

Braille Oriented Classroom

Amrutha R.¹, Bhavya A.², Keerthi K.S.³, Sruthi K.R.⁴, Bindu P.K.⁵

^{1,2,3,4} Final year Students, Dept. of ECE, Ammini College of Engineering, Palakkad, Kerala, India

⁵Asst Professor, Dept. of Electronics and Communication Engineering, Ammini College of Engineering, Palakkad

Abstract – Visually impaired people faces difficulties in interaction and in communication. Braille is the language used by the blind to interact and communicate. It is a system of writing that uses patterns of raised dots to inscribe characters on paper. It therefore allows visually impaired people to read and write using touch instead of vision. All over the world, persons who are visually impaired have used Braille as the primary means of accessing information. Braille is a means of reading and writing for blind people. Despite of all these advancement in the technological field, the physically impaired people have no access for these technologies. So as a step to bridge the gap between the blind people and the technological advancement we decided to design a braille oriented classroom that provides a campus like environment.

Key Words: Braille, Relay, Visual Basic Application, PIC, Zigbee, Actuator.

1. INTRODUCTION

The paper proposes an effective way for developing braille classroom which allow visually impaired students to read the text messages in the form of braille characters. Braille is the system for blind students to participate in a literate culture. A braille trained student can easily read these data by putting their hands on the dc actuators. Here a visual basic application is used for inputting. The teacher can type the text-messages in the VB application and can send using zigbee. The Braille-kit of the student receive the data from the transmitter PC. LCD display interface for trouble shooting purposes. The paper here intended to do in only one direction i.e.; text to Braille conversion. The Braille cell consist of 6 moveable pins in rectangular array. The proposed system is divided into 2 sections

- 1) Transmitter section.
- 2) Receiver section or embedded section.

Fig-1 shows the basic block diagram of the proposed transmitter section.

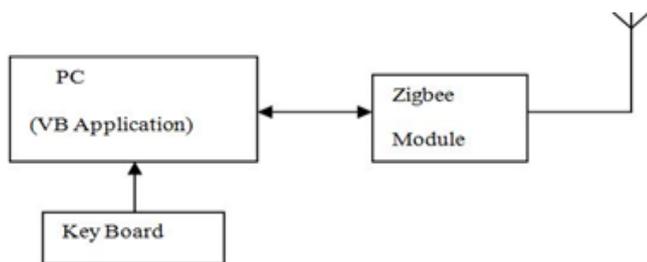


Fig -1: Block diagram of transmitter section.

The Fig-2 shows the basic block diagram of the proposed receiver section.

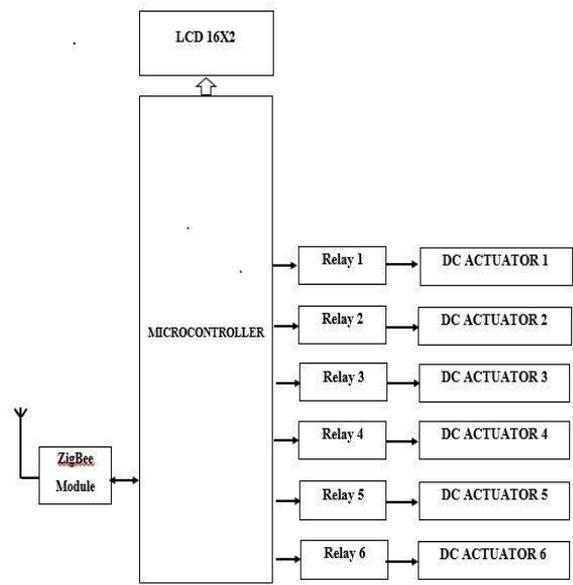


Fig -2: Block diagram of receiver section.

1.1 Basic mechanism

Transmitted section consists of PC with VB platform which is controlled by those who is handling the class. The one who handles the class can type the text-data in VB application and the application send these data wirelessly through a Zigbee transceiver.

Receiver section consists of a Braille-kit with a microcontroller, which is programmed to receive the data from the transmitter PC. There is also a zigbee transceiver module in receiver Braille-kit and these module receive the data and given to the microcontroller. The program loaded in the microcontroller decodes these data to Braille format and the dc- actuators will up and down accordingly.

1.2 Transmitter section

The transmitter section consists of a PC with visual basic application. It is a programming environment. Visual basic application is programmed to serially communicate with the zigbee transmitter module. Also VB is programmed to produce the front end consisting label, command box, and text box.

Following are the steps for creating a programming environment in Visual studio.

- Open Visual studio.
- Build a form.
- Show the code window.
- Writing code.
- Test the code.
- Build the code.

In Visual studio there are tools for writing and designing. On the left of Visual studio is a tool box of windows controls (Drop down menus, text boxes, labels, buttons, checkboxes etc.). By programming this application can control these tools and can be used to transmit the text messages to the braille kit.

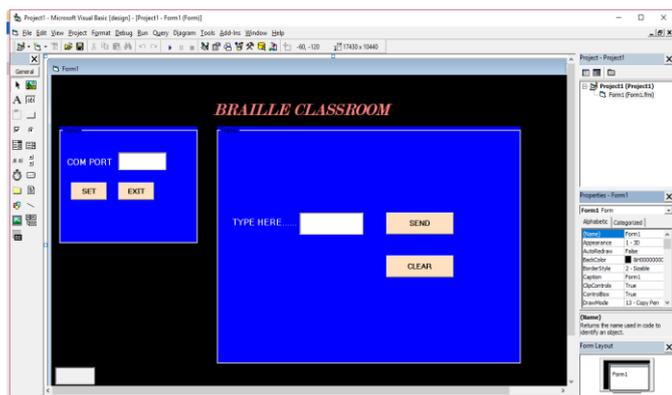


Fig-3: VB front-end

1.3 Receiver section

The receiver section consists of 6 actuators which is connected to 6 relays. Each actuators are controlled by each relay. The actuator are actually controlled by the outputs received which are equivalent to the text message. The pic microcontroller is programmed to decode the text message into braille characters and the actuators will up and down accordingly.

2. SIMULATION OF THE SYSTEM

Simulation of the system is done by the software Proteus 8 Professional and mikroC PRO for PIC. The 16F877A is a capable microcontroller that can do many tasks because it has a large enough programming memory (large in terms of sensor and control projects) 8k words and 368 Bytes of RAM. This is enough to do many different projects. Among the peripheral features of PIC here we have used the Port programming, LCD programming and Zigbee programming i.e. serial communication.

2.1 Simulation result

PIC 16F877A normally have 5 input/output ports. The ports are used for the input/output interfacing with other devices. Here Port B, Port C, and Port D are used as input as well as output ports.

Port B is an 8 bit bi-directional port and its direction is controlled and maintained by TRIS-B data direction register.

Setting TRIS-B into logic 0 makes the port B as an output port. Here instead of actuators, in simulation LED is interfaced with port B and when the input reaches it will on and off accordingly.

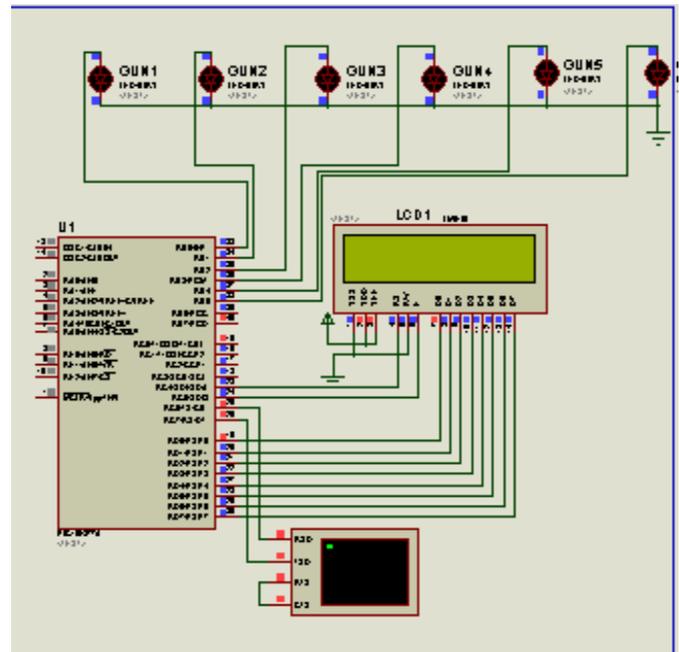


Fig-4: Simulation

Port C is also an 8 bit bi-directional port and its direction is controlled and maintained by TRIS-C data direction register. Setting TRIS-C data direction register into logic 1 makes the port C as an input port. Here zigbee module is interfaced and it acts as an input port.

Port D is an 8 bit bi-directional port and its direction is controlled and maintained by TRIS-D data direction register. Setting TRIS-D into logic 0 makes the port D as an output port. Here RD0 to RD7 are connected to the LCD display's D0 to D7 pins. This acts as an output port.

3. HARDWARE SECTIONS

Main hardware sections used in this project are PIC microcontroller, Actuators, Relay, and LCD for displaying the words which is transmitted. Fig-7 shows the Braille kit.



Fig-5: Braille kit

3.1 Microcontroller-PIC16F877A

The controller is programmed to receive the text message. The controller then decodes the message accordingly to the program loaded. The controller converts the input text signals to the equivalent braille form. PIC 16F877A is one of the most advanced microcontroller which is used here. A slight disadvantage is that it has no internal oscillator so an external crystal oscillator of 4MHZ is provided.

Features

The midrange PIC Microcontroller offer several features that help to achieve these goals. The special features include:

- 5 Digital I/O Ports –Port A,B,C,D,E
- Three timer/counter modules
- A 10-bit ADC with 8 inputs
- Two Capture, Compare, PWM modules
- Synchronous Serial Port (SSP) with SPI (Master mode) and I2C (Master/Slave)
- Universal Synchronous Asynchronous Receiver Transmitter (USART/SCI) with 9- bit address detection.
- Parallel Slave Port (PSP) 8-bits wide, with external RD, WR and CS.

3.2 Actuators

A linear actuator that creates motion in straight line. Actuators are devices which converts electrical energy in to mechanical motion. The piezoelectric effect is the property in the linear actuators used here. The application of the voltages correspond to tiny expansions.



Fig-6: Actuators

3.3 ZIGBEE module

The transceiver module used here is Zigbee. The operating frequency is about 2.4GHZ. One zigbee module is placed in

the transmitter section. Also in transmitter section for serial communication from the PC, USB to TTL converter is used. Since PC doesn't have serial port.

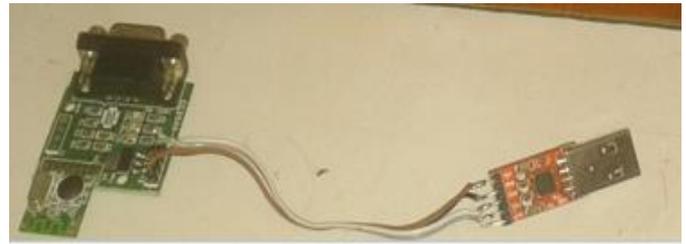


Fig-7: Transmitter module along with USB to TTL converter

Receiver section consists of another zigbee module which is interfaced with the controller. CC2500 is used as transceiver module here.

Features

- Low power consumption.
- Available frequency at: 2.4 2.483 GHz Adjustable
- Integrated IF and data filters.

3.4 LCD module

A 16x2 LCD (Liquid Crystal Display) screen is used for displaying the received text message. Main function of LCD display here used is for trouble shooting purpose.

3.5 Voltage regulator

The voltage regulator here used is to regulate the DC voltage to a stable voltage level. In this project stable voltages 5V is required. For this 7805 voltage regulators is used for 5V.

3.6 Relay

Six relays are used in order to control the six actuators. Relay switches open and close electromagnetically and controls another circuit. Applying an electric current to the contacts will change the state then gets energized and can drive high power devices. Here actuators are driven by these relays.

4. CONCLUSIONS

The proposed method is a new and cost effective way of developing a system for controlling piezoelectric Braille cell by using Programmable Interface Controller (PIC) microcontroller. The new design makes use of electromagnetic or piezoelectric principles. The development of low cost English text to Braille is necessary for Braille teaching people and help to visually impaired community. It will show the new way of conversion method for people working in computer environment. The system that has been proposed here eliminates the use of vacuum suction principle and hence reduces the cost to a great

extent. To support this new design, we have also given details of interface circuitry and software system that controls this head. The Braille code equivalent of each character is generated in the output box of the tool. The same technique can be used in various languages like Bengali, Hindi, Tamil, French, etc., The Braille code conversion process is a single step and the data transfer rate is normal and it is controllable. It is one of the best tool for visually impaired people and Braille learning people using computer technology.

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BIOGRAPHIES



Bindu P K is with Ammini College of engineering, Palakkad as Assistant professor in the ECE dept. She received the B.Tech degree in Electronics and Communication Engineering from Government Engineering College, Wayanad and M.E in Applied Electronics from Anna University Regional Centre, Coimbatore. She published 3 National Conference papers and 3 International Journals on the topic related to Communication, Image Processing and VLSI



Sruthi K.R. is doing his B.Tech in Electronics and Communication Engineering at Ammini college of Engineering, Calicut university, Kerala.



Amrutha R. is pursuing her B.Tech in Electronics and Communication Engineering from Ammini College of Engineering, Palakkad, Kerala.



Bhavya A. currently doing her B.Tech in Electronics and Communication Engineering at Ammini college of Engineering, Calicut university, Kerala.



Keerthi K.S. is with Ammini College of Engineering doing her B.Tech in Electronics and Communication Engineering, Calicut university, Kerala.