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Design and Implementation of a Low Cost, High Speed, High quality Talking Keyboard for Blind Students

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Abstract:
Every day the world is fetching new technologies in the field of Electronics Engineering. But the disabled people, such as blind People are facing many problems while learning and typing their work using computers and they are seeking help from other people to do their work in computer. This work is proposed to help the blind people to do their work by themselves. A low-cost talking keyboard is designed using 8051 microcontroller family IC 89S516rd2 which has 64k program memory. Pre recorded audio samples for all the keys in the keyboard are stored in microcontroller. It uses only 60kb space in the program memory of Microcontroller. When a key is pressed the digital samples of the corresponding key are converted into analog signals using DAC. In order to achieve quality in audio signals, proper filtering is done for the respective key signal and the voice can be heard in speakers. As this project is a low cost, simple and easy to carry, it will be very much helpful for the blind people as well as the people who are interested to learn typing.

Keywords: */2 Keyboard,Samples,Microcontroller,Blind people*

I.INTRODUCTION

Now-a-days, Computers are part and parcel in all our lives. The main input device of the computer is keyboard. It is very difficult to operate blind people which are suffered a lot in these days[1].So,we have implemented a Talking Keyboard with simple technology in sense of Blind People.The main features of this device are low cost,high quality and high speed.

EXISTING SYSTEM

There may be available of these type of devices in the market by using different technologies. Some of the devices are Kurzweil reading machine, optacon, braille keyboard etc.,[2] [3]They having some disadvantages like lack of portability, high cost etc.,

II.PROPOSEDSYSTEM

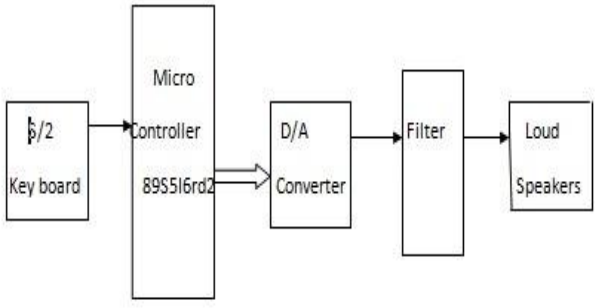

Fig1.Block Diagram of PS/2 Talking Keyboard

The block diagram of our proposed system is shown in Fig 1. Generally, the PS/2 keyboard generates two wire serial frame data [4][5] and clock for its corresponding key. Sample data for each character key is shown in table1. This serial frame is converted as a parallel in a microcontroller. According to the character data, the corresponding voice samples are send to the 8 bit digital to analog

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converter. After converting it as a quantized analog signal,it is passed through a low pass filter having cut off frequency 2KHz for getting clear voice signal for a particular key character.

Table 1:PS/2 serial data for different keys

Character	PS2 data	Character	PS2 data	Special function	PS2 data
A	1C	0	45	Control	14
B	32	1	16	Space	29
C	21	2	1E	Tab	0D

The keys in the keyboard are classified into three types alphabets,numerics, special characters and function keys [6].we have a total memory space for voice samples of 60KB, hence only 10sec of audio samples are to be loaded. Each group total voice times and total samples are given in table 2 Totally 84 keys are in PS/2 keyboard. From Table 2, the voice time for A to Z and 0 to 9 is 6.74sec ,and the remaining time 3.26 sec is used for mathematical operation keys and spacebar. For covering remaining function keys, character voice samples are cascaded for give the voice of that function key.

Table 2 Group voice Time periods and samples

Keyboard keys	Total voice time	Total samples
A to Z(26)	4.655s	27,930
0 to 9(10)	2.085s	12,510
Special function keys	3.26s	19,560

Program Flow chart for Talking Keyboard is given bellow

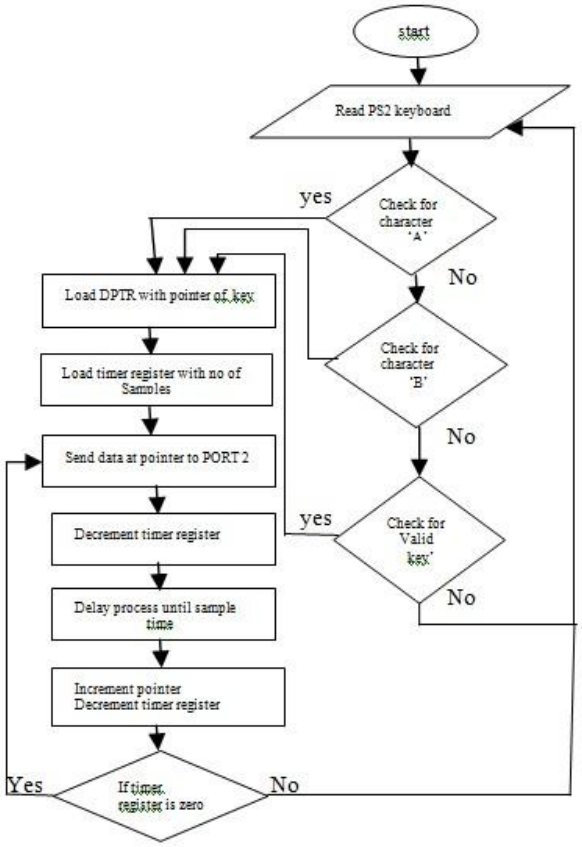

Fig 2 Flow chart of Talking Keyboard

First we enter a character by using PS/2 keyboard,this keyboard send it to the micro controller in a serial frame way.The IC 89s516rd2 microcontroller itself contains the storage space,of 64KB. In that 4KB are utilizes for the programming purpose, Hence 60KB are free which is used to store samples of voice. Then the entered character is decoded by the microcontroller .Later,the corresponding character address is stored in DPTR,at that time timer zero registers is loaded with the maximum number of samples.

After that the microcontroller sends the data pointer to the port 2, Then increases the DPTR and decreases TR0 registers until the TR0 register zero, pointer data is send to port 2 to resend the corresponding character damples. At that time it takes some delay between sample to sample which is equal to sample time..

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We have taken sampling frequency of 6000Hz. Our proposed work is to develop talking keyboard, which gives voice for all keys in the PS/2 keyboard, we use only 10seconds voice for 84 keys. This is achieved by cascading different fundamental voices, corresponding to the function keys in keyboards. To the functional keys F1 to F12 for providing voice microcontroller sends three character voice samples of F and 1 and 2'

Our proposed work is to develop high speed typing . In our keyboard, the minimum and maximum voice times are 0.1 and 0.33 sec.If the maximum voice time is 0.33sec then we can type, minimum characters per minute is (60sec/maximum voice time.) i.e., 60/0.33=181 characters. If average characters per word is 5,then we type the words of (total characters)/(no.of characters per word).i.e., 181/5=36 words. Therefore using this keyboard we can type minimum 36 words per minute .Similarly, at the voice time of 0.1sec, we can type maximum characters of 60/0.1=600 characters and words of 600/5=120. Hence the typing speed is in between 36 to 120 words.

Table3 time and address of the samples

character	Voice time	No.of samples	Starting address	Ending address
A,a	0.2s	1200	1FFF	24AF
B,b	0.17s	1020	24B0	28AC
1	0.16s	960	8A54	8E14
2	0.19s	1140	8E15	9289
Space	0.24	1440	ADE1	B381
+	0.2	1200	C8A0	CD50

The number of samples are calculated using the formula ,(Maximum number of samples per character = voice time *sampling frequency). For getting accurate output, we used the digital storage CRO.For identifying and collecting the sample data's for each time interval of 1/6000sec(sampling time).After collecting and tabulating each voice data with espect to sample,they are further plotted as a graph for observing sample wave form equality of actual audio signal which is to be in the digital storage CRO.

By observing the below three waveform, we can justify that the programming and regenerative waves are same as the sampled wave. Hence we say that samples are truly programmed and regenerated in equal time interval. These equal interval samples are converted as true voice signal and get the original audio signal which is to be verified in PC based CRO. When these three waveforms are correct the output audio will be accurate. We achieved this characteristic in our work

For example character'A'. the corresponding three waveforms are as follows:

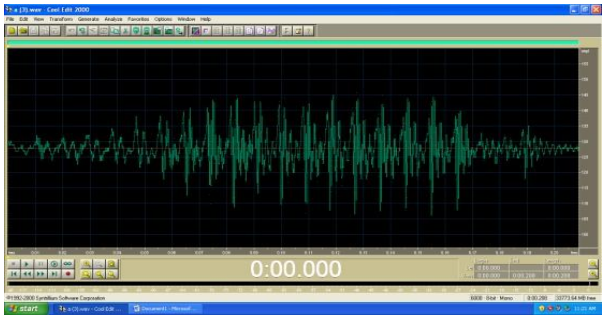

Fig 3. Wave at the time of sampling For A

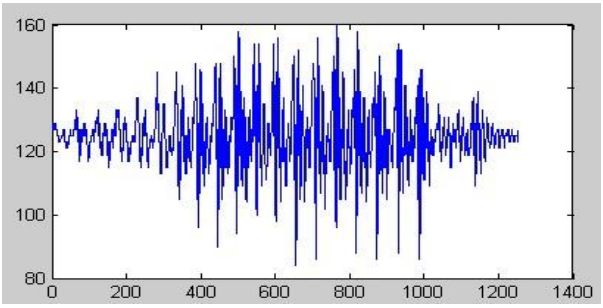

Fig 4 Sample vs Magnitude For A

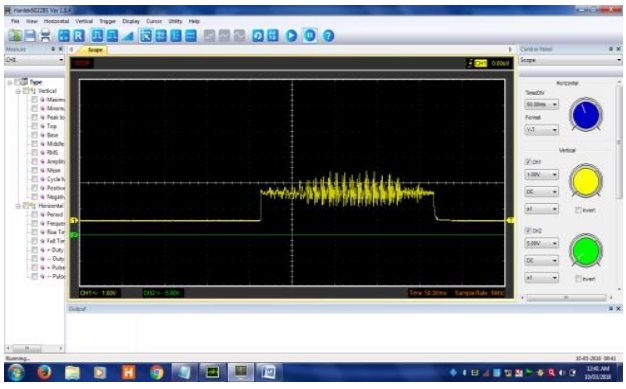

Fig 5 Regenerated Wave For A

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III.CONCLUSION

This project proposed a talking keyboard inorder to help the blind people to do their work by themselves. The talking keyboard is a low cost because of 8051 family IC89s516rd2, .This IC uses only 60kb of memory which is used to store the voice of 84 keys. Even thouth Pre recorded audio samples have 10 second we produce 84 keys audio using voice cascading principle. Using this keyboard we can type minimum(36) and maximum(120) words per minute. This product is simple and easy to carry, it will be very much helpful for the blind people as well as the people who are interested to learn typing.

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