

BRAILLE DISPLAY USING PUSH-PULL SOLENOID FOR GRAPHIC REPRESENTATION

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Abstract—This paper presents a novel innovation in which a new type of display module made entirely of actuators is created and when a graphic is provided, the actuators rise and fall creating the respective graphic in the display which they can touch and understand. It works more like a slate where they can touch and identify the overview of a graphics being shown on the display. This project aims at catering the needs of a visually impaired people for whom the graphics/shape identification is difficult. So, for them by touching on this graphical Braille display they will easily be able to identify its graphics. As far as we are concerned the main advantage of this project is that the described braille display will be able to store a collection of geometry and display it.

Index Terms—Braille display, push-pull solenoids

I. INTRODUCTION

There are huge numbers of development in the field of technology at the present days. But even though there are developments in different field there are a section of people who is still suffering from the lack of information availability. The visually impaired people are those who belong to this category. Even now with the development of these much technologies their needs are not fully satisfied.

We know a normal person can learn things much easier for example let's consider the case of learning the graphical shapes of an object. We went through a survey in a government based blind school in kunnankulam, Kerala from where we came to know that there are much more needs that has to be fulfilled for the visually impaired peoples. From there we came to know that the visually impaired students are taught these kind of objects using the plastic prototype of the same. Which in the practical it is difficult to store these much of models which is used for the same purpose and also it may be difficult to get the prototype for all the objects they desire. Presently when they have to teach an object say for example an elephant they take out a toy like plastic prototype and then show to the students. Hence the storage and durability of these objects may not last for too long.

The utmost requirement for the teaching visually impaired people was as mentioned above. Hence in order to solve this problem we have come up with this idea of a slate like braille display which makes the visually impaired peoples to learn or understand the graphics of objects. There are many slates now available in the markets for the visually impaired people but the mostly seen disadvantages is that all are of high cost mainly due to the actuators used is of high

cost. And hence this project is accomplished with the help of a push pull solenoid (which is of a low cost) controlled by an arduino.

This paper mainly aims at making the visually impaired people to know more about the shapes/graphics of desired objects. This is accomplished with the help of push-pull solenoids connected to a relay module. The action of push-pull solenoid and the relay is controlled by the arduino using the arduino program. The display screen of size 5x5 is fully arranged by the push-pull solenoids (actuators) so when ever an input is given these actuators raise up and fall and forms the shape of that particular graphic thereby making it easy for them to identify and learn easily.

II. METHODOLOGY USED

The project mainly passes through three main segments as shown in the figure below.

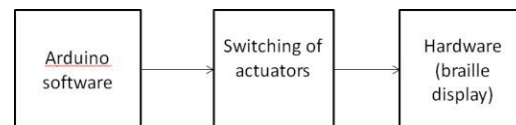


Fig. 1. Block diagram

The main three segments in the project is as shown below. The arduino software controls the entire working of the push-pull solenoid. The solenoids raise and fall according to the arduino program/action. The time of raise and fall of the actuators are controlled with the help of a relay module. And from the third block it is clear that the push-pull solenoids are then arranged in a form of an array where they raise and fall accordingly.

III. WORKING

A. MAKING ACTUATORS OF REQUIRED SIZE

In this section the main aim is to select an actuator according to the need here it is push-pull solenoid. The size of the solenoid must be chosen accordingly as to not

to have larger space in between these solenoids. If the space between them gets increased it would be difficult for the visually impaired to understand.

raise and drop accordingly thereby obtaining the shape of the desired graphic. Here we use 5x5 matrix and hence we can only be able to display small images or alphabets.



Fig. 2. Push-pull solenoid

B. ARDUINO INTERFACING

At the initial stages we started out with a simple program of which only two push-pull solenoid(actuators)are made to raise and fall. And then as the program was set for two actuators we tried making morepush-pull solenoid to work as the same. The program is then given to the relay module through the main controlling unit of the push-pull solenoid.The relay is connected with an external power supply of 12volt , and then the whole connection is given to the push-pull solenoid (the push-pull solenoid used is of 12volts) .

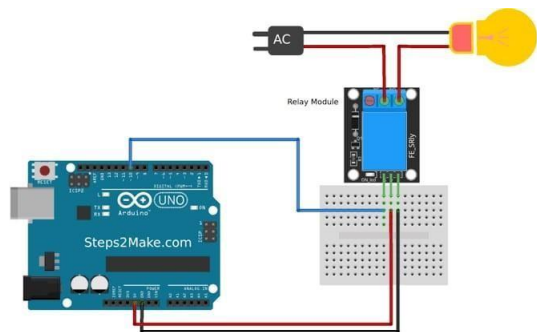


Fig. 3. Example of arduino interfacing

C. ENSURE WORKING OF ACTUATORS

After the arduino setup is done the important part is to check the condition of the push-pull solenoid. Ensure that the solenoid is in the working condition before the above mentioned connections are done. Remember to choose a solenoid of smaller size in order to reduce the space between them.

D. PROGRAM DEVELOPMENT

As mentioned earlier the main aim of the project is to make the visually impaired people to understand the outline of certain graphics. So for that the programs to output certain fraphics is given to the arduino and is saved and kept. According to the graphics needed to display the actuators

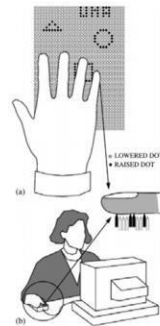


Fig. 4. Figure showing the display touching

E. DISPLAY BOARD

The display board will be of a size of 4x4 matrix which consists of 16 actuators. These 16 push-pull solenoids will be arranged in a matrix form with four rows and 4 columns. Push-pull solenoids will be embedded in a plastic tray like structure as shown below.

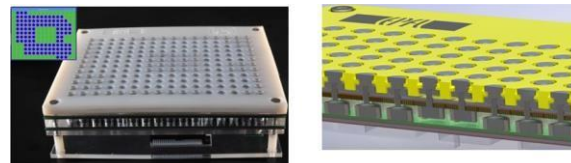


Fig. 5. Prototype of a display board

IV. CIRCUIT IMPLEMENTATION

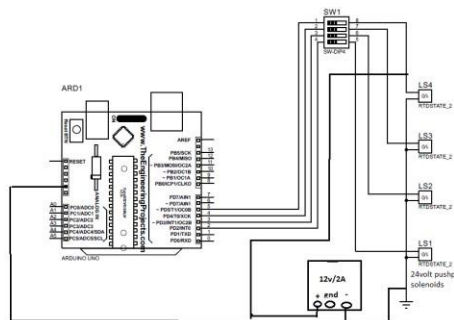


Fig. 6. circuit diagram

The circuit designed for our project mainly consists of an arduino mega, a 16 channel relay, a external

power supply of 12v and push-pull solenoids of 24v. Arduino is interfaced directly to the 16 channel relay and the relay is then connected to the push-pull solenoids basically. Here in the circuit shown above only has a 4 number of push-pull solenoids since it is not practically easy to show all the 16 push-pull solenoids in a single circuit.

The push-pull solenoids used here are of 24 volt so in order to provide the sufficient amount of voltage an external voltage of 12v is been used. As you can see in the circuit above the positive and the negative supply of the power supply is been connected to the push-pull solenoids providing the required 24v to the push. As mentioned above the solenoids works according to the program inserted or given to the arduino and hence when a program is runned the relay accepts the programs and then according to the applied program the push-pull solenoids starts to actuate giving a raise and fall in order to get an exact outline/shape of the graphics provided.

V. CONCLUSION

This proposed methodology mainly aims at helping visually impaired people to understand the various types of shapes and objects. We can accomplish this task with the help of a new type of display module made entirely of actuators. When a graphic is provided, the actuators rise and fall creating the respective graphic in the display which they can touch and identify the overview of a graphics being shown on the display. In the case of smart slate, the cell count is less and in the latter piezoelectric linear motors are expensive and we have to apply high force to the third. This proposed methodology overcomes these shortcomings. As an advanced technology it can also be used to teach maps to the blind.

VI. FUTURE SCOPE

As we know that the project is done in a small scale way and the display size is of just 5x5. As the size is very very small larger images of higher pixel rates will not be able to display over the graphics display section. As an higher version of this project is the array size is increased to higher size it could be easier for us to display a larger images. By the survey that we have come through we could understand that the map identification is an essential requirement for the visually impaired peoples. This could be full filled by increasing the size of the display board by increasing the number of push-pull solenoids. If it is done in this way it would be really helpful for the visually impairs.

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