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Design and Implementation of a Microcontroller based Digital Multi-language Word Master

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Abstract—In order to read a child must first learn to recognize and identify the letters of the alphabet and then match the letters with their respective words. In this paper we designed and implemented a device which can help with this challenging process. It is a toy of colorful appearance with displays giving letters, words, to attract the interest of sighted children, making learning especially enjoyable. Although this lightweight device has plenty to offer a preschooler so it would be optimal for the development of future reading skill.

Index Terms—Microcontroller, LCD, LED, Keyboard, PS2, ASCII, Host.

1 INTRODUCTION

ILLITERACY is a curse. A person who is unable to read and write is simply called illiterate. Literacy is the base line of education. Without it schooling can not proceed. We take it for granted that the majority of people are literate, but no more then tiny proportions of the population had any literacy skills. Although many countries have instituted literacy programs. There have made only a small contribution to a problem of large scale dimensions. Television and electronic media are now used, where they are available to increase preschooler's literacy skill. education and literacy are important routes economic development, hence again lower income countries are disadvantaged, since they can seldom afford high quality public education systems as a consequence children in high income countries are much more likely to get schooling than are children in low income country's and adults in high income countries are much more likely to be able to read and write [10].

Education is important for several reasons. First a it contributes to economic condition, since people quite advanced schooling provide the skilled work necessary for high wage Indus tries. Second education offers the only hope for escaping from the cycle of harsh working conditions and poverty. Since poorly educated people are condemned to low wage, unskilled jobs. Finally educated people are less likely to have large numbers of children, [9] thus slowing the global poverty. In this paper we have addressed the design and implementation of a innovative microcontroller based digital multi-language word master. The whole paper is divided into several sections firstly this paper commences with a description of the product. Then it gives the design requirements and how the integrated circuits (IC's) were selected considering there features, others compromising factors and design requirements. This paper then gives functional description of the product.

Finally, this paper describes advantages of the proposed device, result, conclusion and discussion.

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2 DESCRIPTION OF OUR PROPOSED DEVICE

It is a microcontroller based educational kit. There are two parts of our device namely

2.1 Hardware part

In our proposed device is consisted of a Microcontroller (ATMEGA 32) [1], Pc keyboard (PS2) [3], LCD display (16x2), Brad board and some connectors.

Keyboard works as a input device and lcd display as a output device. Microcontroller controls the input-output according to the program provided to it.

2.2 Software part

In our proposed device basic programming language is used to code the program. And Bascom avr [12] compiler is used to compile the program. The program is to interface pc keyboard and lcd display with the microcontroller. We have made Bengali font in our program. And we have made word for every Bengali and English letter. In our LCD screen there are 5x7 segments in every unit. We arranged the Bengali alphabets in the same way s they are in Bijoy Bengali keyboard. For example if "j"is pressed Bengali alphabet KA [ক]is showed on the display.

3 WORKING PRINCIPLE

There is a particular 'ASCII' value for every button of the keyboard. When a user presses a button of the keyboard the

microcontroller receives a 'ASCII' value. For example, it reads 65 for "A" and 97 for "a. The proposed device is designed to learn English and Bengali typing and to help preschooler to identify and recognize alphabet and word. In this device we used pc keyboard. When the device is switched on it shows two options on the lcd screen.

1. Typing tutorial
2. Letter and word tutorial

If "1" is pressed on the keyboard, the device is directed to the particular program respectively. If "2" pressed on the keyboard, the device is also directed to the particular program respectively.

When the program "of letter and word tutorial" is directed then it shows two options namely Bengali and English. User can chose any one option. When any button on the keyboard is pressed the display shows a relevant word for Bengali and English letter. There is certain word stored on the device memory.

4 BLOCK DESCRIPTION OF OUR PROPOSED DEVICE

Illustrates the functional block diagram of the proposed device (Fig. 1).

The microcontroller interfaces the keyboard and display. Keyboard works the input device write the display shows the output. LED indicated the power on off. The photograph of our proposed device shown at (Fig. 2).

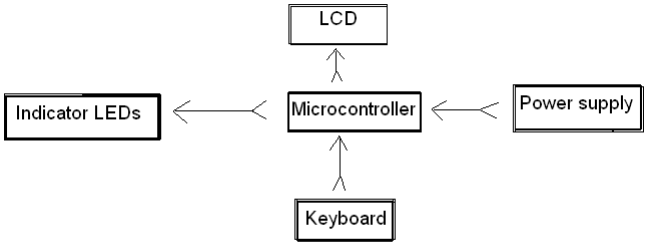

Fig. 1 Block diagram of proposed device

Fig. 2 photograph of our proposed device

5 KEYBOARD IS INTERFACED FOR LOW POWER OPERATION AND TO MAKE IT EASILY USABLE

PC keyboard runs on 5V dc. PC keyboard can be a cheap alternative to a keyboard on a Microprocessor developed system or in a remote terminal, just couple it with a LCD Module.

The PC's AT Keyboard is connected to external equipment using four wires. These wires are shown in (fig. 3) [11] for the 5 Pin DIN Male Plug & PS/2 Plug.

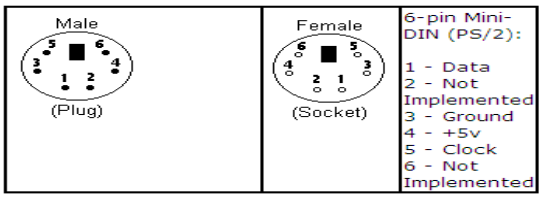

Fig.3 Pin diagram of PS2 key board

5.1 Keyboard to Host

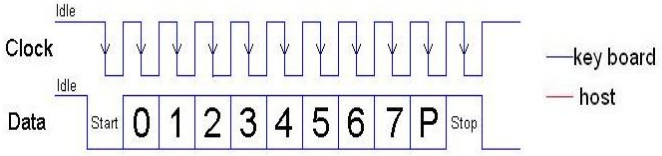

Fig. 4 Keyboard to host

The PC's keyboard implements a bi-directional protocol. The keyboard can send data to the Host (fig.4) [3] and the Host can send data to the Keyboard. The Host has the ultimate priority over direction. It can at anytime (although the not recommended) send a command to the keyboard.

The keyboard is free to send data to the host when both the KBD Data and KBD Clock lines are high (Idle). The KBD Clock line can be used as a Clear to Send line. If the host takes the KBD Clock line low, the keyboard will buffer any data until the KBD Clock is released, i.e. goes high. Should the Host take the KBD Data line low, then the keyboard will prepare to accept a command from the host.

The transmission of data in the forward direction, i.e. Keyboard to Host is done with a frame of 11 bits. The first bit is a Start Bit (Logic 0) followed by 8 data bits (LSB First), one Parity Bit (Odd Parity) and a Stop Bit (Logic 1). Each bit should be read on the falling edge of the clock.

The above waveform represents a one byte transmission from the Keyboard.The keyboard may not generally change it's data line on the rising edge of the clock as shown in the diagram. The data line only has to be valid on the falling edge of the clock. The Keyboard will generate the clock. The frequency of the clock signal typically ranges from 20 to 30 KHz. The Least Significant Bit is always sent first.

5.2 Host to Keyboard

The Host to Keyboard. (fig. 5) [3] Protocol is initiated by taking the KBD data line low. However to prevent the keyboard from sending data at the same time that is attempted to send the keyboard data, it is common to take the KBD Clock line low for more than 60us. This is more than one bit length. Then the KBD data line is taken low, while the KBD

clock line is released.

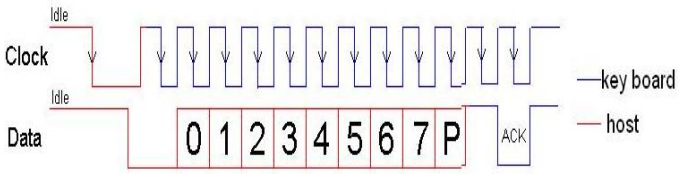

Fig.5 Host to keyboard

The keyboard will start generating a clock signal on its KBD clock line. This process can take up to 10mS. After the first falling edge has been detected, it can be loaded the first data bit on the KBD Data line. This bit will be read into the keyboard on the next falling edge, after which it can place the next bit of data. This process is repeated for the 8 data bits. After the data bits come an Odd Parity Bit.

Once the Parity Bit has been sent and the KBD Data Line is in a idle (High) state for the next clock cycle, the keyboard will acknowledge the reception of the new data. The keyboard does this by taking the KBD Data line low for the next clock transition. If the KBD Data line is not idle after the 10th bit (Start, 8 Data bits + Parity), the keyboard will continue to send a KBD Clock signal until the KBD Data line becomes idle [3].

6 MICROCONTROLLER CONSIDERATIONS FOR REDUCED POWER CONSUMPTION

The circuit current consumption at different microcontroller oscillator frequencies [4].

Microcontroller oscillator frequency	Circuit current consumption (mA)
20MHz	36.0
4MHz	33.1
1MHz	32.4

In our device we used internal 8Hz and external 12 MHz oscillator frequency.

7 ADVANTAGES OF OUR PROPOSED DEVICE

1. Cheap and easily affordable.
2. Easily portable.
3. It can be used as a self learning device.
4. It introduces preschooler with letters and words.
5. It is low energy consumption device.
6. The device is attached with rechargeable battery. So it can.
7. Run without electricity.

8 LIMITATIONS OF OUR PROPOSED DEVICE

1. It can not shows conjugated words.
2. Memory limitations.
3. Word limitations for preschoolers.

9 RESULTS

To quest for the practical implications of our proposed device we delivered it to few preschoolers' .they responded to the device warmly. Their guardians' opinion was 'the device helps children to learn by playing and play by learning'.'. The device accelerates the learning process of the preschoolers. Again it helps adults to be skilled in typing. So the practical research result is very much satisfactory.

10 CONCLUSION

Our proposed device is a locally designed and developed educational tool which is competitive with the imported products both technically and in educational value. The similar educational toys available in Bangladeshi market are less in cost since they are produced in mass scale, in countries, which are giants of electronic industry. However the availability of the device with the verbal instructions and words in native Bengali language is a special and innovative feature of our device.

11 DISCUSSIONS

One innovative and effective idea can change a nation. We are now towards the goal to build a illiteracy free digital Bangladesh. But the real scenario is that population of a large dimensions is still illiterate.

The device designed and implemented in this paper may be a very useful option to combat this problem. The proposed device is commercially viable Because of its cost effectiveness. To spread it to the root level, patronization is required. We expect that the device can be a very useful tool to eradicate illiteracy.

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