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SELF LEARNING BRAILLE APPLICATION FOR VISUALLY IMPAIRED PEOPLE

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Abstract

Braille system is the main method for the blind and visually impaired people for acquiring the reading and writing skills. Considering their disability, efforts were dedicated to facilitating the learning with Braille. Studying Braille system at the specialized centers and schools isn't easy for all the involved blind and visually impaired people. Moreover, making the learning process independent of others is very useful. This project implements a Braille Script Teaching Aid in which the presence of combination of six servo motors is operated using the input got from the STM32 microcontroller. This project presents the design and implementation of an Self-learning Braille application for the blind and visually impaired people on the smart devices.

Keywords: Braille, Teaching, Visually Impaired, Microcontroller , Bluetooth, Self-learning, Speech.

1.Introduction

Human communication today is mainly via speech and text .To access report numerous difficulties with accessing printed text using existing technology, including problems with alignment, focus, accuracy, mobility and efficiency. Machine replication of human functions like reading is an ancient dream. However, over the last five decades, machine reading has grown from a dream to reality.

Today, there are already a couple of systems that have some promise for portable use, like portable Universal Product Code readers designed to assist blind people identify different products in an extensive product database can enable users who are blind to access information about these products through speech and Braille.

Braille may be a method of reading and feeling text through touch, instead of sight. It is mainly used by those with impaired vision; however, sighted people can read Braille as well. There are many reasons for this, especially for those with a blind or visually impaired person in their house. The representation of alphabets of Braille language shown in (figure 1.1).

There are many sorts of Braille, including musical, mathematical, and multiple sorts of literary Braille. Reading speed is significantly slower than for print reading or recorded materials. Daily and current brailed information isn't readily available. Braille materials are expensive to produce. But an enormous limitation is that it's very hard for blind users to seek out the position of the Universal Product Code and to properly point the Universal Product Code reader at the bar code. It takes up considerable space and presents portability and storage problems. Spelling skills require special attention due to the constructions. Specific elements of Braille present serious problems to variety of multiple handicapped individuals.

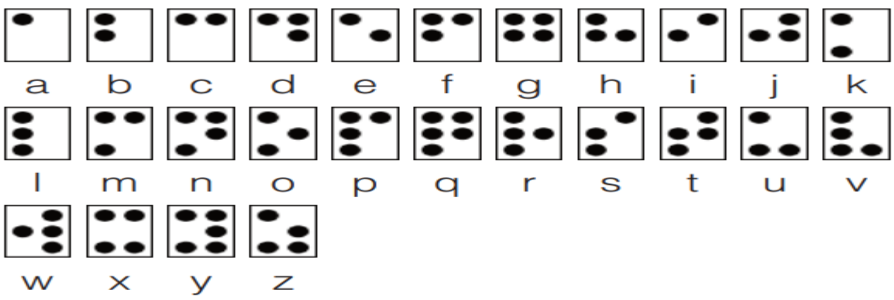

Figure 1.1 Braille Representation of Alphabets

2.Related works

In the world there are 285 millions of Visually-Impaired People (VIP), 39 millions of which are blind [1]. Blind and VIP can access text information relaying on voice synthesizers perceived via speakers or headphones [2]. On the contrary, the sense of touch represents a brighter solution for surrogating visual content to blind people, also considering the various similarities between touch and vision, resulting e.g. in supra modal cortex organizations [3]. For these reasons, haptic devices are developed targeting VIP usage to: (i) render general graphic information [4], (ii) allow the event of mental maps from virtual objects [5]. Braille devices are usually well-received by users, which can actively use their sense of touch to read and learn informative cues. Indeed, because it has been demonstrated in [6], a lively mode of accessing textual information, like through haptic exploration, generally results in greater comprehension compared to the case where blind people only passively listen a text being read [7].

Indeed, although they have reasonable reliability due to their sophisticated mechanical elements, the proposed design solutions typically require considerable cell dimensions, a very high operating voltage (100–300 V) and the final product is typically very expensive [8], [9]. Other approaches presented in literature propose the utilization of shape memory alloy (SMA) coils, or thermo-pneumatic/pneumatic actuators, but they will also accompany not-negligible costs. Furthermore, these technologies may exhibit low portability [10], they will be complex to regulate , and therefore the dynamics of the actuation is usually slow [11], [12]. Moreover, other negative aspects are often the relatively high working temperatures, which could end in repetitive cooling phases during the usage, and therefore the high power consumption thanks to continuous powering of the actuators also in static conditions [9].

The operating principle consists in a static magnetic field, usually generated by a permanent magnet, which interacts with a variable magnetic field, produced by electrical current flowing into one or more coils. In this case the force exerted by the coil on the magnet are often regulated by modulating the present . For example, in [13] the authors propose a flapper mechanism for every dot of the Braille cell, enabling to rearrange the voice coil actuators horizontally beneath the cell surface, and to transmit the movement with convenient leverages. However, cells designed with this sort of actuation are considerably large. and the resulting system can be cumbersome [14]. A Refreshable Braille Display to computers, smart phones and tablets to fully access Braille without being loaded down with a bulky heavy book [15].

3.Proposed method

The proposed system provides translation for visually impaired people to read English characters. The system uses the characters for vibrating the vibration motors for the visually impaired people in the form of Braille language which is communicated to the users through mini vibration motors representing each Braille glyph. Suitable hardware is chosen for implementing the system. The system contains , a single Braille cell and mobile for voice recognition to get the characters as the input. STM32 microcontroller is used as the processing device in this project as shown in (figure 3.1).

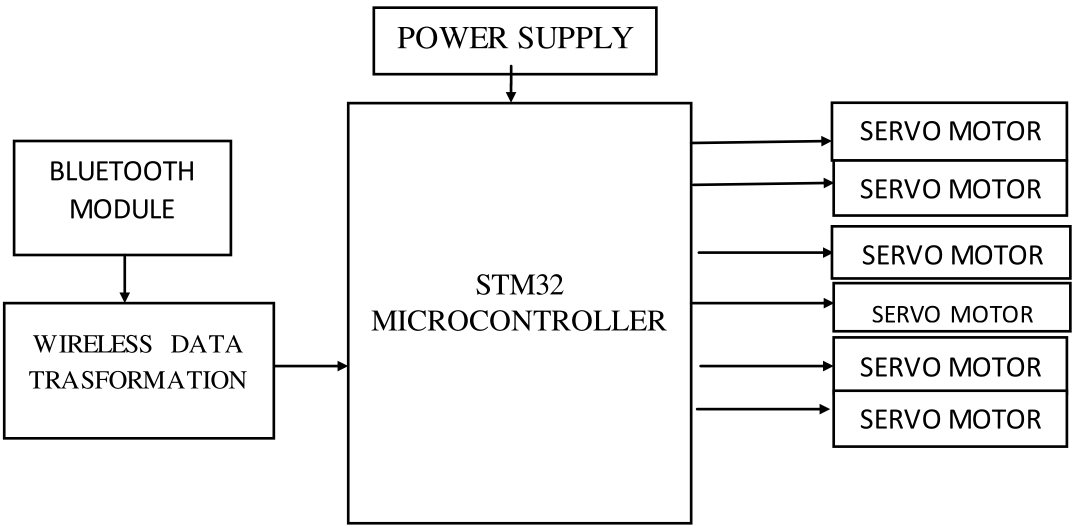

Figure 3.1 Block diagram of self learning Braille application

3.2 Working principle

This system used for the visually impaired people in the form of Braille language which is communicated to the users through servo motors representing each Braille glyph. Suitable hardware is chosen for implementing the system. The important key factor of this project to facilitate these people and to fix them more confident to manage their sites by themselves. The primary advantage is that the device are often removed easily and is of about less weight.

The block diagram of complete system is shown in (figure 3.1) . Here, STM32f103c8f6 is used as a microcontroller. Input is given to this microcontroller by Bluetooth module through wireless data transmission. Bluetooth module consists of three pins (GND, VCC, Transmitter). These three pins are connected to STM microcontroller. The transmitter pin of Bluetooth module is connected to PA10 of STM microcontroller. Six different pins of STM microcontroller (PA0, PA1, PA2, PA3, PA6 and PA7) is connected to the respective servo motors as input. Each servo motor is given a 5v power supply and separate ground. Three different power supplies are given to Bluetooth module, STM microcontroller and Servo motors. Audio input is given to microcontroller through smart phone via Bluetooth module. By using Embedded C, the program is fed into the controller.

4.Results and discussion

The simulation of the designed Braille system is done on Embedded C software which is an integrated development environment (IDE) from Arduino. A sample text typed through Braille keyboard with speaking mode. The designed Braille system has the capability to the speech. When the speech output is stopped the system goes in idle mode. The volume of the designed Braille system can be adjusted to the desired level. The speech rate can also be changed and visually impaired individual can increase or decrease the speech rate to the desired level. The designed Braille system also provides the facility to type with some external. (Figure 4.1) represents the output of alphabet ‘a’ which is in the form of single dot. (Figure 4.2) represents the number ‘1’. Word “do” is displayed as output as shown in (figure 4.3(a) and 4.3(b)).

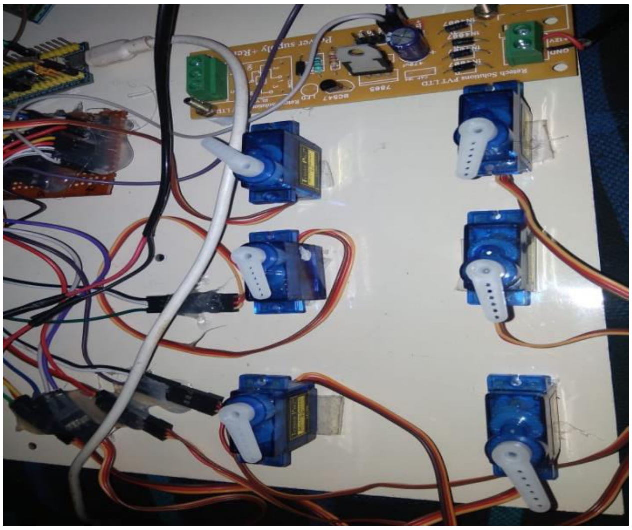

Figure 4.1 ‘a’ symbol representation

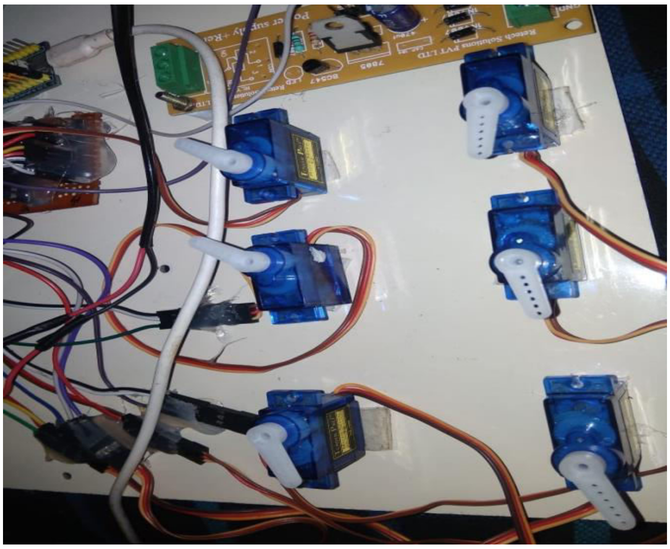

Figure 4.2 '2' number representation

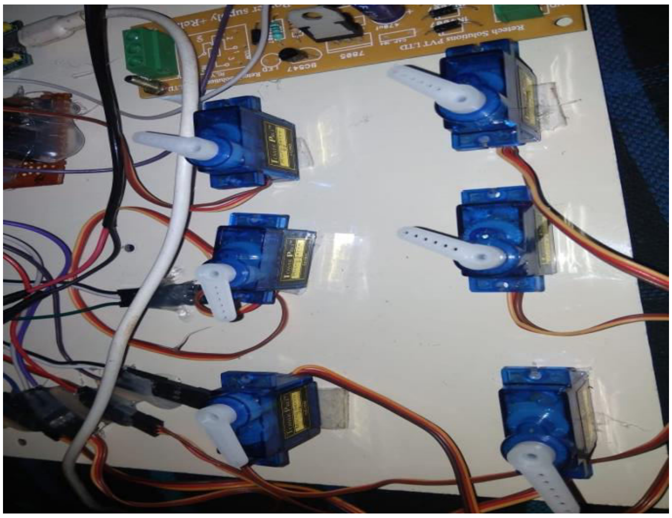

Figure 4.3(a) 'd' symbol representation

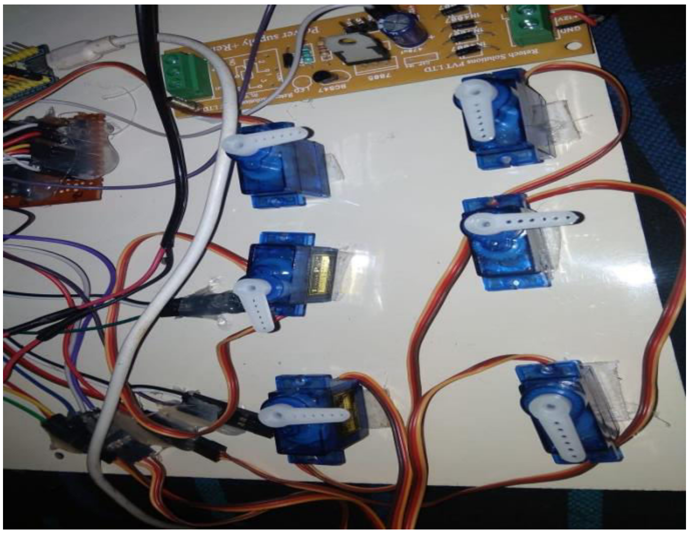

Figure 4.3(b) 'o' symbol representation

5. Conclusion

The problem of Braille literacy is a burning question for making an effective solution with a view to enabling the visually disabled people. To achieving a rightful placed in the society. The device is useful for initial learners and primary school students. Visually impaired person can use this device to learn the basic letters. Very similar to how normal student studies the basic alphabets initially. Self-learning Braille device enables the Visually Impaired Students to expand their knowledge in a self-paced easy expertise over Braille characters. The device enables the Visually Impaired Students to be independent without the need of constant guidance.

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