GESTURE CONTROLLED HOVERBOARD

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Abstract:Hoverboardmeans transport resembling a skateboard that travels above the surface of the ground, that you ride on in a standing position, Hover board is a type of portable, rechargeable battery-powered scooter. They typically consist of two wheels arranged side-by-side, with two small platforms between the wheels, on which the rider stands. The device is controlled by the rider's feet, standing on the built-in gyroscopic, sensor pads. Ease of transportation and self-subsistent carrier. 1) Is there any device available for the peoples who has problem in knees and can't walk for the long distance? 2) Any other device used in Google campus other than Google cycles costs very high. Yes, we have an idea to make a Hover board which will have great impact on people's life who are suffering from knee problem. Hover board is used as a private transport device and it can also be made applicable for Google campus area. Our project is Gesture Controlled Hover board which will be austere by hand motion. It would be device consisting of four wheels viz. two wheels at front and two wheels at the back. Front wheels will be controlled by microcontroller circuitry which will get input from RFID receiver. Back wheels will be controlled by two motors which would be charged by the batteries and controller switches for each motor. Hand gesture controller consist of RFID transmitter which will detect the hand motion ad accordingly sends the signal to microcontroller circuit which would control the wheels for appropriate direction i.e. left and right movement.

Indexterms- RF module, Gesture, Hoverboard, Microcontroller.

INTRODUCTION

1.1Earlier Stage

Self-balancing scooter was invented prior to the invention of the Hover board. A self-balancing scooter or self-balancing two-wheeled board, commonly referred to as a "hover board", is a type of portable, rechargeable battery-powered scooter. Shane Chen, an American businessman who founded the company Inventist, subsequently made an early claim of inventing the self-balancing scooter device. They typically consist of two wheels arranged side-by-side, with two small platforms between the wheels, on which the rider stands. The device is controlled by the rider's feet, standing on the built-in gyroscopic, sensored

fig 1. self balancing scooter

1.2 Hover board invention

Hoverboard was first described by author M. K. Joseph in 1967 and was popularized by the Back to the Future film franchise, which was later established by the Romania-born Canadian inventor Cătălin Alexandru Duru in May 2015. Hover boards are generally depicted as resembling a skateboard without wheels. Hover board means transport resembling a skateboard that travels above the surface of the ground that you ride on in a standing position. Hover board is a type of portable, rechargeable battery-powered scooter. They typically consist of two wheels arranged side-by-side, with two small platforms between the wheels, on which the rider stands. The device is controlled by the rider's feet, standing on the built-in gyroscopic, sensored pads.

fig. 2 hoverboard

1.3 New Concept

Our project is Gesture Controlled Hover board which will be austere by hand motion. It would be device consisting of four wheels viz.two wheels at front and two wheels at the back. Front wheels will be controlled by microcontroller circuitry which will get input from RFID receiver. Back wheels will be controlled by two motors which would be charged by the batteries and controller switches for each motor.The modified version of hoverboard is shown in fig 3. Hand gesture controller consist of RFID transmitter which will detect the hand motion ad accordingly sends the signal to microcontroller circuit which would control the wheels for

appropriate direction i.e. left and right movement.

fig. 3. new concept of hoverboar

LITERATURE SURVEY.

2.1 Acceleration based band gesture controlled robot.

For past two decades, researchers from around the world have shown keen interest in gesture technology and its possibilities in various fields making it a powerful tool for humans. Smartphones have proved to be of much more aid than being a device just for making calls. The large world is merging together into the palms of humans in the form of a smartphone. A lot of research work in this context has been explored and presented in the next section. The emergence of service robots in early 90's (Helpmate Robots and Robo-Caddy) followed by the development of natural language interface through keyboard has been given by Torrance in 1994. Speech recognition evolved as an upgradation of the past work to communicate with machines but it lacked the standardization of commands due to varying languages, pitch and accent of different users. Hence, researchers proposed vision-based interface that included gesture recognition through camera to provide geometrical information to the robots. They developed mobile robot systems that were instructed through arm positions but those robot systems couldn't recognize gestures defined through specific temporal patterns. Other limitation faced by the cameras was the poor illuminations at night and in foggy weather. Motion technology facilitates humans to interact with machines naturally without any interventions caused by the drawbacks of mechanical devices. Using the concept of gesture recognition, it is possible to move a robot accordingly. Gyroscope and Accelerometers are the main technologies used for human machine interaction that offer very reasonable motion sensitivity, hence, are used in large array of different applications. A lot of work has been done on motion technology using accelerometers. In 2008, Chinese traffic police system used two 3-axis accelerometers fixed on the back of their arms that were synchronized with traffic lights. However, data could only be extracted while the arms would be steady. In 2010, Sauvik Das et al have used an accelerometer as a potential spying device to show locations and activities ofuser without one's knowledge. One of the limitations was that inbuilt accelerometer smartphone would have to be in the same place as was in the training mode to make accurate predictions. In late 90's the smartphones started gaining popularity.

2.2 Wireless gesture control robot: an analysis.

The usage of mechanical accelerometer was cumbersome as it possessed the complexity of connections and also portability was a major challenge. With the emergence of smartphone, the technology became lucid as it was equipped with several accessories in concised form. In 2010, Smartphones were used to control Universal Robot Control System by the students of Kyungpook National University, Korea, to design a real time robot control system in ubiquitous environment. However, gestures involved were complex and an extra robot control manager unit was required .Similar work has been done using Symbian and iOS platforms. However, parallel work on Android OS by Google became more popular because of its powerful capabilities and open architecture. Also, it has a large community of developers writing applications that could enhance the functionality of device, written primarily in a customized version of JAVA.Android OS based Smartphone was being interfaced with LEGO Mindstorm RCX and later with NXT to control robot. The usage of NXT eased the integration of sensors.Based on Android OS, Craige J. Mouser et al built an application to control and view a live video stream from the remote robot. Smartphones have an inbuilt Bluetooth module that is a wireless technology in a short range communication system that aims to replace cables connecting portable devices. Keeping the above features in view, Nasereddin and Abdelkarim proposed controlling of robots through bluetooth using Direct Drive and Map-based models. The present work envisages the use of Android Smartphone for the controlling of robot using Bluetooth Wireless Technology.

DESCRIPTION OF GESTURE CONTROLLED HOVER BOARD.

3.1 Block Diagram

As discussed in the introduction the block diagram of Gesture Control Hover board is illustrated in the fig 3.1. The overview of the block diagram is described below.

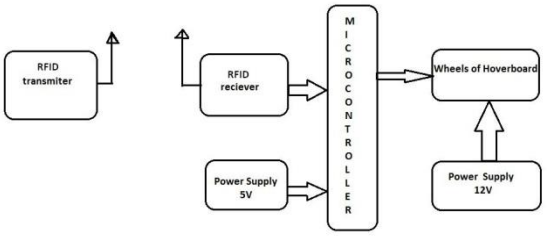

fig. 4. block diagram of gesture control hover board

3.2 RF Transmitter

Transmitter is an electronic device which converts measurements from a sensor into a signal, and sends it, via wires or wireless, to be received by control device located a distance away. The transmitter (TX) operates at a frequency of

433 MHz which receives serial data andtransmits it wirelessly through RF through its antenna as shown in Fig 3.2. This transmission occurs at the rate of 1Kbps - 10Kbps.

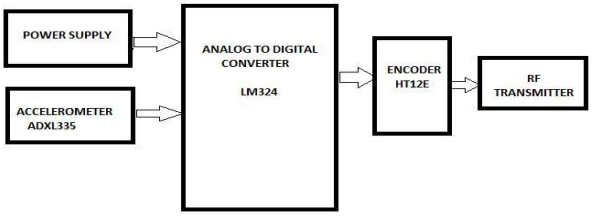

fig 5. block diagram of transmitter

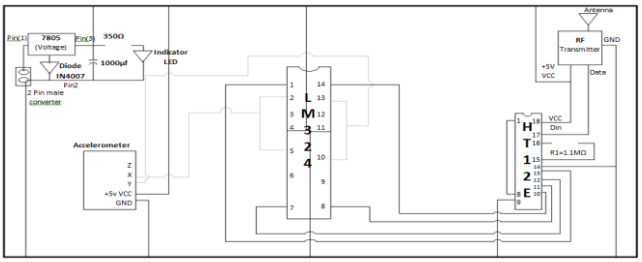

fig 6. transmitter circuit diagram

3.3 Description of block diagram

3.3.1 Power Supply

The input to the circuit is applied from the regulated power supply. The ac. input i.e., 230V from the mains supply is step down by the transformer to 12V and is fed to a rectifier. The output obtained from the rectifier is a pulsating dc voltage. So in order to get a pure dc voltage, the output voltage from the rectifier is fed to a filter to remove any ac components present even after rectification. Now, this voltage is given to a voltage regulator to obtain a pure constant dc voltage.

3.3.2 DC Motor

Digital systems and microcontroller pins lack sufficient current to drive the circuits like relays, buzzer circuits, motors etc. While these circuits require around 10milli amps to be operated, the microcontroller's pin can provide a maximum of 1-2milli amps current. For this reason, a driver such as a power transistor is placed in between the microcontroller and the motors.

3.3.3 Accelerometer

An accelerometer is an instrument for measuring acceleration, detecting and measuring vibrations, or for measuring acceleration due to gravity (inclination). Accelerometers can be used to measure vibration on vehicles, machines, buildings, process control systems and safety installations. They can also be used to measure seismic activity, inclination, machine vibration, dynamic distance and speed with or without the influence of gravity.

3.3.4 Analog to Digital Converter

LM324 is used for Analog to Digital Conversion as shown in Fig.3.2. It has four embedded op amps, which requires Vcc (5V) and ground only. Analog signal is fed to the parallel combinations of comparators, which produces an encoded signal corresponding to input analog signal. The encoded signal is then applied to Digital Code Converter (a combinational circuit), that will produce binary output. If the analog input exceeds the reference voltage to any comparator that comparator turns ON.

3.3.5 HT12E

Encoders are software programs that are used for compressing information. Often, the function of an encoder will also allow for the conversion of data from one format to another. The HT12E is a 4bit encoder which encodes the input data applied on it. It converts the parallel inputs into serial output. It encodes the 12 bit parallel data into serial for transmission through an RF transmitter. These 12 bits are divided into 8 address bits and 4 data bits. HT12E has a transmission enable pin which is active low. When a trigger signal is received on TE pin, the programmed addresses/data are transmitted together with the header bits via an RF or an infrared transmission medium.

3.4 RF Receiver

RF receivers are the easiest way possible to add wireless control. It receives the data which is transferred by the gesture device whose working is similar to the transmitter module. The data pin is connected to HT12D decoder. The description of the block diagram of transmitter is given below.

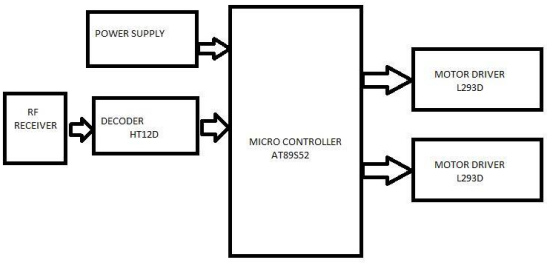

fig. 7. block diagram of receiver

3.4.1 HT12D

The HT12D converts the serial data into parallel data which is received by the RF receiver module as shown in Fig 3.3. The input data is decoded when no error or unmatched codes are found. A valid transmission is indicated by a high signal at Voltage Terminal pin.

3.4.2 L293D

The Actuators are those devices which gives the movement or to do a task like motors. In the real world there are various types of motors available which works on different voltages so we need motor driver for running them through the controller. To get interfaced between motor and microcontroller we use L293D motor driver as shown in Fig.3.3.

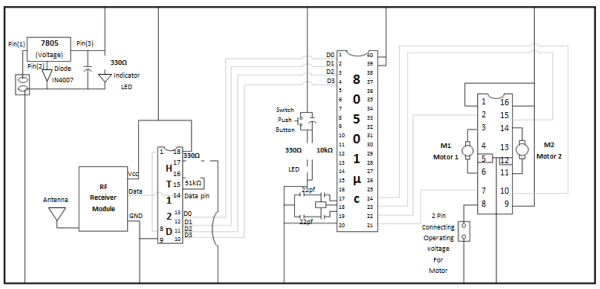

fig. 8. block diagram of receiver

3.5 Layout of RF transmitter and receiver section

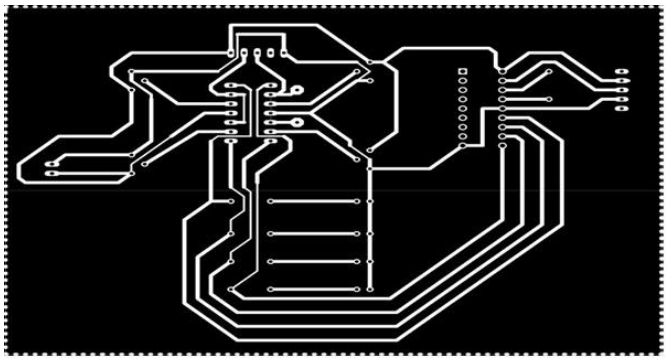

fig. 9. layout of rf transmitter

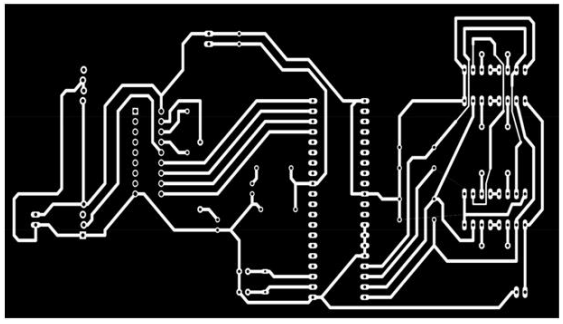

fig. 10. layout of rf receiver

HARDWARE IMPLRMENTATION.

4.1 Microcontroller

The microcontroller used in this project is AT89C51. Atmel Corporation introduced this 89C51 microcontroller. This microcontroller belongs to 8051 family. This microcontroller had 128 bytes of RAM, 4K bytes of on-chip ROM, two timers, one serial port and four ports (each 8-bits wide) all on a single chip. AT89C51 is Flash type 8051. The present project is implemented on Keil Uvision. In order to program the device, Preload tool has been used to burn the program onto the microcontroller. The features, pin description of the microcontroller and the software tools used are discussed in the following sections.

4.1.1 Description

The AT89C51 is a low-voltage, high-performance CMOS 8-bit microcomputer with 4K bytes of Flash programmable memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard MCS-51 instruction set. 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. In addition, the AT89S51 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.

4.1.2 Block Diagram

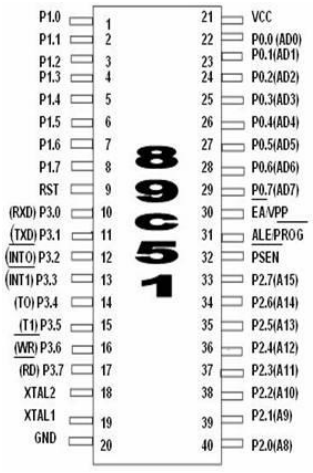

fig 11. .microcontroller block diagram

Pin Description

1) **Vcc** - Pin 40 provides supply voltage to the chip. The voltage source is +5V.
2) **GND**- Pin 20 is the ground.
3) **XTAL1 and XTAL2** - XTAL1 and XTAL2 are the input and output, respectively, of an inverting amplifier that can be configured for use as an on-chip oscillator, as shown in Figure 11. 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, as shown in the above Fig.6. There are no requirements on the duty cycle of the external clock signal, since the input to the internal clocking circuitry is through a divide-by-two flip-flop, but mini-mum and maximum voltage high and low time specifications must be observed.
4) **RESET**- Pin9 is the reset pin. It is an input and is active high. Upon applying a high pulse to this pin, the microcontroller will reset and terminate all the activities. This is often referred to as a power-on reset.
5) **EA (External access)**- Pin 31 is EA. It is an active low signal. It is an input pin and must be connected to either Vcc or GND but it cannot be left unconnected. The 8051 family members all come with on-chip ROM to store programs. In such cases, the EA pin is connected to Vcc. If the code is stored on an external ROM, the EA pin must be connected to GND to indicate that the code is stored externally.
6) **PSEN (Program store enable)**- This is an output pin.
7) **ALE (Address latch enable) -** This is an output pin and is active high.
8) **Ports 0, 1, 2 and 3-** The four ports P0, P1, P2 and P3 each use 8 pins, making them 8-bit ports. All the ports upon RESET are configured as input, since P0-P3 have value FFH on them.
    - **Port 0(P0):** Port 0 is also designated as AD0-AD7, allowing it to be used for both address and data. ALE indicates if P0 has address or data. When ALE=0, it provides data D0-D7, but when ALE=1, it has address A0-A7. Therefore, ALE is used for demultiplexing address and data with the help of an internal latch. When there is no external memory connection, the pins of P0 must be connected to a 10K-ohm pull-up resistor. This is due to the fact that P0 is an open drain. With external pull-up resistors connected to P0, it can be used as a simple I/O, just like P1 and P2. But the ports P1, P2 and P3 do not need any pull-up resistors since they already have pull-up resistors internally. Upon reset, ports P1, P2 and P3 are configured as input ports.
    - **Port 1 and Port 2:** With no external memory connection, both P1 and P2 are used as simple I/O. With external memory connections, port 2 must be used along with P0 to provide the 16-bit ad-dress for the external memory. Port 2 is designated as A8-A15 indicating its dual function. While P0 provides the lower 8 bits via A0-A7, it is the job of P2 to provide bits A8-A15 of the address.
    - **Port 3:** Port 3 occupies a total of 8 pins, pins 10 through 17. It can be used as input or output. P3 does not need any pull-up resistors, the same as port 1 and port 2. Port 3 has an additional function of providing some extremely important signals such as interrupts

4.2 IC L293D

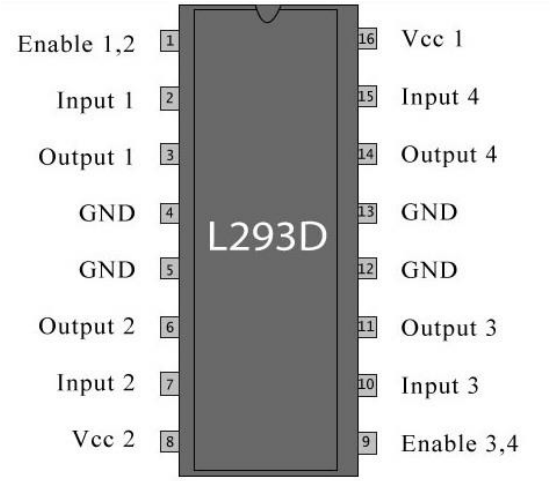

fig 4.1. icl293d

Function:

We used IC L293D for driving the motors according to the signal given by themicro-controller,so that the movement of the robot takes place. 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.

4.3 RF Wireless Communications

Radio frequency (**RF**) is a frequency or rate of oscillation within the range of about 3 Hz to 300 GHz. This range corresponds to frequency of alternating current electrical signals used to produce and detect radio waves. Since most of this range is beyond the vibration rate that most mechanical systems can respond to, RF usually refers to oscillations in electrical circuits or electromagnetic radiation.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.

4.3.1 Properties of RF

Electrical currents that oscillate at RF have special properties not shared by direct current signals. One such property is the ease with which it can ionize air to create a conductive path through air. This property is exploited by 'high frequency' units used in electric arc welding. Another special property is an electromagnetic force that drives the RF current to the surface of conductors, known as the skin effect. Another property is the ability to appear to flow through paths that contain insulating material, like the dielectric insulator of a capacitor. The degree of effect of these properties depends on the frequency of the signals.

4.3.2 Brief Description of RF

Radio frequency (abbreviated RF) is a term that refers to alternating current (AC) having characteristics such that, if the current is input to an antenna, an electromagnetic (EM) field is generated suitable for wireless broadcasting and/or communications. These frequencies cover a significant portion of the electromagnetic radiation spectrum, extending from nine kilohertz (9 kHz),the lowest allocated wireless communications frequency (it's within the range of human hearing), to thousands of gigahertz(GHz).When an RF current is supplied to an antenna, it gives rise to an electromagnetic field that propagates through space. This field is sometimes called an RF field; in less technical jargon it is a "radio wave." Any RF field has a wavelength that is inversely proportional to the frequency ***s*= 300/*f*.**

4.3.3 Advantages of RF

1. No line of sight is needed.
2. Not blocked by common materials: It can penetrate most solids and pass through walls.
3. Longer range.
4. It is not sensitive to the light.
5. It is not much sensitive to the environmental changes and weather condition.

REASEARCH AND METHODOLOGY.

5.1 Flowchart of the hoverboard

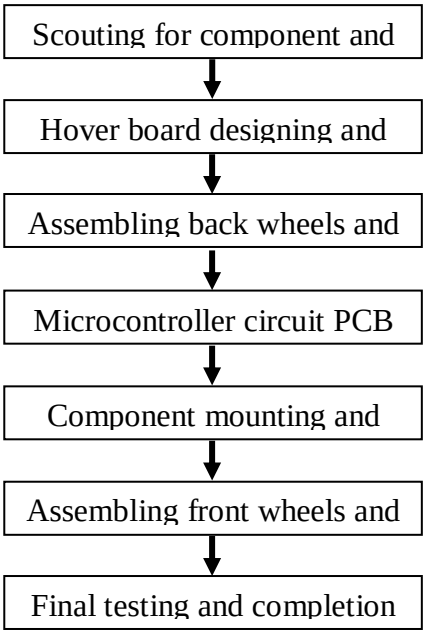

fig. 13 flowchart of the project

We scouted various components and selected RF module of 433 MHz. the cutting and shaping of the plywood with reference to blueprint was done in the workshop. Assembling of back wheels and motors is to be done. Microcontroller circuitry PCB designing is made on protues. Component mounting and testing, assembling of wheels and RFID module is to be done. Last stage is final testing.

5.2 Algorithm and flowchart of hoverboard.

5.2.1 Algorithm for Hoverboard

1. Step1: Initialization of port1 of microcontroller for gesture control.
2. Step2: Initialization of port 2 of microcontroller for movement of motors.
3. Step3: Set P2 of microcontrolleras 0xb0 for the right movement of motor.

4. Step4: Set P2of microcontrolleras 0xd0 for the left movement of motor.
5. Step 5: Set P2 of microcontrolleras 0xe0 for the forward movement of motor.
6. Step6: Set P2 of microcontroller as 0xf0 for the backward movement of motor

5.4.2 Flowchart for Hover board

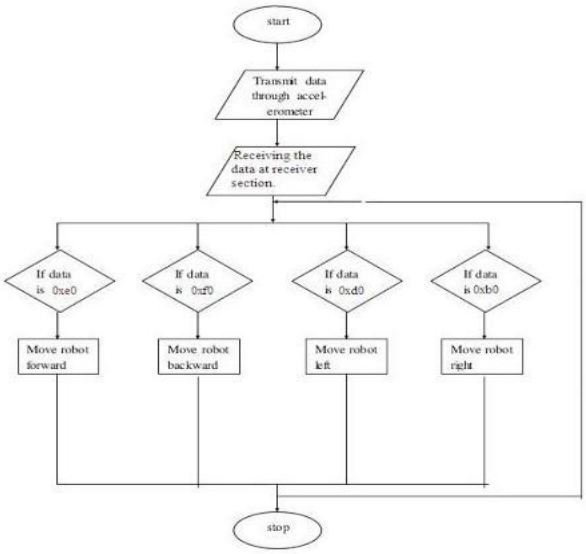

fig 14. flowchart

PCB FABRICATION AND SOLDERING.

6.1 Introduction

In this chapter illustration about making of PCB, designing layouts of PCB, rules of designing and brief description about PCB soldering is given.

6.2 PCB Fabrication

PCB Making

Printed circuit board (PCB) is a component made of one or more layers of insulating material with electrical conductors. The insulator is typically made on the base of fiber reinforced resins, ceramics, plastics or some other die-electric materials. During manufacturing the portions of conductors that are not needed are etched off, leaving printed circuit that connect electronic components. The width of the circuit conductors should be chosen based on maximum temperature rise at the rated current and acceptable impedance. There is another criterion that is often overlooked. The trace should not melt during short surge currents that can develop in the circuit. This requires sufficient cross-sectional area of copper as a function of amps and seconds.

The spacing between the PCB traces is determined by peak working voltage, the coating, location of the circuit and the product application. The minimum possible widths of traces and of the spacing between them are both limited by the manufacturing capabilities of your fabricator. In any case they should not be less than 2 mils.typical minimum values are 6/6 mils.

PCB Designing Rules

In the PCB designing of electronic circuit, it is important that one plan and has a checklist of the do's and don'ts before proceeding to do the printed circuit board layout. The understanding of the circuit is critical to design, for example one need to understand the maximum current and voltage that are carried by each conductor in order to determine the clearance between each conductor in order to determine the track width of the conductor and type of PCB that will be used. The voltage difference between each track will determine the clearance between each conductor. if the clearance is not enough, chances are that the electrical potential between each track will cause spark over and short circuit the PCB. This will cause functional failure to the product and the safety of the users that are using the product will be compromised. It is therefore critical for one to understand some of this basics requirement before one proceeds to design the PCB.

Conductor thickness and width

The PCB conductor thickness and width will determine the current carrying capacity of the track. The IPC standard for the conductor thickness and width of the common 1 square-feet PCB is as shown below. However it is always advisable to use a bigger value due to the tolerance and variation of PCB processes. If high current capacity is required, a 2 oz/square-feet or 3 of/square-feet type of PCB is preferred. Many electronics hobbyist prefer to solder a thick copper conductor on the PCB track to increase the current capacity of the track. While designing the PCB, we first placed the chips so that a minimum area was converted. This was done after preparing a rough out layer. The IC's, which had most number of connections between them, were side by side. There were 2 layers of track and the upper screen for components. In the 1st layer, horizontal tracks were used, as far as possible. This was done in order to give the PCB a neat look and avoid overlapping of tracks. The power supplies needed that is +12V,+9V and GND are taken from battery.

Making layout using Dip traces

Here is the procedure of design the layout using Dip trace:

Setting up initial settings: This step of PCB designing involves setting up snaps andvisible grid. At this stage the default track and pad size should be set.

Set the mechanical elements of the PCB design: It is necessary to import the details forthe printed circuit board outline into the PCB layout software programmed as soon as possible. It is also necessary to set up any reference marks and holes. These may be required for pick and place machines, or test fixtures during production process.

Putting all components on the board: At this stage of the PCB layout, the componentsneed to be placed onto the printed circuit board so that they are available to be moved and set in place later.

Creating functional building blocks: At this stage of the PCB layout, the componentsshould be moved into their functional blocks so that associated components are close to each other and the circuit can be routed easily later.

Identifying and routing layout critical tracks: Any tracks that are layout criticalshould be identified and then routed as they are required. By routing these tracks at this stage, then they remained of the design can be implemented around this tracks rather than trying to resolve problems in PCB layout.

Routing power and earth rails: Often the earth and power rails may be included asplanes, occupying a complete layer of the printed circuit board. This has significant advantage of not only in terms of enabling the higher levels of current to be routed easily, but it also significantly reduces any problem with interference on the printed circuit board.

Routing the remaining lines: Usually it is necessary to use the auto- route function onthe PCB layout software. Although there are manual routing options on PCB layout software; it is normal to use the auto route function as this may save many days about the PCB layout manually.

Manually routing any PCB lines on the PCB layout: After the PCB layout softwarehas complemented the auto-routing there may be routed manually. Alternatively if the design has become too complicated for the space and available number of layers, it may be necessary to make some fundamental changes to the board.

Undertaking final tidy up: Once all the lines have been routed, it is complete any smallitems that may need complete at this stage.

Completing a design rule check: While all the design rule should have been followduring the design, it is necessary to do a final check. It is better to catch any problems this stage rather than once a prototype PCB has been made. Thus we completed the PCB layout designing process.

6.3 PCB Soldering

Soldering Techniques

To achieve a solder joint, the solder and the base metal must be heated above the melting point of the solid used. The method, by which the necessary heat is applied, depends among other things on: 1. Nature and type of the joint. 2. Melting temperature of the solder. 3. Flux. Generally applied soldering methods are iron soldering, torch soldering, mass soldering, electrical soldering, (high frequency soldering, resistance soldering), furnace soldering and other methods.

Iron Soldering

The most commonplace method for general soldering is the use of the soldering iron. This technique has reached a reasonably high state of perfection as far as the design of the iron is concerned. Basically, a soldering iron consists of an insulated handle, connected via a metal shank to the bit. The face of the bit actually makes contact with components parts of the joint and the solder, and heats them up. The electrical heating element is usually located in the hollow shank or in the handle and is thermostatically controlled to give a pre-set temperature in the bit. Wetted by solder, a continuous film of liquid metal bridges the gap between the soldering iron bit and the work which provides a path of high thermal conductivity along which the heat can flow into the workplace. Soldering bits are usually made of copper; since this metal combines good wetting properties with the optimum heat capacity and thermal conductivity. However, there are erosion problems in long-term usage. Tin-lead solders will attack the copper and dissolve it during the soldering operation. Thus time is to be spent on re-sharpening the bit. Various approaches have been tried to overcome the erosion problems. The most successful solution is to protect the copper bit with a thick iron casting followed by nickel/tin plating. The life of the bits can this way be increased by a factor 10 to 15.

Soldering iron design

The size and to a certain extent also the shape of the bit are largely determined by the amount of heat that has to be supplied during each joining operation. The bit must be sufficiently large to enable soldering of the required number of joints, before the heat is drained away thereby reducing its temperature below that necessary for a sound joint.

The heat input of an electric soldering iron (wastage) is thus mostly related to the intend rate of working. The proper choice of soldering iron therefore depends on whether occasionally a small number of individual joints have to be

made or whether continuous production line soldering of many joints has to be undertaken.

Soldering fluxes

During the soldering operation, an auxiliary medium is mostly used to increase the flow properties of molten solder or to improve the degree of wetting. Such a medium is called flux. Following characteristics are required in a flux –

1. It should provide a liquid cover over the materials and exclude air up to the soldering temperature.
2. It should dissolve any oxide on the metal surface or on the solder and carry such unwanted elements away.
3. It should be readily displaced from the metal by the molten soldering operation.
4. Residues should be removable after completion of the solder.

Fluxes are usually divided into 3 groups according to the nature of their residues. Corrosive, intermediate and non-corrosive fluxes. The soldering iron at soldering temperature is held on the workplaces to heat them. The solder, usually in the form of wire or stick is applied to the work close to the bit where it should melt immediately and become bright and fluid. If enough solder has been applied, it should completely penetrate and fill the gap of the joint. Surface to be joined should, after cleaning, be first treated with liquid flux unless flux-cored solder wire is used. When the joint appears to be sufficiently filled, the soldering iron is removed and the joint is allowed to cool down undisturbed. The time required to keep the soldering iron on the work is entirely dependent on the nature of joint and that gentle movements of the bit during soldering can assist is rapid penetration of the solder into the joint spaces, especially if seams of some length have to be soldered. Where assembly methods require the use of manual iron soldering, it is sometimes decided to conduct soldering test with an iron of specified wattage, bit size and bit temperature. This can give a useful guideline to the likely performance on the production line. The temperature employed in soldering techniques is high enough to cause significant burning of human skin. Accidental contact with hot solder wire, molten solder or soldered assemblies will immediately require medical attention. In mass soldering splashing of hot solder due to accidental dropping of Ingots or careless handing gets frequently reported.

In order to protect the eyes from such damages, it is compulsory to wear suitable protective eye glasses or face shields. Traces of moistures may also produce an instant stream formation-causing severe splashing of solder. The contact of water in any form, with liquid solder must therefore be strictly avoided. The use of heat resistant gloves and armlets is very much advisable. To avoid accidents signboards with the letter DANGER HOT must be installed at suitable places. In soft soldering, the base metal solder and flux are heated to 200 - , some of the constituents are vaporized or dissociated; the rising warm air becomes impure as a vapor or more especially as an aerosol, consisting of particles of 0.01-1 micro m in size. Whether health is affected by inhalation of these particles depends completely on the nature and concentration of the matter. As a standard for such effects the experts resort to the M A C value (Maximum Admissible Concentration). This is by definition the concentration, which a healthy person can inhale for 8 hours a day without incurring permanent adverse effects.

TROUBLESHOOTING AND TESTING OF HOVERBOARD.

7.1 Introduction

Troubleshooting is a form of problem solving, often applied to repair failed circuits. It is logical, systematic search for the source of a problem so that it can be solved, and circuit be made operational again. Troubleshooting is needed to develop and maintain complex systems where the symptoms of a problem can have many possible causes. Troubleshooting requires identification of the malfunctions or symptoms within a system and confirms the solution so that can work again.

7.2 Need of Troubleshooting

Every product, circuit and instruments are designed to give desired output, but there are many problems associated with the design which tend to produce unexpected output. Therefore, for satisfactory performance it needs to be troubleshooted so that the circuit can be made operational again. Troubleshooting is needed to develop and maintain complex systems where the symptoms of the problem can have many possible causes. It is needed for identifying the symptoms and rectifying the problem so that it gives the desired output. Troubleshooting is used in many fields such as engineering, system administration, electronics, automotive repair and diagnostic medicine.

Steps Prior To Troubleshooting

Before applying power, read the instruction carefully to check we haven't missed anything and whether there is any specific instruction for switching on and testing. Check again that we have all polarity sensitive components the right way around, and that all the components are in

the correct places. Then check whether the off-board components are connected correctly. Check the underside of the board carefully for short circuit between the tracks which is common reason for circuits failing to work. When we are sure that everything is correct, apply power and see if the circuit behaves as expected, again following the kit manufacturer's instructions.

Troubleshooting steps:

1. Identify The Symptom: Determine what the voltage levels in the circuit should be so that you know what to look for.
2. Power check: The first thing to do while checking a defective circuit is to make sure the power cord is plugged in and the fuse is not burnt. In case of battery powered system, make sure the battery is good.
3. Perform sensory check After power check, observe for the obvious defect. Example burnt resistor is often visible as are broken wires; poor solder connection and burnt out fuses. Also when certain types of component fail, may be able to detect a smell of smoke if you happen to be there. Since some failures are temperature dependent, you can sometimes unplug the circuit and immediately use your sense of touch to detect an overheated component. Always perform sensory check before proceeding with more sophisticated troubleshooting methods. Never touch operating circuit because there may be a risk of burn or electrical shock.
4. Signal Tracing: In this you look for appoint in a circuit or system where you first lose signal or any incorrect signal first occurs. There are three ways of signal tracing as given below:

Method 1:

It starts at the input of a circuit where there is known input signal and works towards the output. Check the signal at successive test points until you get incorrect measurement, when it found, the problem is isolated from the last test points to the present test points.

Method 2:

It starts at the output of a circuit and works towards the input. Check for voltage at each test point until you get a correct measurement. At this point you have isolated the problem between the last point and the current test point.

Method 3:

This method is called as half splitting. It starts in the middle of the test circuit. If a beginning test points has a correct signal, you know that the circuit is working properly from input to that of the test points. This means the fault is somewhere between the test points and output. Therefore begin signal tracing from test points towards output and get the point at fault.

Fault Analysis

It consists of Voltage analysis, Resistance analysis and Signal analysis methods.

1) Voltage analysis:

After performing the visible testing, if the problem still persists, then go for voltage analysis. In this method the voltage at different test points is checked.

2) Resistance analysis:

In this analysis power supply connected to the circuit must be switched off when resistance is measured. Resistor analysis is generally used for continuity testing. For example, check the continuity of pcb track from one test point to other or in case of double sided pcb it helps for checking the connectivity between the holes from the sides. Similarly this can be used for testing the components such as diode, capacitor and transistors (e.g. open or short circuit). This method requires the instrument such as ohmmeter.

3) Signal Analysis:

Sometimes it is important to observe the nature of signal at test point(e.g. in case of rectifier). Whereas it is not possible in voltage analysis. By observing the waveform at test point we can estimate the waveform distortion. For testing the circuit such as rectifier, multivibrator, amplifier it is important to know the nature. Therefore signal analysis is done. For carrying signal analysis, we require a CRO.

Replace or Repair

With the power turned off, replace the defective component or repair defective connection. Turn on the power, and check the proper operation of the circuit.

ADVANTAGES, FUTURE SCOPE AND APPLICATIONS.

8.1 Introduction

Every prototype designed has its own advantages, applications and future scope. In this chapter we have discussed about the advantages, applications and future scope of Gesture Control Hoverboard.

8.2 Advantages

1. Easy to control.
2. Open Source system.
3. Portable.
4. User Friendly.
5. Useful system for the disables.

8.3 Future Scope

It can be used in military applications as a robotic vehicle which can be handled by a soldier to avoid casualties. Our system has shown the possibility that interaction with machines through gestures is a feasible task and the set of detected gestures could be enhanced to more commands by implementing a more complex model of a advanced vehicle for not only in limited space while also in broader area as in the roads too. In the future, service robot executing many different tasks from private movement to a full-fledged advanced automotive that can make disabled to able in all sense. We can add explosive material Detector to track the path of Army. We can drive our Hover board in Heavy traffic from anywhere using our Remote. We can add webcam to see the traffic in our laptop.

8.4 Applications

1. The robotic hoverboards are used in military applications to operate robots.
2. The hoverboard can be used in medical applications for the purpose of surgery.
3. The robotic hoverboar are used in the construction field.

REFERENCES.

1] ,Monika Jain ,Aditi Ashwani Lohiya, Mohammad Fahad Khan ,Abhishek Maurya "WirelessGesture Control Robot" ISSN:2319-5940, Vol.1,Issue 10,December 2012.

[2] Waldherr, S., Thrun, S., and Romero, R., "A Gesture based interface for Human-Robot Interaction", Kluwer Academic Publishers, Netherland, 2000.

[3] Liu, T., Guo, H., and Wang, Y., "A new approach for color-based object recognition with fusion of color models", Congress on Image and Signal Processing Conference, Sanya-China, vol. 3, pp. 456-460, May 2008.

[4] Wang, B., and Yuan, T., "Traffic Police Gesture Recognition using Accelerometer", IEEE SENSORS Conference, Lecce-Italy,pp. 1080-1083, Oct. 2008.

[5] Lalanne, T., and Lempereur, C., "Color recognition with a camera: a supervised algorithm for classification", IEEE Southwest Symposium on Image Analysis and Interpretation, Tucson-Arizona, pp. 198- 204, April 1998.

[6] Available online: http://en.wikipedia.org/wiki/Gesture_recognition.

[7] Cannan, J. and Hu, H., "Human-Machine Interaction (HMI): A Survey".[Online]. Available online: http://www.dces.essex.ac.uk/staff/hhu/Papers/CES-508%20HMI-Survey.pdf

[8] Das, S., Toya, L., Green, Perez, B., and Murphy, M. M., "Detecting User Activities using the Accelerometer on the Smartphone", Team for Research in Ubiquitous Secure Technology REU Research Program, July 2010.

[9] Aroca, R. V., AntônioPéricles B. S. de Oliveira, and Gonçalves, L. M. G., "Towards Smarter Robots With Smartphone", 5th workshop in Applied Robotics and Automation, Bauru-Brazil, June 2012.

[10] Song, M., Kim, B., Ryu, Y., Kim, Y., and Kim, S., "A design of real time control robot system using android Smartphone" The 7th International Conference on Ubiquitous Robots and Ambient Intelligence (URAI), BusanKorea, Nov. 2010.

[11] Shilpa, V., Pradeep, H. S., and Kurian, M. Z., "The Symbian Robot," International Journal of Computer Science and Informatics (IJCSI), Vol-1, Issue-3.

[12] M. Klingmann, "Accelerometer-Based Gesture Recognition with the iPhone",Goldsmiths University, MSc in Cognitive Computing, London, September 2009.

[13] G¨obel, S., Jubeh, R., Raesch, S. L., and Z¨undorf A., "Using the Android Platform to control Robots", Kassel University Germany.[Online]. Available: Available onlinewww.innoc.at/fileadmin/user_upload/_temp_/RiE/.../65.pdf

[14] Available online: http://en.wikipedia.org/wiki/Android_(operating_system).

[15] Do, H.M., Mouser, C. J., and Sheng, W., "Building a Telepresence Robot Based on an open source", ASCC Lab, Oklahoma State University USA, Dec. 2011.

[16] Nasereddin, H. H. O., and Abdel Karim, A. A., "Smartphone Control Robots Through Bluetooth", International Journal of Research and Reviews in Applied Sciences(IJRRAS), Vol-4, Issue-4, Sept, 2010.

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