids time wasted on setup problems. Additionally, with simulation, you can write and test applications before target hardware is available.

Embedded c:-

Use of embedded processors in passenger cars, mobile phones, medical equipment, aerospace systems and defense systems is widespread, and even everyday domestic appliances such as dish washers, televisions, washing machines and video recorders now include at least one such device.

Because most embedded projects have severe cost constraints, they tend to use low-cost processors like the 8051 family of devices considered in this book. These popular chips have very limited resources available most such devices have around 256 bytes (not megabytes!) of RAM, and the available processor power is around 1000 times less than that of a desktop processor. As a result, developing embedded software presents significant new challenges, even for experienced desktop programmers. If you have some programming experience - in C, C++ or Java - then this book and its accompanying CD will help make your move to the embedded world as quick and painless as possible. It is small and simpler to learn, understand, program and debug. Compared to assembly language, C code written is more reliable and scalable, more portable between different platforms. In Embedded we need read/write data on given address, so in C its Easy to excess and modify, because of its pointer concept.

Hardware Used:-

Battery:-

An electrical battery is a combination of one or more electrochemical cells, used to convert stored chemical energy into electrical energy. The battery has become a common power source for many household and industrial applications.

Batteries may be used once and discarded, or recharged for years as in standby power applications. Miniature cells are used to power devices such as hearing aids and wristwatches; larger batteries provide standby power for telephone exchanges or computer data centers.

Voltage regulator 7805:-

Features:-

- ❖ Output Current up to 1A
- ❖ Output Voltages of 5, 6, 8, 9, 10, 12, 15, 18, 24V
- ❖ Thermal Overload Protection
- ❖ Short Circuit Protection

❖ Output Transistor Safe Operating Area Protection

Description:-

The LM78XX/LM78XXA series of three-terminal positive regulators are available in the TO-220/D-PAK package and with several fixed output voltages, making them useful in a Wide range of applications. Each type employs internal current limiting, thermal shutdown and safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output Current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

Microcontroller at89s52:-

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes 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 standard 80C51 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 in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non volatile memory programmer. Each port has 8 pins, and will be treated from the software point of view as an 8-bit variable called 'register', each bit being connected to a different Input/Output pin. The 89S52 has 4 different ports, each one having 8 Input/output lines providing a total of 32 I/O lines. Those ports can be used to output DATA and orders do other devices, or to read the state of a sensor.

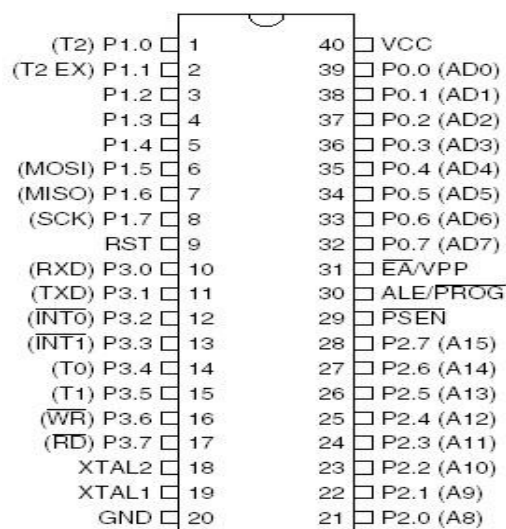
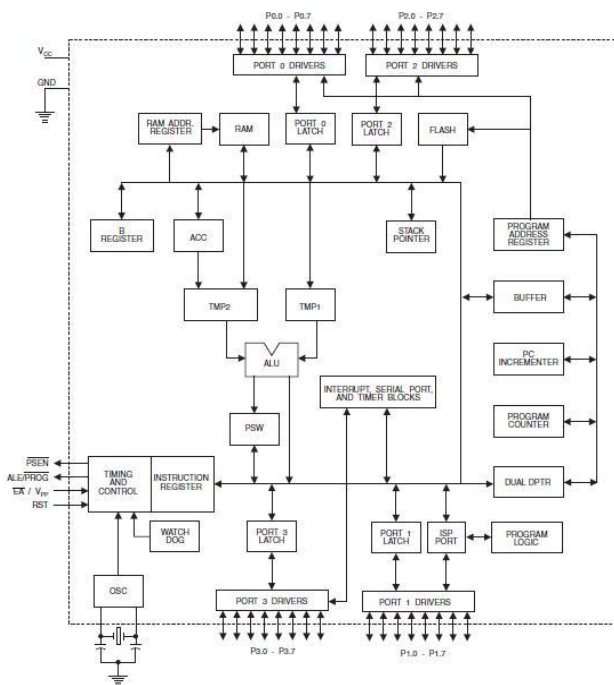


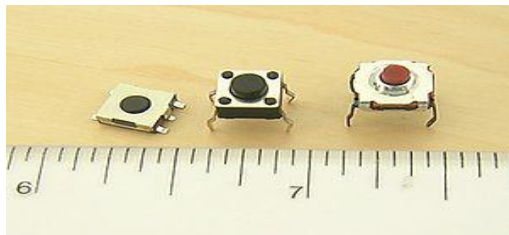
Figure taken from a datasheet provided by ATMEL™

Features:

- ❖ Compatible with MCS®-51 Products.
- ❖ 8K Bytes of In-System Programmable (ISP) Flash Memory.
- ❖ Endurance: 10,000 Write/Erase Cycles.
- ❖ 4.0V to 5.5V Operating Range.
- ❖ Fully Static Operation: 0 Hz to 33 Mhz.
- ❖ Dual Data Pointer.
- ❖ Power-off Flag.
- ❖ Fast Programming Time.
- ❖ Flexible ISP Programming (Byte and Page Mode)
- ❖ Three 16-bit Timer/Counters
- ❖ Eight Interrupt Sources.
- ❖ Full Duplex UART Serial Channel.



Push buttons:-

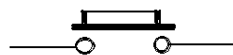


A push-button (also spelled pushbutton) or simply button is a simple switch mechanism for controlling some aspect of a machine or a process. Buttons are typically made out of hard material, usually plastic or metal. The surface is usually flat or shaped to accommodate the human finger or hand, so as to be easily depressed or pushed. Buttons are most often biased switches, though even many un-biased buttons (due to their physical nature) require a spring to return to their un-pushed state. Different people use different terms for the "pushing" of the button, such as press, depress, mash, and punch.

Uses:-

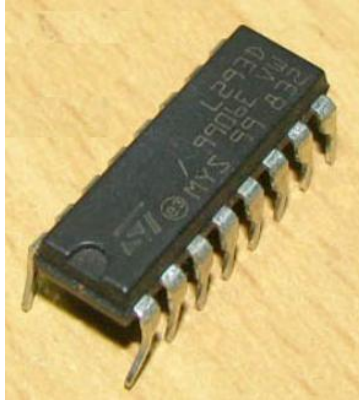
In industrial and commercial applications push buttons can be linked together by a mechanical linkage so that the act of pushing one button causes the other button to be released. In this way, a stop button can "force" a start button to be released. This method of linkage is used in simple manual operations in which the machine or process have no electrical circuits for control.

Commonly used colors are red for stopping the machine or process and green for starting the machine or process.
 Push to ON button:



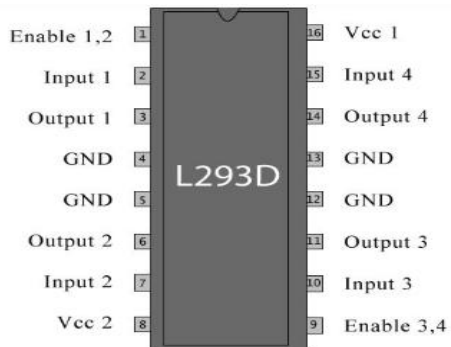
Initially the two contacts of the button are open. When the button is pressed they become connected. This makes the switching operation using the push button.

MOTOR DRIVER (L293D)



Features:

- ❖ Wide supply-voltage range: 4.5V to 36V.
- ❖ Separate input- logic supply.
- ❖ Internal ESD protection.
- ❖ Thermal shutdown.
- ❖ High-Noise-Immunity input.
- ❖ Functional Replacements for SGS L293 and SGS L293D.



Description:-

L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal. This higher current signal is used to drive the motors.

L293D contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction. The motor operations of two motors can be controlled by input logic at pins 2 & 7 and 10 & 15. Input logic 00 or 11 will stop the corresponding motor. Logic 01 and 10 will rotate it in clockwise and anticlockwise directions, respectively.

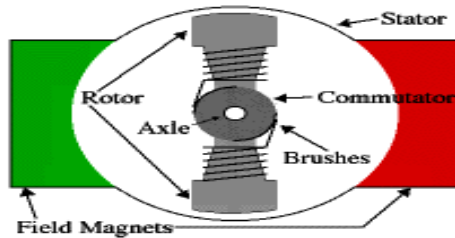
Enable pins 1 and 9 (corresponding to the two motors) must be high for motors to start operating. When an enable input is high, the associated driver gets enabled. As a result, the outputs become active and work in phase with their inputs. Similarly, when the enable input is low, that driver is disabled, and their outputs are off and in the high-impedance state.

Dc Motor:-

What is DC Motor?

A DC motor is an electric motor that runs on direct current (DC) electricity. In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of

the external magnetic field. As you are well aware of from playing with magnets as a kid, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel. The internal configuration of a DC motor is designed to harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion.



DC motorP:-

Rf Communication:-

General physics of radio signals:-

RF communication works by creating electromagnetic waves at a source and being able to pick up those electromagnetic waves at a particular destination. These electromagnetic waves travel through the air at near the speed of light. The wavelength of an electromagnetic signal is inversely proportional to the frequency; the higher the frequency, the shorter the wavelength.

Frequency is measured in Hertz (cycles per second) and radio frequencies are measured in kilohertz (KHz or thousands of cycles per second), megahertz (MHz or millions of cycles per second) and gigahertz (GHz or billions of cycles per second). Higher frequencies result in shorter wavelengths. The wavelength for a 900 MHz device is longer than that of a 2.4 GHz device.

In general, signals with longer wavelengths travel a greater distance and penetrate through, and around objects better than signals with shorter wavelengths.

How does an RF communication system work?

Imagine an RF transmitter wiggling an electron in one location. This wiggling electron causes a ripple effect, somewhat akin to dropping a pebble in a pond. The effect is an electromagnetic (EM) wave that travels out from the initial location resulting in electrons wiggling in remote locations. An RF receiver can detect this remote electron wiggling.

The RF communication system then utilizes this phenomenon by wiggling electrons in a specific pattern to represent information. The receiver can make this same information available at a remote location; communicating with no wires.

In most wireless systems, a designer has two overriding constraints: it must operate over a certain distance (range) and transfer a certain amount of information within a time frame (data rate). Then the economics of the system must work out (price) along with acquiring government agency approvals (regulations and licensing).

How is range determined?

In order to accurately compute range – it is essential to understand a few terms.

dB– Decibels:-

Decibels are logarithmic units that are often used to represent RF power. To convert from watts to dB: Power in dB = $10 * (\log x)$ where x is the power in watts.

Another unit of measure that is encountered often is dBm (dB milliwatts). The conversion formula for it is Power in dBm = $10 * (\log x)$ where x is the power in milliwatts.

Transmit Power:-

Transmit power refers to the amount of RF power that comes out of the antenna port of the radio. Transmit power is usually measured in Watts, milliwatts or dBm.

Receiver sensitivity:-

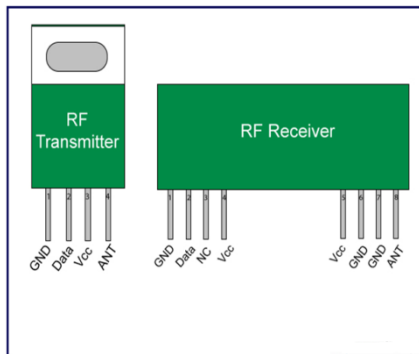
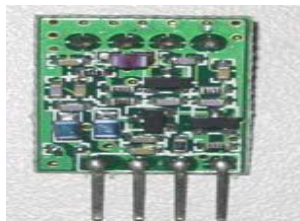
Receiver sensitivity refers to the minimum level signal the radio can demodulate. It is convenient to use an example with sound waves; Transmit power is how loud someone is yelling and receive sensitivity would be how soft a voice someone can hear. Transmit power and receive sensitivity together constitute what is known as “link budget”. The link budget is the total amount of signal attenuation you can have between the transmitter and receiver and still have communication occur.

Rf Modules:-**What is RF?**

RF itself has become synonymous with wireless and high-frequency signals, describing anything from AM radio between 535 kHz and 1605 kHz to computer local area networks (LANs) at 2.4 GHz. However, RF has traditionally defined frequencies from a few kHz to roughly 1 GHz. If one considers microwave frequencies as RF, this range extends to 300 GHz. The following two tables outline the various nomenclatures for the frequency bands. The third table outlines some of the applications at each of the various frequency bands.

Features:

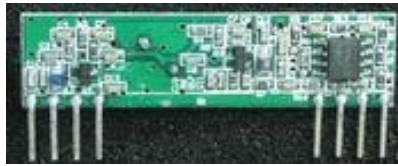
- ❖ Range in open space(Standard Conditions) : 100 Meters.
- ❖ RX Receiver Frequency : 433 Mhz.
- ❖ RX Typical Sensitivity : 105 Dbm.
- ❖ RX Supply Current : 3.5 mA.
- ❖ RX IF Frequency : 1MHz.
- ❖ Low Power Consumption.
- ❖ Easy For Application.
- ❖ RX Operating Voltage : 5V.
- ❖ TX Frequency Range : 433.92 Mhz.

**Rf Transmitter:-****General Description:-**

- ❖ The ST-TX01-ASK is an ASK Hybrid transmitter module. ST-TX01-ASK is designed by the Saw Resonator, with an effective low cost, small size, and simple-to-use for designing.

- ❖ Frequency Range: 315 / 433.92 MHZ.
- ❖ Supply Voltage: 3~12V.
- ❖ Output Power: 4~16dBm.
- ❖ Circuit Shape: Saw.
- ❖ Applications.
- ❖ Wireless security systems.
- ❖ Car Alarm systems.
- ❖ Remote controls.
- ❖ Sensor reporting.
- ❖ Automation systems.

Rf Receiver:-



General Description:-

The ST-RX02-ASK is an ASK Hybrid receiver module. A effective low cost solution for using at 315/433.92 MHZ. The circuit shape of ST-RX02-ASK is L/C. Receiver Frequency: 315 / 433.92 MHZ Typical sensitivity: -105dBm Supply Current: 3.5mA IF Frequency: 1MHz

Features:

- ❖ Low power consumption.
- ❖ Easy for application.
- ❖ Operation temperature range: - 20°C~ +70°C
- ❖ Operation voltage: 5 Volts.
- ❖ Available frequency at: 315/434 Mhz.

Rf encoder and decoder:-

Rf encoder (ht 12e):-

General description:-

The RF encoders are a series of CMOS LSIs for remote control system m applications. They are capable of encoding information which consists of N address bits and 12_N data bits. Each address/ data input can be set to one of the two logic states. The programmed addresses/data are transmitted together with the header bits via an RF or an infrared transmission medium. Upon receipt of a trigger signal. The capability to select a TE trigger on the HT12E or a DATA trigger on the HT12A further enhances the application for flexibility of the 2^12 series of encoders. The HT12A additionally provides a 38 kHz carrier for infrared systems.

Pin Diagrams:-



Features:

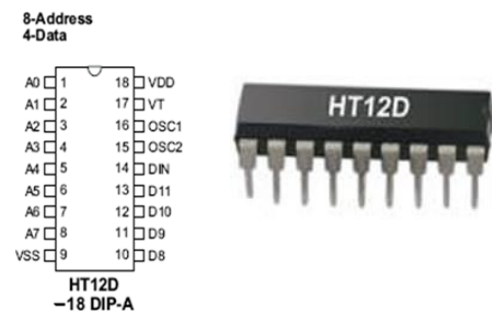
- ❖ Operating voltage is 2.4V~12V for the HT12E.
- ❖ Low power and high noise immunity CMOS technology.
- ❖ HT12A with a 38kHz carrier for infrared transmission medium.
- ❖ Minimum transmission words are Four words for the HT12E.
- ❖ Built-in oscillator needs only 5% resistor.
- ❖ Data code has positive polarity.
- ❖ Minimal external components.

Applications:

- ❖ Burglar alarm system.
- ❖ Smoke and fire alarm system.
- ❖ Garage door controllers.
- ❖ Car door controllers.
- ❖ Car alarm system.

RfDecoder(HT 12D)**General Description:-**

The 212 decoders are a series of CMOS LSIs for remote control system applications. They are paired with Holtek's 212 series of encoders (refer to the encoder/decoder cross reference table). For proper operation, a pair of encoder/decoder with the same number of addresses and data format should be chosen. The decoders receive serial addresses and data from a programmed 212 series of encoders that are transmitted by a carrier using an RF or an IR transmission medium. They compare the serial input data three times continuously with their local addresses. If no error or unmatched codes are found; the input data codes are decoded and then transferred to the output pins. The VT pin also goes high to indicate a valid transmission. The 212 series of decoders are capable of decoding information that consists of N bits of address and 12_N bits of data. Of this series, the HT12D is arranged to provide 8 address bits and 4 data bits, and HT12F is used to decode 12 bits of address information.

Pin Diagrams:-**Features:**

- ❖ Operating voltage: 2.4V~12V.
- ❖ Low power and high noise immunity CMOS technology.
- ❖ Low standby current.
- ❖ Capable of decoding 12 bits of information.
- ❖ Binary address setting.
- ❖ Received codes are checked 3 times.

Applications:

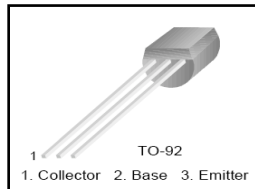
- ❖ Burglar alarm system.
- ❖ Smoke and fire alarm system.

- ❖ Garage door controllers.
- ❖ Car door controllers.
- ❖ Car alarm system.
- ❖ Security system.
- ❖ Cordless telephones.

BC 547

Technical Specifications:-

The BC547 transistor is an NPN Epitaxial Silicon Transistor. The BC547 transistor is a general-purpose transistor in small plastic packages. It is used in general-purpose switching and amplification BC847/BC547 series 45 V, 100 mA NPN general-purpose transistors.

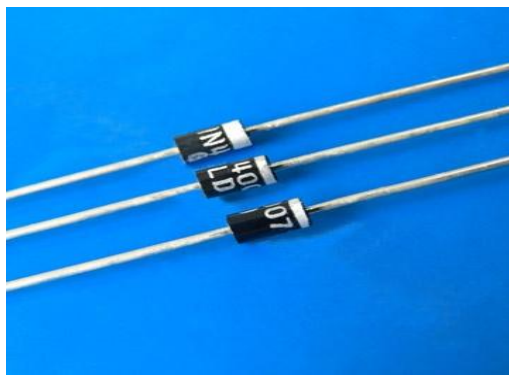


We know that the transistor is a "CURRENT" operated device and that a large current (I_c) flows freely through the device between the collector and the emitter terminals. However, this only happens when a small biasing current (I_b) is flowing into the base terminal of the transistor thus allowing the base to act as a sort of current control input. The ratio of these two currents (I_c/I_b) is called the DC Current Gain of the device and is given the symbol of h_{fe} or nowadays Beta, (β). Beta has no units as it is a ratio. Also, the current gain from the emitter to the collector terminal, I_c/I_e , is called Alpha, (α), and is a function of the transistor itself. As the emitter current I_e is the product of a very small base current to a very large collector current the value of this parameter α is very close to unity, and for a typical low-power signal transistor this value ranges from about 0.950 to 0.999.

1N4007

Diodes are used to convert AC into DC these are used as half wave rectifier or full wave rectifier. Three points must be kept in mind while using any type of diode.

- ❖ Maximum forward current capacity.
- ❖ Maximum reverse voltage capacity.
- ❖ Maximum forward voltage capacity.



The number and voltage capacity of some of the important diodes available in the market are as follows:

- ❖ Diodes of number 1N4001, 1N4002, 1N4003, 1N4004, 1N4005, 1N4006 and 1N4007 have maximum reverse bias voltage capacity of 50V and maximum forward current capacity of 1 Amp.
- ❖ Diode of same capacities can be used in place of one another. Besides this diode of more capacity can be used in place of diode of low capacity but diode of low capacity cannot be used in place of diode of high capacity.

Resistors:-

A resistor is a two-terminal electronic component designed to oppose an electric current by producing a voltage drop between its terminals in proportion to the current, that is, in accordance with Ohm's law:

$$V = IR$$

Resistors are used as part of electrical networks and electronic circuits. They are extremely commonplace in most electronic equipment. Practical resistors can be made of various compounds and films, as well as resistance wire (wire made of a high-resistivity alloy, such as nickel/chrome).



The primary characteristics of resistors are their resistance and the power they can dissipate. Other characteristics include temperature coefficient, noise, and inductance. Less well-known is critical resistance, the value below which power dissipation limits the maximum permitted current flow, and above which the limit is applied voltage. Critical resistance depends upon the materials constituting the resistor as well as its physical dimensions; it's determined by design.

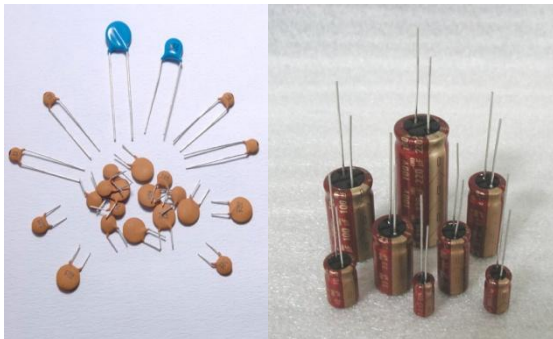
Resistors can be integrated into hybrid and printed circuits, as well as integrated circuits. Size, and position of leads (or terminals) are relevant to equipment designers; resistors must be physically large enough not to overheat when dissipating their power.

Capacitors:-

A capacitor or condenser is a passive electronic component consisting of a pair of conductors separated by a dielectric. When a voltage potential difference exists between the conductors, an electric field is present in the dielectric. This field stores energy and produces a mechanical force between the plates. The effect is greatest between wide, flat, parallel, narrowly separated conductors.

An ideal capacitor is characterized by a single constant value, capacitance, which is measured in farads. This is the ratio of the electric charge on each conductor to the potential difference between them. In practice, the dielectric between the plates passes a small amount of leakage current. The conductors and leads introduce an equivalent series resistance and the dielectric has an electric field strength limit resulting in a breakdown voltage.

The properties of capacitors in a circuit may determine the resonant frequency and quality factor of a resonant circuit, power dissipation and operating frequency in a digital logic circuit, energy capacity in a high-power system, and many other important aspects.



Capacitors are widely used in electronic circuits for blocking direct current while allowing alternating current to pass, in filter networks, for smoothing the output of power supplies, in the resonant circuits that tune radios to particular frequencies and for many other purposes.

Accelerometer:-**The purpose of the accelerometer:-**

The application of accelerometers extends to multiple disciplines, both academic and consumer-driven. For example, accelerometers in laptops protect hard drives from damage. If the laptop were to suddenly drop while in use, the accelerometer would detect the sudden free fall and immediately turn off the hard drive to avoid hitting the reading heads into the hard drive platter. Without this, the two would strike and cause scratches to the platter for extensive file and reading damage. Accelerometers are likewise used in cars as the industry method way of detecting car crashes and deploying airbags almost instantaneously.

In another example, a dynamic accelerometer measures gravitational pull to determine the angle at which a device is tilted with respect to the Earth. By sensing the amount of acceleration, users analyze how the device is moving.

Accelerometers allow the user to understand the surroundings of an item better. With this small device, you can determine if an object is moving uphill, whether it will fall over if it tilts any more, or whether it's flying horizontally or angling downward. For example, smartphones rotate their display between portrait and landscape mode depending on how you tilt the phone.

How they work:-

An accelerator looks like a simple circuit for some larger electronic device. Despite its humble appearance, the accelerometer consists of many different parts and works in many ways, two of which are the piezoelectric effect and the capacitance sensor. The piezoelectric effect is the most common form of accelerometer and uses microscopic crystal structures that become stressed due to accelerative forces. These crystals create a voltage from the stress, and the accelerometer interprets the voltage to determine velocity and orientation.

The capacitance accelerometer senses changes in capacitance between microstructures located next to the device. If an accelerative force moves one of these structures, the capacitance will change and the accelerometer will translate that capacitance to voltage for interpretation.

Accelerometers are made up of many different components, and can be purchased as a separate device. Analog and digital displays are available, though for most technology devices, these components are integrated into the main technology and accessed using the governing software or operating system.

Typical accelerometers are made up of multiple axes, two to determine most two-dimensional movement with the option of a third for 3D positioning. Most smartphones typically make use of three-axis models, whereas cars simply use only a two-axis to determine the moment of impact. The sensitivity of these devices is quite high as they're intended to measure even very minute shifts in acceleration. The more sensitive the accelerometer, the more easily it can measure acceleration.

Accelerometers, while actively used in many electronics in today's world, are also available for use in custom projects. Whether you're an engineer or tech geek, the accelerometer plays a very active role in a wide range of functionalities. In many cases you may not notice the presence of this simple sensor, but odds are you may already be using a device with it.

This sensor can measure static (earth gravity) or dynamic acceleration in all three axis. Application of the sensor is in various fields and many applications can be developed using it. The accelerometer measures level of acceleration where it is mounted, enables us to measure acceleration/deceleration of an object, or tilt of a platform with respect to earth axis.

DESIGN & WORKING:-

The transmitter prototype is kept on the palm and the receiver prototype (i.e robot) moves according to the palm movement. This paper explains about the 5 different gesture position of the hand i.e stop condition, forward movement, backward movement, moves towards right and moves towards left.

Stop Condition:-

When the accelerometer is parallel to the horizontal plane, all the output pins of decoder (13, 12, 11, 10) are set to high which makes the robot in stop mode. Led are connected to the decoder output pins. Since all the output pins are high, so all the led are glowing

Forward Movement:-

When the accelerometer is tilted to forward, two output pin of decoder (13, 11) are set to low and other two output pin of decoder (12, 10) are set to high. This condition commands the robot to move in forward direction. Led connected to pin 13 and 11 are not glowing as it is low and led connected to pin 10 and 12 are glowing

Backward Movement:-

When the accelerometer is tilted towards backward direction, two output pin of decoder (12, 10) are set to low and other two output pin of decoder (13, 11) are set to high. This condition commands the robot to move in backward direction. Led connected to pin 13 and 11 are glowing as it is high and led connected to pin 10 and 12 are not glowing

Moves Right:-

When the accelerometer is tilted towards right, two output pin of decoder (12, 11) are set to low and other two output pin of decoder (13, 10) are set to high. This condition commands the robot to move towards right. The output can be seen in the above picture. Led connected to pin 13 and 10 are glowing as it is high and led connected to pin 11 and 12 are not glowing

Moves Towards Left:-

When the accelerometer is tilted towards left, two output pin of decoder (12, 11) are set to high and other two output pin of decoder (13, 10) are set to low. This condition commands the robot to move towards left. Led connected to pin 13 and 10 are not glowing as it is low and led connected to pin 11 and 12 are glowing

Conclusion:-

In this paper, an automated robot has been developed which works according to your hand gesture. The robot moves wirelessly according to palm gesture. The RF module is working on the frequency of 433 MHz and has a range of 50-80 meters. This robot can be upgraded to detect human life in earthquake and landslide by implementing the sensor accordingly. It can also be upgraded to bomb detecting robot as it has robotic arm it can also lift the bomb. GPS system can be added to the robot by the help of which its location can be tracked.

References:-

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