

DESIGN AND ANALYSIS OF SMART SKATE BOARD

¹Somla, ²Sohail Patel, ³Mohammed Anas, ⁴Somashekar B. ⁵Guide: Kumaraswamy.K.L

School of Mechanical Engineering

REVA UNIVERSITY, BENGALURU, INDIA

Abstract : An electric skateboard is a personal transporter based on a skateboard. The speed is controlled by a hand-held throttle or weight-shifting and the direction of travel is adjusted by tilting the board to one side or the other. A skate board is a type of sports equipment used primarily for the activity of skateboarding. Skateboarding is an action sport which involves riding and performing tricks using a skateboard. Skateboarding can also be considered are creational activity, an art form, a job, or a method of transportation. It usually consists of a specially designed Maple wood board combined with a plywood than eco acting used for making smoother slides and stronger durability.This is a novel idea to introduce remote controlled electronic skateboards using smartphones into the society. This skateboard is the dawn of the new era of commuting over short distances using electronic powered vehicles or devices.

1. INTRODUCTION

A skateboard is a type of sports equipment used primarily for the activity of skateboarding. Skateboarding is an action sport which involves riding and performing tricks using a skateboard. Skateboarding can also be considered a recreational activity, an art form, a job, or a method of transportation. It usually consists of a specially designed Maplewood board combined with a polyurethane coating used for making smoother slides and stronger durability.

Recently, electric skateboards have also appeared. These no longer require the propelling of the skateboard by means of the feet; rather an electric motor propels the board, fed by an electric battery. An electric skateboard is typically a modified skateboard propelled by an electric engine like DC Motors, the thrust of which is usually controlled with an RF remote. As with a regular skateboard, it is steered by the rider shifting his or her weight. It was originally designed for local transport, but with the advent of more serious "Off Road" models is emerging as a new thrill sport. The Off Road style boards are able to traverse grass, gravel, dirt and hard sand and are often seen at low tide on the beach. Skateboards have three axes.

2.EXPERIMENTAL DETAILS

2.1 Block Diagram of Transmitter and Receiver Section :-

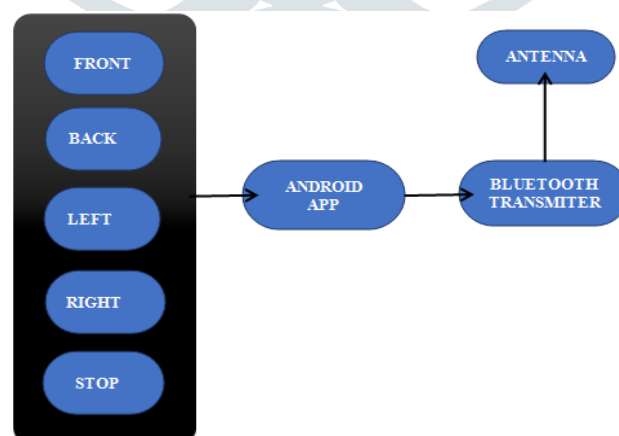


Figure 2.1.1 : Transmitter section of Smart Skateboard

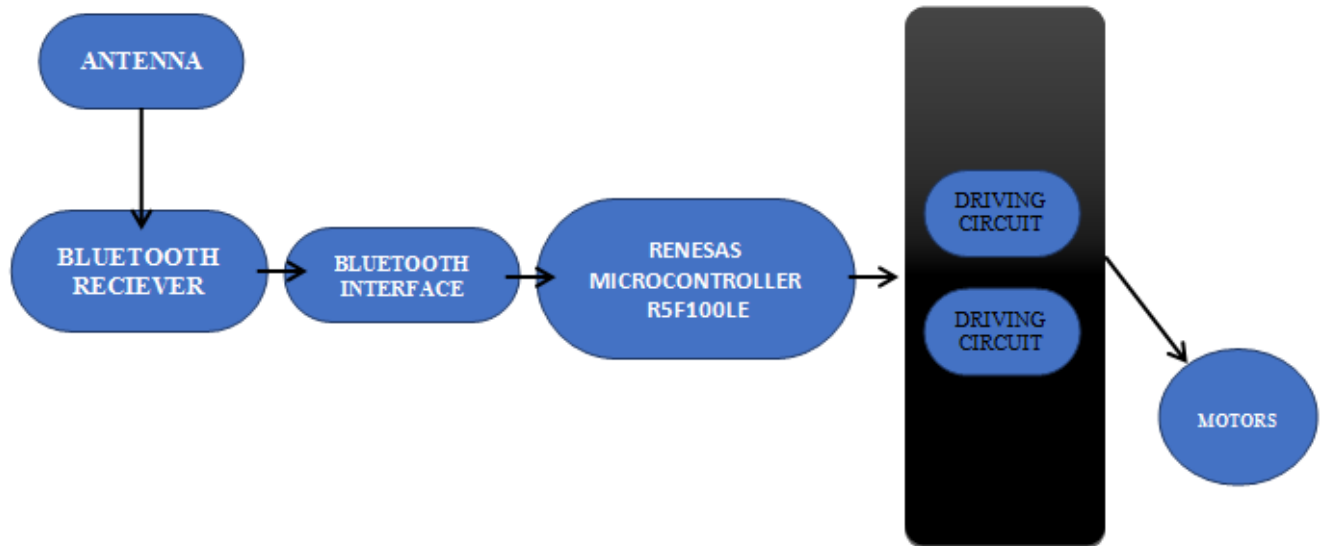


Figure 2.1.2 : Receiver section of Smart Skateboard

3. DESCRIPTION OF THE BLOCK DIAGRAM OF TRANSMITTER SECTION SIDE

3.1 Smart Phone :-

A smart phone is a computerized communications device small enough to be held in the palm of the hand and which provides a wide variety of features to the user. The smart phone enables to take control over the skate board via bluetooth connection using a Bluetooth module.

3.2 Andriod and Andriod App :-

Android is an Linux-based operating system and designed primarily for touch screen mobile devices such as smart phones and tablet computers. The user interface of Android is based on direct manipulation, using touch inputs that loosely correspond to real-world actions, like swiping, tapping, pinching and reverse pinching to manipulate on-screen objects. Android allows users to customize their home screens with shortcuts to applications and widgets, which allow users to display live content, such as emails and weather information, directly on the home screen. Applications can further send notifications to the user to inform them of relevant information, such as new emails and text messages.

An Android app is nothing but an application (that is a code written) to perform a specific task or job.

3.3 Bluetooth :-

It is a wireless technology standard for exchanging data over short distances using short-wavelength radio waves in the ISM band from 2.4 to 2.485 GHz from fixed and mobile devices, building personal area networks (PANs). The Bluetooth enables connection between the skateboard and the controlling device i.e. smart phone.

4. DESCRIPTION OF THE BLOCK DIAGRAM OF RECEIVER SECTION SIDE

4.1 Renesas Microcontroller :-

It is a small computer on a single integrated circuit containing a processor core, memory, and programmable input peripherals. Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools and other embedded systems. By reducing the size and cost compared to a design that uses a separate microprocessor, memory, and input/output devices, microcontrollers make it economical to digitally control even more devices and processes.

4.2 Driving Motor Circuit :-

The Driving Motor circuit is basically a circuit which is controllers the motion of all the DC motors. The connection wires that connects motor is connects to the motor section on the driving circuit. The driving motor circuit basically consists of integrated circuits which is responsible for the control to take place.

4.3 DC Motor :-

A DC Motor is a mechanically commutated electric motor powered from direct current (DC) electricity. The stator is stationary in space by definition and therefore the current in the rotor is switched by the commutator to also be stationary in space. This is how the relative angle between the stator and rotor magnetic flux is maintained near 90 degrees, which generates the maximum torque. The speed of the DC motor can be controlled by the programming part.

5. PRINCIPLE OF OPERATION

5.1 Smart Phone :-

A smart phone is the logical evolution of the PCS or personal communications system. A smart phone is a telling indications the vice which allows the user to not only make and receive phone calls, text messages, and voice messages, but also a wide variety of other communications forms as well as the ability to run productivity and convenience applications and enjoy multimedia. A smart phone is able to do a wide variety of functions since it is at its core a simplified handheld computer device.



Figure 5.1 : Simple picture of smart phone

The smart phone sends the commands to the skate board via Bluetooth connection. This helps in maneuvering the skate board left, right, forward and backward.

5.2 Speech Recognition :-

In computer science and electrical engineering, speech recognition (SR) is the translation of spoken words into text. It is also known as "automatic speech recognition" (ASR), "computer speech recognition", or just "speech to text" (STT). Some SR systems use "speaker-independent speech recognition" while others use "training" where an individual speaker reads sections of text into the SR system. These systems analyze the person's specific voice and use it to fine-tune the recognition of that person's speech, resulting in more accurate transcription.



Figure 5.2 : Simple Picture Of Speech Recognition

5.3 Bluetooth :-

The Android platform includes support for the Bluetooth network stack, which allows a device to wirelessly exchange data with other Bluetooth devices. The application framework provides access to the Bluetooth functionality through the Android Bluetooth APIs. These APIs let applications wirelessly connect to other Bluetooth devices, enabling point-to-point and multipoint wireless features. In this project we will be using Bluetooth to create a communication interface between our smartphone and the skateboard.

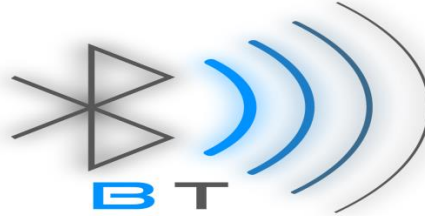


Figure 5.3 : Bluetooth Symbol

Using the Bluetooth APIs, an Android application can perform the following:

- Scan for other Bluetooth devices
- Query the local Bluetooth adapter for paired Bluetooth devices
- Establish RFCOMM channels
- Connect to other devices through service discovery
- Transfer data to and from other devices
- Manage multiple connections

5.4 Renesas Microcontroller :-

A **microcontroller** is a small computer on a single integrated circuit. In modern terminology, it is similar to, but less sophisticated than, a system on a chip (SoC); an SoC may include a microcontroller as one of its components. A microcontroller contains one or more CPUs (processor cores) along with memory and programmable input/output peripherals. Program memory in the form of ferroelectric RAM, NOR flash or OTP ROM is also often included on chip, as well as a small amount of RAM.

Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications consisting of various discrete chips. It enables customers to build compact and energy-efficient systems at lower cost. The Renesas RL78 is a new generation of power-efficient microcontrollers that combine the excellent CPU performance of the 78K0R with the superior on-chip functions of the R8C and 78K.

The microcontroller acts as the motherboard for all the components which are connected to the skateboard i.e Bluetooth, battery ect.

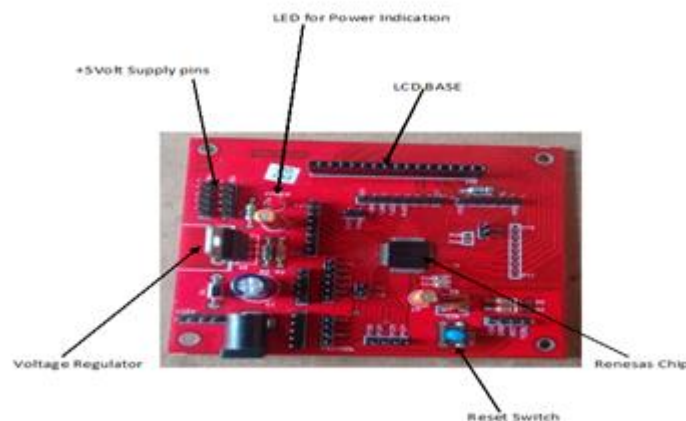


Figure 5.4 : Simple picture of a Renesas Microcontroller

5.5 NAND Flash Memory :-

NAND flash memory is a type of nonvolatile storage technology that does not require power to retain data. This is basically used to dump the program in the processor.. It is done by connecting the nand flash memory to the laptop/pc via usb port and then the nand flash is connected to the processor.

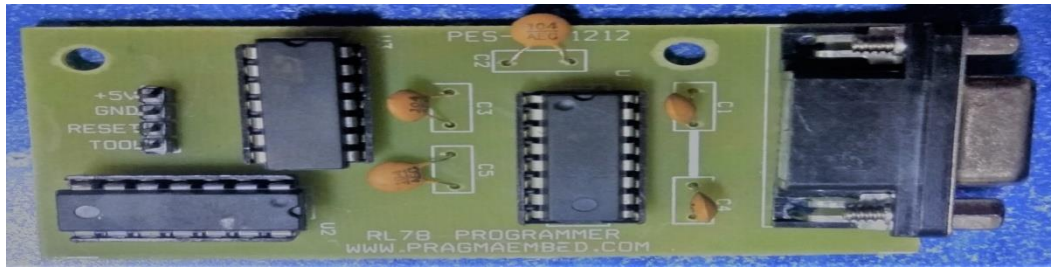


Figure 5.5 : A picture of a NAND Flash memory

5.6 Driving Motor Circuit :-

Normal DC gear-head motors requires current greater than 250mA. ICs like 555 timer, ATmega16 Microcontroller, 74 series ICs cannot supply this amount of current. If we directly connect motors to the output of any of the above IC's, they might get damaged. Hence the DC motors are short together and are connected to these circuits which helps in controlling the motions of the DC motor.



Figure 5.6 : A simple picture of driving motor circuit

5.7 DC motor :-

A **DC motor** is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor.

The motor rotation is controlled by the program to attain basic motions. Hence the speed of the motor can be controlled by the android app using a smart phone



Figure 5.7 : A simple picture of DC motor

Table 5.7.1 : Showing the specifications of a DC motor

SL.NO	PARTICULARS	SPECIFICATIONS
1.	Weight	100grms (approx)
2.	RPM	60
3.	Operating Voltage	12VDC
4.	Shaft Diameter	6mm
5.	Shaft Length	21mm
6.	Torque	1.2 Kg-cm
7.	Body Dimensions	Diameter-38mm, motor length with shaft-77mm

5.8 Pick and Place Mechanism :-

The pick and place mechanism attached on the smarts skateboard helps in shipment of work job from one place to another by the help of neck and a jaw. The drivers used to enhance the pick and place mechanism is again the DC motor. With the help of worm gear and spur gears the two degree motion can be attained. The neck of the pick and place mechanism helps in reach and rack towards the job where as the jaw help in holding the job.

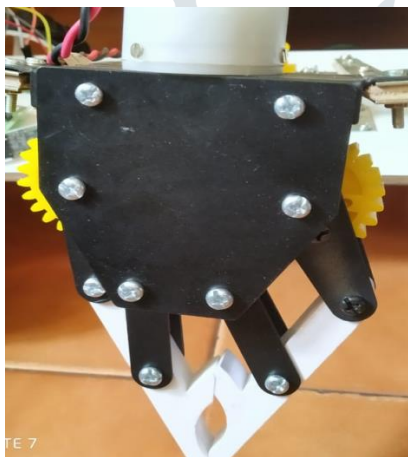


Figure 5.8.1: Jaw mechanism

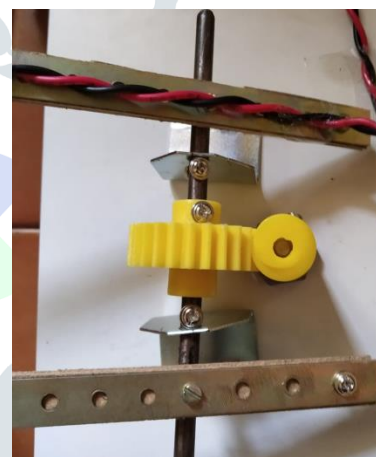


Figure 5.8.2 : Mechanism for neck movement

6.RESULTS AND DISCUSSIONS

Microcontroller executes the main program and generates controlling signals. The control program is written. After programming the microcontroller fetches program code one by one and executes it and generate signals according to the code. When a command is given, the mobile transmits the signals to the receiver in the board and starts the board. By using this small distances can be covered in a short duration.

7.REFERENCES

- THE 8051 MICROCONTROLLER AND EMBEDDED SYSTEMS PAPERBACK – 1 NOV 2012 BY MUHAMMAD ALI MAZIDI JANICE GILLISPIE MAZIDI
- ROBOTICS: FUNDAMENTAL CONCEPTS AND ANALYSIS PAPERBACK – 17 FEB 2006 BY ASHITAVA GHOSAL
- DESIGN OF MACHINE ELEMENTS PAPERBACK – 1 JUL 2017 BY BHANDARI
- ANSYS WORKBENCH 14.0 FOR ENGINEERS AND DESIGNERS (MISL-DT) PAPERBACK – 2013 BY SHAM TICKOO
- THEORY OF MACHINES PAPERBACK – 2012 BY B.S. UBHI
- JAVA - THE COMPLETE REFERENCE PAPERBACK – 1 NOV 2017 BY HERBERT SCHILDT