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Voice Touch Screen Display for the Education of Blind Students

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Abstract - *This instrument is an electronic device for the blind. It is a design to meet the requirements of needy blind students, it is very simple to control, robust constructed and is activated by touch only. Visually handicapped Children can select the activities by just touch the touch screen guided by the pointers placed at just side of touch screen. When we clicks on the Menu option, the device will start interacting with the student. Thus it is so simple design for use with peoples who doesn't have computer experience. To serve this purpose we make use of combination of Touch screen, graphics LCD and a Pointer like device. Here the user will be shown a MENU on the graphics LCD and trough the touch screen the user has to choose from the menu. After touching the appropriate menu the user can start interacting with the embedded device.*

Key Words: blind, touch screen, LCD, menu, embedded etc.

1. INTRODUCTION

Touch screens are rapidly becoming common interfaces from small handheld devices to large industrial consoles, people can interact with information using their fingertips. To enable touch screens to provide a more interactive user experience, there has been an increasing recent interest in incorporating tactile hectic feedback into these devices as well as an audio Play back system. Such hectic – typically vibratory – feedback is designed to enable the user to "feel" virtual objects (e.g. the click of a button). This is particularly useful when user attention is or can be diverted from the touch screen due to multitasking or interruptions. There are so many different technologies have been developed over the past few years to interlink touch screens with Graphical interface. The simplest way to create touch screen based Voice feedback system is to design a Education frame work on the graphics LCD and keep a touch screen over the display.

By referring sight visit, hearing and touch are definitively the first important human senses, respectively. For the blind, they evidently become the first abnormal things of their life. Blind people rely on hearing environmental sounds and moments for key tasks such as: situation, peoples, moments and their safety also. For example is when a blind fellow is crossing a street intersection all alone: they stand-still listen to the environmental noise and will cross when the traffic light sequence is fully understood.

The main Idea behind the project is to design an handy educational embedded device which can be used by the visually Impaired. For this may design criteria's are considered such as µC, Graphics LCD, Touch screen, SD card interface. Etc.

2. Objective:

The true objectives of blind education are to:

- Provide the similar sense and knowledge for blind children as those provided for normal children
- To keep blind children and their families, friends, relatives and nearest peoples to interact in society with normal situations
- To Change the regular mindset of people to blindness by showing that blind children are children first and blind children next
- Provide a natural experience to blind students so that they may contribute to the society in all sectors or fields.

3. Problem Statement :

The main Idea behind the project is to design an handy educational embedded device which can be used by the visually Impaired. For this purpose we use microcontroller, graphics LCD, touch screen, SD card interface. Etc.

3.1 Problem Definition:

The main objective is to design an electronic book for the blind. It is a design is to fulfill the needs of blind students, is robust and simple to control, and is activated by touch only which is very commonly used now. Blind childrens can choose the subject by touching the touch screen guided by the pointers placed at the side of touch screen. When we clicks on the menu option, the device will start interacting with the student. Thus it is a simple design for use with people can use who doesn't have computer experience.

3.2 Problem solving strategy:

Here the user will be shown a MENU on the graphics LCD and trough the touch screen the user has to choose from the menu. After touching the appropriate menu the user can start interacting with the embedded device.

As shown in Figure 3.1 the touch screen comes with a pointed reference. By using this reference points the blind student can access the menu. Here the Menu will be announced verbally via messages stored in SD card. After

giving the answer the user will be announced with result in the form of sound. All the items in the MENU are for education purpose. The user will be presented with a series of fun tasks for which he has to answer from the 4 options.

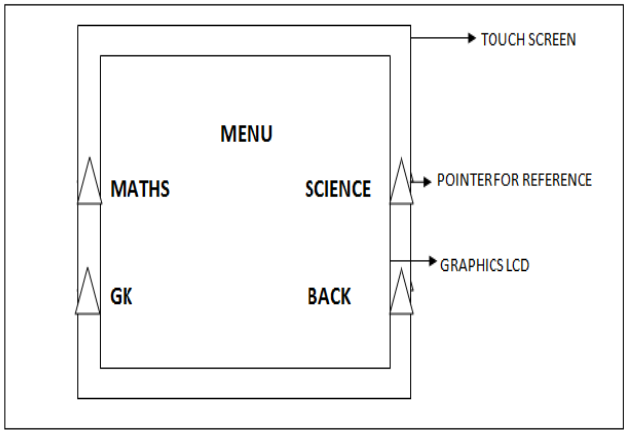

Figure 3.1 Resistive Touch screen

After giving the answer the user will be announced with result in the form of sound. Also the device will have some songs to play. For this we are interfacing a 2GB SD card to the µC. The SD card will store the songs. The user can select from any of these songs, after selecting the song shall be played via speaker assembly.

Blind students don't recognize the menu directly. There are 4 pointers given in the graphics LCD (shown as 4 triangles in the diagram). The blind student can feel these triangles via his fingers. These triangles are located next to the menu. So the student can know exactly where to press in the touch screen. When the student touches that part of menu we are doing voice announcement via SD card. So the student listens to the menu.

Figure 3.2 shows block schematic of system. System contains main 4 sections like resistive touch screen, graphical LCD, SD Card, speaker system. Block diagram also contains ARM7 processor and 4 keys keyboard to select the menu.

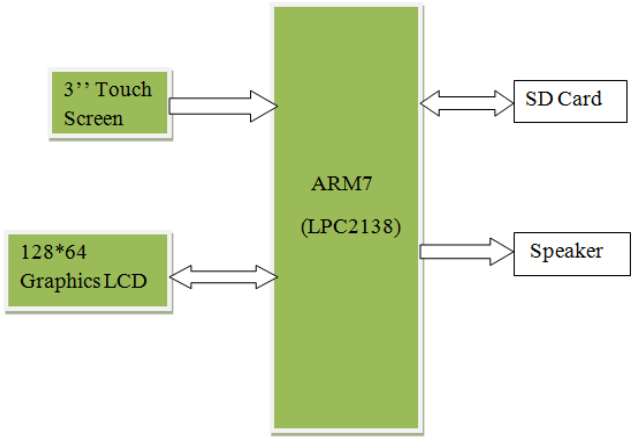

Figure 3.2 Block Schematic for Method of Implementation

4. METHODOLOGY

This device is an electronic Book for the blind or handicapped students. It is a design is to fulill the needs of blind students, it is robust and very simple to control, and it is activated by touch only which technique used in common now. To serve this need we make use of combination of Touch screen, graphics LCD and a Pen like device. Here the user will be shown a r on the graphics LCD and trough the touch screen the user has to choose from the menu. After touching the appropriate menu the user can start interacting with the embedded device.

I. ARM:

The ARM7TDMI-S is a general purpose microprocessor with having beats 32, It can offer high performance and very low power consumption. The ARM architecture is utilized on Reduced Instruction Set Computer (RISC) principles and the instruction set and related decode mechanism are so simpler than those of micro programmed Complex Instruction Set Computers. Because of this simplicity in a high instruction throughput and impressive real-time interrupt response from a small and provide us cost-effective processor core.

The ARM7TDMI-S processor has two instruction sets:

• The standard 32-bit ARM set.

• A 16-bit Thumb set.

The Thumb set's 16-bit instruction length allows it to approach twice the density of standard ARM code while retaining most of the ARM's performance advantage over traditional 16-bit processor using 16-bit registers.

We can use this because Thumb code works on the same 32-bit register set as ARM code. This Thumb code can provide around 60 % of the code size of the ARM, and 150 % of the performance of similar type of ARM processor which is connected to a 16-bit memory

system. The impact on the overall code size will be very small but the speed we can increase around 30% over Thumb mode.

II. Touch Screen:

Resistive Touch Screen Panel:

The resistive touch screen panel is with so many layers, the most important of which are two thin layers which are transparent. These layers are electrically-resistive separated by very small gap. These layers kept with facing each other with a small gap between the top screen (the screen that is touched) has a coating on the below surface of the screen. It is a similar resistive layer on top side of its some portion. One layer has connections along with its sides, the other layer have connections on its top and bottom.

A voltage is supplied to one layer, and it can be sensed by the second layer. When any substance, such as a finger or stylus tip, presses down onto the outer surface of layer, the two layers touch to each other and connect at that point: The panel then treats as a common pair of voltage dividers, on one axis at a time. By suddenly changing between every layer, the position of a pressure on the screen can be read.

Structure of resistive touch screen:

A resistive touch screen is having top and bottom transparent sheets facing each other with a small gap between them. The top and bottom sheets are coated with Oxide film. ITO is a transparent conducting material. The top sheet and bottom sheet is having uniform resistance on its surface.

When the top sheet is pressed, the pressed point of the top sheet physically activates and contacts the bottom sheet. When the ITO layers of the top sheet and bottom sheets contact, electricity gets conducted at that contact point and the location of the contacted point is detected. The material of construction of the top sheet should be flexible, because it should be yield when pressed. PET film, glass or polycarbonate plastic is most times used components. The PET film is utilized as top sheet and glass as bottom sheet in most of the cases.

III. SD Card:

SD card is a storage device which will required or used to store the required data. The information of database can be used to store in SD card in the form of .wav file and also accessible from that whenever it is required. SD card is attached with the system using a system protocol called SPI protocol.

SD (SDSC):

In explanatory words Secure Digital card was generated to improve on the MultiMediaCard (MMC) standard, which is also called as SDSC or Secure Digital Standard Capacity Secure Digital changed the MMC design in following ways:

- Non symmetrical shape of the sides of the SD card doesn't allow inserting it upside down (while an MMC goes in most of the way but makes no contact if inverted).
- Very few SD cards are with 2.1 mm (0.083 inches) thick, compared to 1.4 mm (0.055 inches) for MMC cards. The SD specification tells us that a card called thin SD with a thickness of 1.4 mm, but they came only few times, as the SDA went on to give even smaller form factors.
- The card's electrical contacts are attached on the surface of the card, which protect them from contact with a user's fingers.
- The SD specification envisioned capacities and transfer rates are more those of MMC, and both of these facilities have grown over time.
- While MMC uses a single pin for data transfers, the SD card uses a four-wire bus mode to get higher data rates.
- The SD card is having CPRM security circuitry for digital rights management (DRM) content-protection.
- Addition of a write-protect notch

Full-size memory SD cards will not fit in the slim MMC slots, and other issues are also there due to which affect the ability to use one format in a host device designed for the other.

SDHC:

The Secure Digital High Capacity (SDHC) is launched in Jan 2006 and defined in version 2.0 of the SD specification, supports cards having capacities up to 32 GB. The SDHC trademark is kept with license to trace compatibility.

SDHC cards are physically and electrically looks same to standard-capacity SD cards (SDSC). The major suitability problems in SDHC and SDSC cards are the Card-Specific Data (CSD) register in version 2.0 and the in reality SDHC cards are shipped preformatted with the FAT32 file system. Version 2.0 also launched with a High-speed bus mode for both SDSC and SDHC cards, which gives the original Standard Speed clock to produce 25 MB/s data.

SDHC host devices need to accept older SD cards. Some old host devices could not recognize SDHC or SDXC memory cards, but some devices can do so through a firmware upgrade version of cards.

IV. Graphic LCD Module:

The Graphic LCD Module shown is normally (for example JHD12864J) splited logically into two portions. One portion

with controller #1 (CS1) which will drive the left half portion of the display, and controller #2 (CS2) will drive the right half portion.

These two portions linked directly to the physical display areas of graphic LCD. With a correct controlling on pin CSx (x=1,2), D/I, and R/W, we can write anything. Just like pattern, image, animations, and text in bigger fonts directly to the LCD screen at a specified column position.

Backlight :

As LCDs do not produce light themselves, they need regular light or a special light source to generate a visible image. Backlights guide the LCD from the side or back of the display panel, just like front lights, these are placed in front of the LCD. Backlights are used in low light conditions to increase readability in small displays.

4.4.3Features of Graphic Display:

- •Display construction: 128*64 DOTS
- •Display mode: STN / Yellow Green
- •Display type: Positive Tranflective
- •Viewing direction: 6 o'clock
- •Operating temperature: Indoor
- •Driving voltage: Single power
- •Driving method:1/64 duty, 1/9 bias
- •Type:COB (Chip On Board)
- •Number of data line: 8-bit parallel
- •Connector: Pin

4. FACILITIES AVAILABLE AND REQUIREMENTS

Software:
Embedded C Programming in Keil

Circuit & Layout Designing: Proteus 7.7

Programming At PC Using Visual Basic 6.0

Hardware:

ARM7

LCD **:-** LAMPEX
BAUD RATE**:** 9600 BPS, TIMER MODE 1
AUTORELOAD MODE

Touch screen : Resistive 3 inches

6. CONCLUSIONS

Using such electronic device, visually handicapped students can evaluate a variety of phenomena, from education systems point of view. If we use ARM-based voice touch screen system then it can provide the most flexible, customized, and integrated solution. To define voice touch screen systems, we must evaluate your requirements for different functions like songs, mathematics, science and quiz and etc... Based on these requirements, we can choose touch screens, graphical LCD and hardware to meet our needs.

If we use ARM-based control systems then it is an important tool to visualize and analyses experimental data, scientific data, mathematical calculations and songs. It is having the capacity to clearly present real time results, with sensors and probes it will respond to parameters that are beyond the normal range available from most of the regular equipment's.

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