Braille Label Printer using Solenoid Actuator for Embossing

Shreyash Vijay Ankam
Student, Department of Electronics and Telecommunication
Pune Vidyarthi Grih College of Engineering
Pune, India

Shivani Vishal Patil
Student, Department of Computer Engineering
MKSSS's Cummins College of Engineering
Pune, India

Shantanu Ganesh Susar
Student, Department of Electronics and Telecommunication
Pune Vidyarthi Grih College of Engineering
Pune, India

Abstract:- In rapid growing technology world electronics has taken over a leap in every domain. The technology helps the disabled people to win over their flaws, allowing them to interact with the neighboring. Braille label printer is a stepping stone device allowing the blind people to interconnect in the form of labels. The 5×8 matrix keypad accept alphanumeric language which then convert input into braille language using linear actuator, an embossing method. The output braille fonts are printed on the Casio label sticker. This sticker allows the blind people to sense dot by touch in enhanced way by using labels placed on particular object.

Keywords:- Solenoid Actuator, Stepper Motor, DC Motor, 5×8 Matrix Keypad, A4988 Stepper Motor Driver, L239D Motor Drive, LCD.

I. INTRODUCTION

This project primarily involves easily place able labels printed in the "braille script".

Braille is a tactual writing method used by persons possessing a visually impairment. It is traditionally inscribed with an embossing on paper. It comprises of 6 dots in a pattern of 3×2 matrix format. It comprises of all the alphabet and numerical series.

We can optimize this language so that the visually impaired can use this system as a convenient medium of communication. As Not every person can understand and comprehend Braille scripted language. So a solution to this problem is to convert the alphabetical language recognition system into braille script. With these labels, blind can interact with the surroundings by touching and sensing the labels. Braille printer are only used for printing books, label and sticker in the form of Braille language.

The basic objective of this project is to print labels in form of Braille language. These labels can paste on day-to-day equipment's like medicine boxes, food items and many more akin things. This would help the blind to get the access to their surrounding objects without any support.

The problems faced mainly on the dots, which need to be very precise and the distance between dot is minute. The dots pattern should only cover the distal phalanges of the index finger.

Thus by this technology blind people can easily interact with the environment. It will be convenient person to print tags without having the command on the Braille language. This low-cost effective project aids the visually impaired people to communicate with the surrounding objects.

II. PURPOSE

- The main aim of this project is to benefits visually impaired people to intermingle with surroundings.
- The second intention of this project is to let the visually impaired people acquire day-to-day words.
- This labels, tag and hints allow the visually disabled people to be part of normal life.
- This braille label printer is one step towards future. where every disabled person adapts a spec alike a normal person with means of braille label printer.

Common control architecture: the succeeding list displays characteristic system control architecture.

A. Atmega 32A
Atmega 32A is a solution to lower-performance controller. It is 8-bit AVR RISC-Based microcontroller that unites an 8-channel 10 bit A/D converter, SRAM of size 2KB, 32KB of programmable flash memory, EEPROM of size 1KB and for on-chip debugging a JTAG interface is being used.

It has ability to detect brown-out, setting power on/off and reset. And holds features such as internal calibrated RC oscillator, external and internal interrupt sources.

Atmega 32A has special 6 sleep modes along this lines are: power-save, power-down, standby, extended standby, idle, ADC noise reduction, it provides peripheral features to help the programming of Atmega smoothly which mainly comprise of four PWM channels, Real time

counter with separate on–chip oscillator and analog comparator, Programmable serial UART.

It offers Master/slave SPI serial interface, Byte oriented two-serial interface and Programmable watchdog timer with separate on chip oscillator.

B. L293D

L293D is a driver IC, which acts as bridge between motors and ICs. It is essential for designing H-bridge motor control circuit. To drive motor, L293D provides bi-directional drive current of up to 600-MA. Resultant motor drives in bi-directional. By using single L293D we can handle two DC motors simultaneously as it is comprising of two H-bridge circuits inside. The L293D is compact in size.
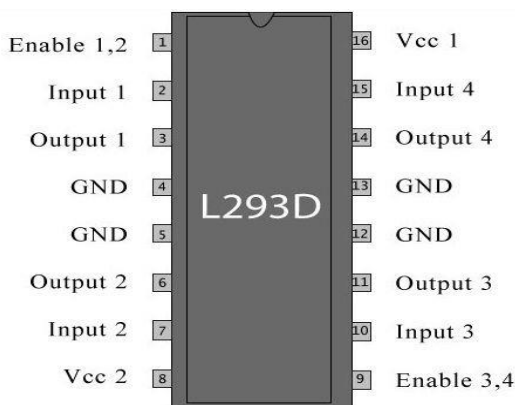

Fig 1: - L293D

To set up motors which requires voltage between 5V to 36V and 600mA of current it is used. The frequency of IC is 5 kHz. The L293D is an upgraded version of L293 where we needed to use external component for application.

C. Stepper Motor

Division of full rotations into number of steps is being done by stepper motor. It follows principle of electromagnetism. Motor works efficiently on 12V input voltage. It is a hybrid bipolar stepper motor adept of holding torque at 0.6A per winding at 3.75 degree stepping angle.
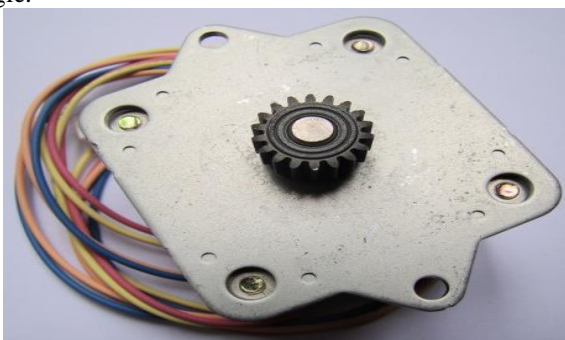

Fig 2: - Stepper Motor

It is a Bipolar winding type Motor. Weighing 180gms. This motor is used for the minute spacing between dots of braille language. And has a great role for the precise positioning and allowing the paper to move in X-direction. A4988 is a Companionable stepper motor driver IC.

D. A4988

The A4988 driver IC is replacement for the A4983 carrier, a breakout board which is easy-to-use bipolar stepper motor driver and stepper motor driver carrier. The driver comprises overcurrent protection, safe guarding the driver from getting damaged and 5 different step size resolutions. Its operation range varies from 8V - 35 V.
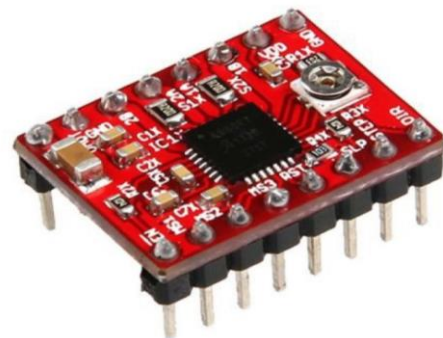

Fig 3: - A4988

It poses 5 different step resolutions are as following: full-step, half-step, quarter-step, eighth-step, and sixteenth-step along with over-temperature thermal shutdown. Adjustable current control with the help of potentiometer by providing maximum output current.

It comprises 3 step size selector inputs (MS1, MS2, MS3) which permit selection of diverse angle steps from the 5 step resolutions. MS2 has an internal 50kΩ pull-down resistor. While MS1 and MS3 comprises internal 100kΩ pull-down resistors. For micro step modes, the current limit is set low for current limiting to get engaged. Else midway current level will not be correctly maintained and the motor will skip micro steps.

MS1	MS2	MS3	Microstep Resolution
Low	Low	Low	Full step
High	Low	Low	Half step
Low	High	Low	Quarter step
High	High	Low	Eighth step
High	High	High	Sixteenth step

Table 1: - Selection of step size resolution

E. Solenoid actuator

Linear actuator is an electromagnetic device which converts electrical energy into magnetic field producing a linear motion (straight line) for positioning applications. Pulling force or pushing motion are the undeviating actions perform by solenoid.
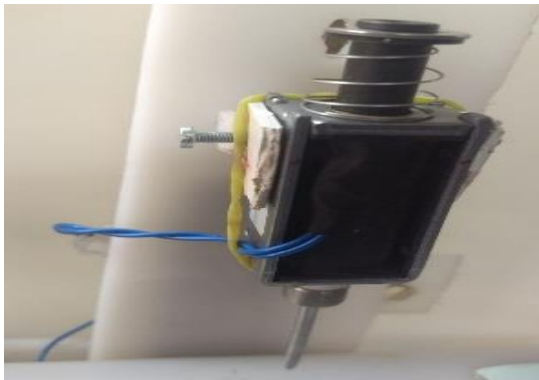
Fig 4: - Solenoid Actuator

Actuator fundamentally consist of an electrical coil wound around a cylindrical tube alongside Ferro-magnetic actuator which delivers sliding "IN" and "OUT" movement of the coils body. Linear actuator are also used in computer peripherals such as disk drivers, printer or utilize in opening and closing of the valves electrically. It aid in actuating electrical switches by energizing the coil.

F. LCD

Liquid crystal display (LCD) is a user-friendly output device which uses liquid crystal for displaying alphabets and numbers or any custom generated characters. Whose operating Voltage ranges from 4.7V to 5.3V. LCD consists of 2 rows and 16 columns. Each row is capable of printing 16 characters. Where each single character is built by a 5×8-pixel box. LCD works on two mode operation: 8-bit and 4-bit mode. Current consumption of LCD is 1mA without backlight. LCD offers two backlight shades green and blue.
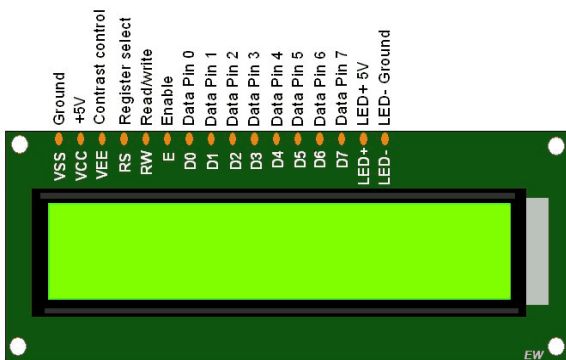

Fig 5: - LCD

G. DC motor

DC motor converts mechanical energy into direct current (DC) electricity. DC is subtype of electric machines consist of electric generator which works on the Ideology of electromagnetic induction. Input supplied to electric machines are in the form of electrical energy which is then converted into mechanical energy or vice versa. Micro-machines are integrated electric machines measure from few nm to μm which resembles the size of red blood cells and are mainly used in medicinal applications. DC motors poses a variable speed control capability which mainly used in applications like motor vehicles and industrial

machinery. While Lathe machines, blowers and centrifugal pumps mainly comprises of DC shunt motors.

F. KEYPAD

Keypad is considered as one of the efficient input device. It comprises an arrangement of buttons or keys representing symbols, digits or alphabetical letters aligned on a pad in a sequential manner. In this project 5x8 matrix keypad is used, which accepts the input from user (alpha-numeric value). The data provide by user is processed by the Atmega and provide to solenoid and motors.
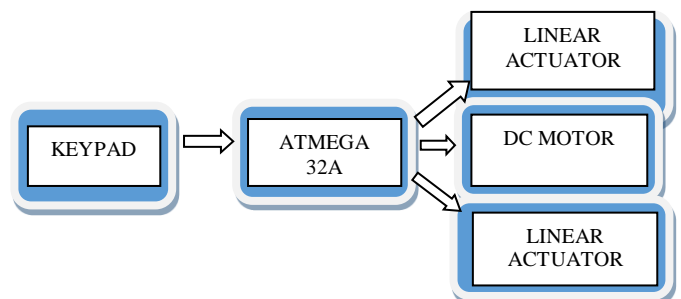

Fig 6: - Keypad

III. PROPOSED SYSTEM

Fig 7: - Block Diagram

- *Procedure and steps for label print execution*
- ➤ The user enters the string using the 8x15 custom made matrix keypad which contains all 26 alphabets and 10 numbers. It is a 40 keys keypad. The string given as input is provided to the Atmega 32 microcontroller.
- ➤ The controller accepts the string and displays it on the 16x2 Alphanumeric LCD. Once the user enters the whole string and presses the 'enter' key on the keypad, the microcontroller starts processing the printing of the string in braille script according to the program code.
- ➤ The input string develops into a printed form of braille script with the help of precise movements of the stepper motor, DC motor and the solenoid actuator altogether.
- ➤ The stepper motor rolls the label paper out precisely providing the solenoid an embossing action dotted point over the label paper for every column i.e. it provides the movement in the x-direction.
- ➤ The dc motor along with worm wheel arrangement provides the precise movement of the platform for getting the embossing point for each row, i.e. it provides the movement in the y-direction.

➤ These motions of the motors are controlled by the microcontroller with the help of L293D and A4988 motor drivers.

➤ At this stage solenoid actuator comes into the picture. the solenoid actuator is used to make the braille symbols by embossing the paper to create impressions on the paper which can be read by the visually impaired people.

➤ As the braille has embossing on paper on the top side the string needs to be printed in reverse direction that too in a mirror image format so that on the opposite side the actual letter is obtained by the readers.
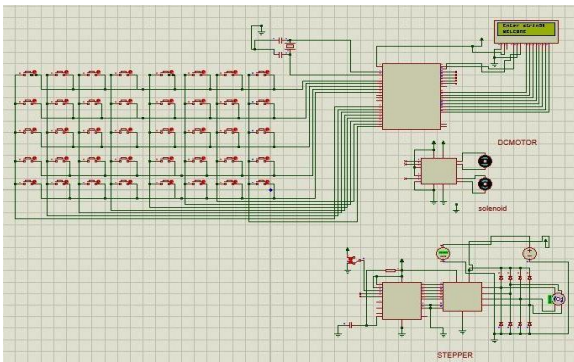
IV. SIMULATION RESULTS

Fig 8: - Interfacing of stepper motor, LCD, Driver IC, Atmega 32A controller and keypad "enter your string" displayed on LCD.

V. RESULTS

Fig 9: - The braille letter ABC are embossed on the Casio sticker. This tag can be applied on daily things which can easily be identify by blinds.
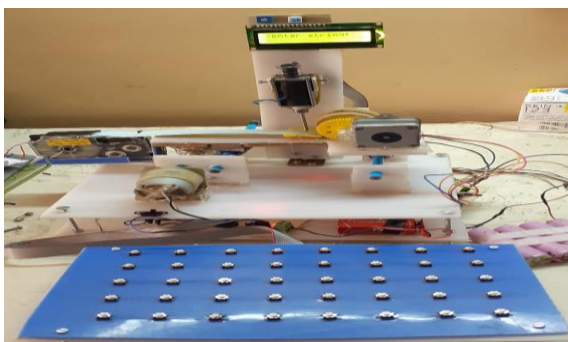

Fig 10: - Experimental Setup of Braille tag printer

VI. SCOPE OF PROJECT

• Blind people can easily interact with their surroundings.
• Braille label printer provide better user interface.
• Even the ordinary people can print the tags without any knowledge of braille language.

VII. CONCLUSION

• This technology could mean a way for about millions of people with blind disability as a one step toward interacting the world.
• This low-cost operative project benefits the visually impaired people to interconnect with the surrounding objects.
• Its seconds-to-do print braille tag with numerical features.

ACKNOWLEDGMENT

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