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ADVANCED MUSIC PLAYER WITH AUDIO RECOGNITION AND TOUCH INTERFACE FOR VISUALLY IMPAIRED

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ABSTRACT

Music player are provided with very few search options. In this paper, two different user interfaces touch screen and audio recognition module are used to access music player. This can be used by both blind people as well as normal persons. The project is based on the MSP430 microcontroller which has low power consumption. Feedback is also provided when song selected is not present in music player. This overcomes the disadvantage of other audio players by providing search option in an easy manner.

Keywords: music player, voice recognition module, touch pad, MSP430 controller.

1. INTRODUCTION

Music players navigate through the database of songs through forward and backward movement. Forward and backward movement for navigating through a database of thousands of songs is cumbersome.The goal of this project is to add an search option based on number of the touches in touch pad and also to use voice recognition module to select songs. This can be used by a visually blind person as well as a driver in an automobile to avoid accidents because of driver's diversion of concentration. The various music players make use of different interfaces which makes them desirable to work with, but the visually challenged people require a different user interface which will make it easy for them to access the songs, normal music players are provided with user interfaces like keypad with buttons which will make it bulky, unattractive. The users will access the songs by seeing the display. This makes the music player inaccessible to visually impaired as they can't see the display.

2. RELATED WORK

Most of the existing music players support controls such as play/pause, next song/fast-forward, previous song/fast-reverse, and volume up/down. iPod Shuffle also supports a "shuffle" mode to play a randomly selected song. Sansa Clip supports browsing lots of songs. Milestone 312 supports a feature called "Speakout" which associates a recorded message with an RFID tag so that the user can hear this message whenever the corresponding tag is scanned[1].If a number of songs are shortlisted, then the only option for a user is to step through the songs sequentially.When other techniques like tooth-touch sound are used to select songs it might be affected by noise[2]. All these music players use keyboard and display interfaces through which songs are selected, which is practically impossible to be used by visually blind people.

In this paper we can sort the songs futher and easily selected using touch pad and voice recognition module.In implementation, the project makes use of the following components: (a) MSP430 launchpad (b) Voice recognition module and (c) Touch pad. The new user interfaces can be used by visually challenged people and songs can be sorted in an easy manner without seeing them.

3. PROPOSED DESIGN

The proposed design consists of MSP430 microcontroller interfaced with touch pad interface and audio recognition module.The controller is interfaced with audio player and songs are sorted through touch pad and audio input interface.The MSP430 has 16KB flash memory and 512B RAM.It has serial port to which audio recognition module is connected. The digitally controlled oscillator (DCO) allows wake-up from low-power modes to active mode in less than 1 μs.The communication with voice recognition module occurs through UART interface.Peripherals are connected to the CPU using data, address, and control buses, and can be handled with all instructions. Each instruction can operate on word and byte data. The Figure-1 shows the MSP430 controller is interfaced with touch interface, voice recognition system and audio player to process the voice commands and touches and based on that, it sorts songs in music player.

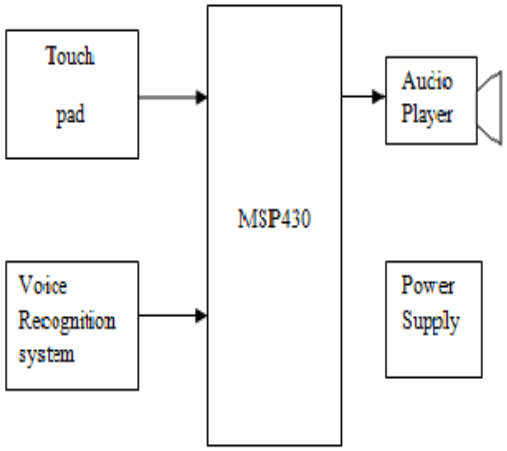

Figure-1. Block diagram of the system.

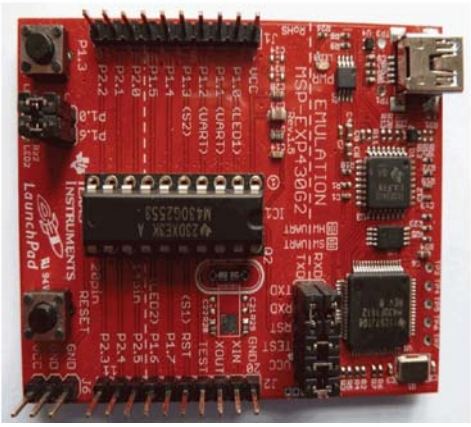

Figure-2. MSP430 launch pad.

The Figure-2 shows the MSP430 Launchpad.It has five low-power modes, is optimized to achieve extended battery life in portable measurement applications.

The device features a powerful 16-bit RISC CPU, 16-bit registers, and constant generators that contribute to maximum code efficiency.It consumes low power i.e.,230µA, Ultra-Fast Wake-Up FromStandby Mode in 1 µs.

4. SORTING SONGS BASED ON TOUCHES

The Audio player module has songs. The touch pad section consists of five touch pads. Two Touch pads are used to sort songs based on alphabets. When fifth touchpad is touched, songs in alphabet 'A' will be selected and all songs in 'A' will be played sequentially. When fifth touchpad is touched second time it will sort songs in 'B' and so on. When fourth touch pad is touched songs will be sorted in decrementing order, from 'Z' to 'A'.If the number of matches is zero, a message that there are no audio files by the artist is played on the player.i.e., When no songs are present in a particular alphabet feedback called "Not Available" is obtained.

If the number of matches is greater than 1, the user is given the option of playing all the songs by the artist or other searches. This narrow down the search.Using touch screen visually challenged people can easily access the songs in music player. Singer name, Artist name and Track name are used to sort songs.The song can be sorted in voice recognition module by giving the artist name,movie name or mood.In this project the Singer name, Artist name and Track name are used to sort songs and audio feedback for specific options which helps visually blind people.

The touch pad module consists of five touch pads, each when pressed produces Electro Magnetic field, the generated field produces voltage which in turn gives input to Transistor which triggers the IC555 which controls the timing delay. The output transistor acts as switch and sends the signal when IC is triggered to MSP430 controller. The MSP430 controller determines which touch pad is touched based on obtained signal from transistor and plays the selected song in audio player.The time delay may have to be adjusted by varying PT to compensate for the wide tolerance of electrolytic.An important feature to be noted here is that 555, unlike many RC timers, provide a timed interval that is virtually independent of supply voltage Vcc. This is because the charge rate of C and the reference voltages to the threshold comparator and trigger comparator are all directly proportional to the supply voltage. Operating voltage can range from 3V to 18V.The touch pad uses monostable mode with output pulse width of time *t*, which is the time it takes to charge C to 2/3 of the supply voltage, is given

$$t=RCln(3)=1.1RC$$

Where t is in seconds, R is in ohms (resistance) and C is in farads (capacitance).While using the timer IC in monostable mode, the time span between any two triggering pulses must be greater than the RC time constant.

The songs will be sorted in alphabetical order in decrementing order. When fourth touchpad is touched and particular alphabet is selected it can be decremented to the before alphabet. Similarly when fifth touch pad is selected and particular alphabet is selected it can be incremented to play song in next alphabet. Also the songs can be sorted using audio recognition through which songs are played by choosing Artist name, movie name, mood, name of the track also provides audio feedback for specific options which helps visually blind people.

The MSP430 has a UART interface through which it receives input signal. The MSP430 controller is programmed to perform further operations to select song based on audio input.

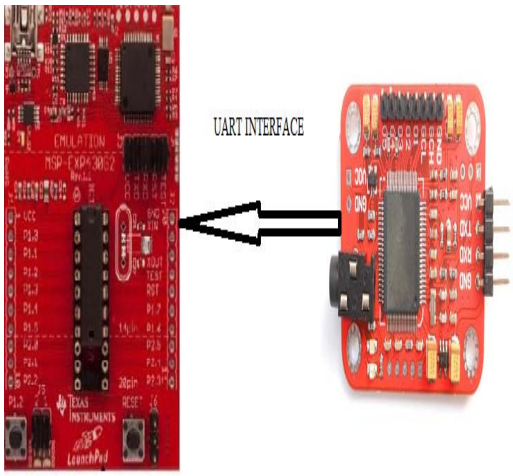

Figure-3. Song selection through audio input.

The Figure-3 shows the way of transmission of audio input signal received in real time by voice recognition module which does the speech processing by comparing trained signal with real time input.

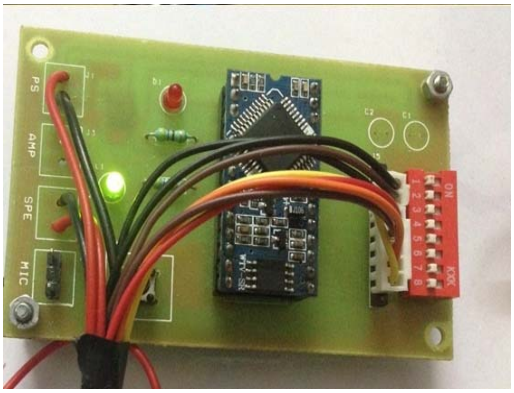

Figure-4. Audio player module.

The Figure-4 shows the audio player module which has DIP switch that enables input signal which is sent from controller to audio player.The audio player plays the song when input signal is obtained from controller through voice input or touch.For recording the voice commands we use Access port Software

5. MODE SELECTION

The main difference between Compact Mode and Common Mode is the returning message. Common mode response is long string but compact mode response is a byte. For example, after sending 0xaa04 to delete all the contents of the 3 groups, in Common Mode it will return "All Groups Deleted! \ n", but in Compact Mode it will return a concise bytes such as 0xcc which means a successful operation. If voice instruction is recorded, each time after you power it on, you need to import the group before letting it identify voice instructions. The software is used to record songs in audio player.

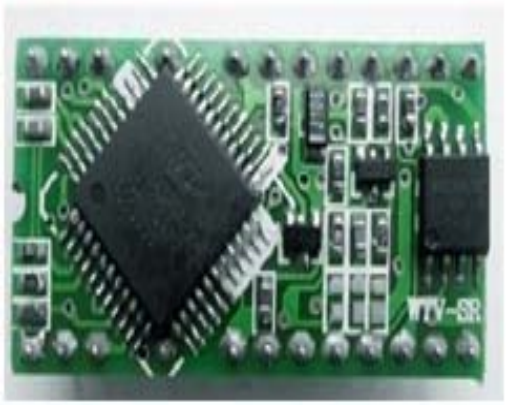

Figure-5. WTV-SR and WTV080-44F2 IC's.

The audio player has WTV-SR and WTV080-44F2 IC's are shown in Figure-5.

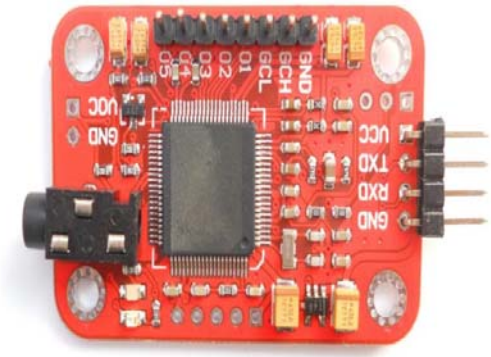

Figure-6. V2 Voice recognition module.

The songs are loaded into audio player by means of WTV-SR Voice Chip Beta1.3.If voice instruction is recorded, each time after you power it on, you need to import the group before letting it identify voice instructions.WTV080 has mode (keyboard), key combination mode (key array), parallel port mode(COM+SBT), serial port mode (one-line three-line),they are almost the same.WTV series chips are high cost effective.

The Figure-6 shows the voice recognition module which does the audio processing.

6. TRAINING COMMANDS

Before using it, we have to train it by recording voice instructions. The Figure-7 shows the training of commands. Each voice instruction has the maximum length of 1300ms, which ensures that most words can be recorded. Once you start recording, you can't stop the recording process until you finish all the 5 voice instructions recording of one group. Also, once you start recording, the previous voice instructions in that group will be erased.

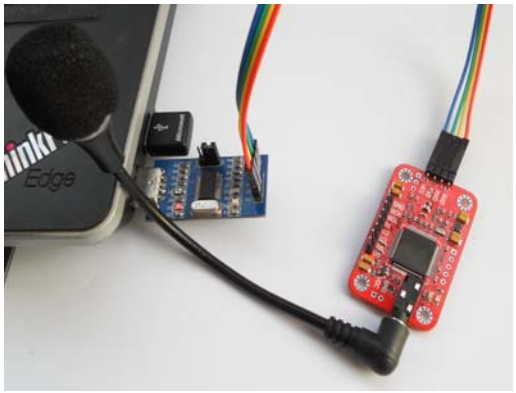

Figure-7. Training commands.

The O1~O5 are pins which output the result of voice recognition. For example, if the first voice

instruction in the working group is recognized, O1 could output HIGH signal.

7. RESULTS

The Figure-8 shows the Interfacing of voice recognition module with MSP430 controller, touch pad with timer IC circuit, MSP430 controller and audio player is interfaced at output to get the signal to the MSP430 controller. The Touch pad module has five touch pads.

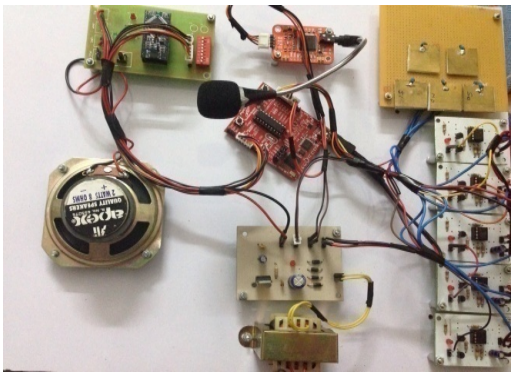

Figure-8. Experiment setup.

Table-1 shows the results of touches in the touch pad module. If first touch pad is touched, it selects track name. If second touch pad is touched, it selects music director name. If third touch pad is touched, it selects singer name. If fourth touch pad is touched, it selects songs in decrementing alphabetical order. If fifth touch pad is touched, it selects songs in incrementing alphabetical order.

Table-1. Touch pad selection.

Touch PAD 1	Touch PAD 2	Touch PAD 3	Touch PAD 4	Touch PAD 5
Track name	Music director name	Singer name	Decrementing songs in alphabetical Order	Incrementing songs in alphabetical order

8. CONCLUSIONS

Advanced music player with voice recognition and touch interface is implemented. This project eliminates the need for display, since songs are selected by means of voice commands and touch pad. While several kinds of audio players are available in the market, they have drawbacks(i.e).,visually impaired users will find it difficult the user interfaces provided in normal music players.The usual way of navigation through songs will make it difficult if large number of songs are provided.

This project features an audio player with a special mode for visually impaired users.Also this music player will assist the drivers in vehicle during driving by helping them to select songs without viewing the display screen,thus preventing accidents.This overcomes the disadvantage of other audio players by providing search option in an easy manner.

9. FUTURE WORK

Presently,the project implementation keeps the entire song database in the flash memory of the audio player with limited memory. This limitation can be overcome by a better software implementation which keeps song database in the memory of SD card. Also voice recognition module which can store large number of commands can be used to sort various songs in an efficient manner.

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