SMART WRITING BOARD USING RASPBERRY PI

Akangire Rohini Dilip[1], Awatade Bhagyashree Vitthal[2],

Burungale Akash Laxman[3], Prof. Punam Chaudhari[4]

[1,2,3,4]*Department of E&TC, G.S.Moze College of Engineering, Balewadi, Pune (India)*

ABSTRACT

Multimedia applications are a very common trend nowadays in classroom teaching. Traditional chalk board system produces a lot of chalk dust which pollutes the air and also affects adversely on the health of students and teachers. Whereas, on the other hand using multimedia in teaching process helps in better learning and understanding. Different international firms like Panasonic, Hitachi are working on developing the technology which can efficiently replace the traditional blackboard.

The unit consists of Raspberry-Pi board which is to be connected to the projector through HDMI port. When a person writes on touch screen of the hand held unit using a stylus, the signals are converted into electrical signals and are transmitted to the Raspberry pi board. Raspberry board processes the signal and displays the written content using projector.

I. INTRODUCTION

In India, the traditional scheme of teaching using blackboards has many disadvantages such as teacher has to approach the blackboard if he wants to explain his point. Traditional teaching scheme still uses chalk-blackboard or slate pencil approach. If it is possible for him to write or draw on the board remotely i.e. without actually approaching the board, it will be convenient for him as well as students. Through this project we are trying to draw a pattern or figure what we write on touch pad on transmitter side with the help of Touch screen equipped portable device. The chalk, which is simply compressed dust, can bother some educators and students with allergies, not to mention land on top of other school equipment that is dust sensitive, such as computers and microscopes. The idea of cost reduction and enhancing the quality of service in the field of technology-aided teaching is put forth in this paper. It proposes the use of Raspberry Pi for transmission and reception of hand written signals to be displayed on the projector. Also web interface of Raspberry Pi is used to store files that have been sent from remote sources and view these power point files or Portable Document Files(PDF) on the projector. The aim of the proposed system is to substitute laptops with Raspberry Pi which will drastically reduce the cost involved,yet will provide the same functionality as any other similar system does System Design.

II. SYSTEM DESIGN

System includes two units which are handheld unit and remote unit. Handheld unit receives processes and sends handwritten signals to the remote unit by using RF module . Handheld unit includes AVR microcontroller, Touch screen, GLCD display and RF module. Remote module is a Raspberry Pi ARM11 board which has HDMI port to display processed handwritten signals in larger view by interfacing projector with it.

A. Handheld transmitter unit

At the handheld unit terminal we are using AVR microcontroller with GLCD and touch screen. The touch sensed by the touch screen is converted into electrical signal by the processor and transmitted to the remote unit wirelessly via RF module. Also at this unit, inputs are provided for power supply.

B. Remote receiver unit

At the receiver side we are using Raspberry-Pi ARM11 board for processing of the signals that are sent from the handheld unit. In last article we saw that these signals are again received using RF receiver. ARM 11 boards gives output signals at the HDMI port which can be visualized on the projector display. Raspberry-Pi Arm11 also has USB port to play or run the files stored in the external USB device such as pen-drive.

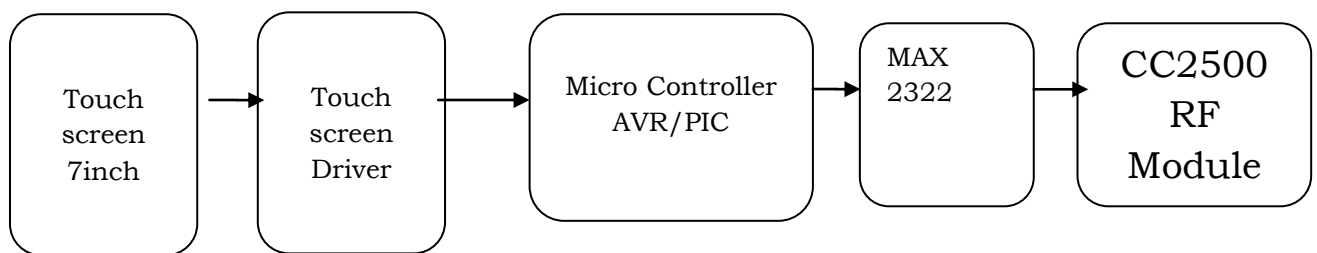Touch screen 7inch → Touch screen Driver → Micro Controller AVR/PIC → MAX 2322 → CC2500 RF Module

Fig.1 Handheld Unit

At the handheld unit terminal we are using ARM7 board with GLCD and touch screen. The touch sensed by the touch screen is converted into electrical signal by the processor and transmitted to the remote unit wirelessly via RF.
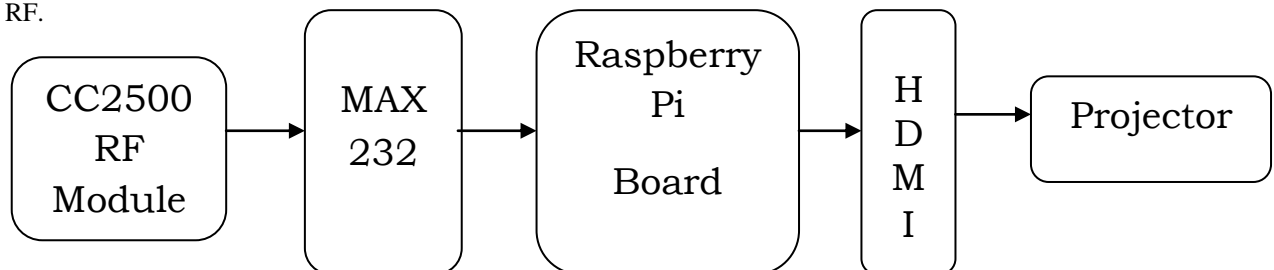
CC2500 RF Module → MAX 232 → Raspberry Pi Board → HDMI → Projector

Fig.2 Remote Unit

III. HARDWARE DESIGN

Handheld Unit Hardware Design

Handheld unit includes AVR microcontroller. AVR microcontroller have power saving features due to which they are widely used in mobile electronic devices where low power consumption is critical consumption goal. Touch screen display is used to receive handwritten signals and RF module interface for sending signal to remote module using RF transmitter. Diagrammatic structure of handheld terminal unit is shown in figure 1.

A. Touch Screen

A touch screen is an electronic display which is sense the location of a touch within the display region. In this project the 4 wire resistive touch screen display is used. The phrase generally refers to touching the display of the device with a finger and stylus. Fig. shows how to interface the touch panel with the LPC2138 processor. To identify the touched location, we have to read touch position consecutively i.e. first read X position and then read the Y position.
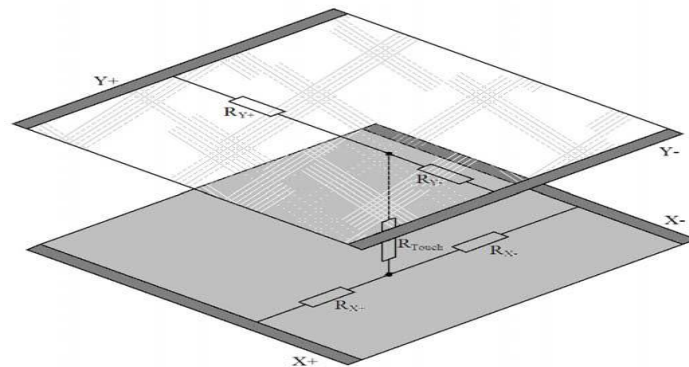
Fig.3 Touch Screen Foils

a. Principle of operation

The resistive touch panel is constructed by sandwiching two transparent rigid foils having resistive layer on their inner side. Usually the resistance of the foil should not exceed 1Kohm. Contacts made on the opposite sides of the foils by a flat cable. The process of identifying the touched place point is partitioned into two steps. The first step is to identify the X co-ordinate and the second one is to identify the Y co-ordinate. Thus voltage divider is made when we touches on the screen. Y surface bottom contact reads the values of divider. Then divider voltage ranges from 0V to power supply voltage and it depends upon the X coordinate.

Table1. Touch screen Configuration

Touchscreen Configuration				
	X1	**X2**	**Y1**	**Y2**
To Measure X position	Logic High (+5v or +3.3v)	Logic Low(GND)	--	ADC
To Measure Y position	ADC	--	Logic Low(GND)	Logic High(+5v or +3.3v)

If the touch is nearer to X surface left contact, then the voltage is taken as 0V by the processor. In order to identify Y co-ordinate of Y surface then bottom contact of surface Y is grounded and upper contact is connected to power supply.

B. Raspberry Pi

Raspberry Pi is a credit card sized computer. It's basically a small PC which provides all the basic functions that are provided by a desktop PC. For example, it provides functions like word processing, gaming and playing audio/video. It has become a widely used device for learning programming since last one year. The Raspberry Pi is a 3.370 X 2.125 motherboard with a 700 MHz CPU and a 250 MHz GPU. The Ethernet LAN port is present for internet and remote access. It also has an HDMI port, through which it can be connected to any display device, like the monitor or the projector. Another great facility which Raspberry Pi provides is the presence of two USB ports, where one can connect his pen drive or USB mouse/Keyboard. General Purpose Input/output (GPIO) are a set of generic pins on a Raspberry Pi whose behavior can be controlled as well as programmed through software. The Raspberry Pi also has an SD card slot, which can act as an internal storage and can also store an image of Operating System.

IV. SOFTWARE DESIGN

A. Handheld Unit Software Design

Operations that are to be performed by handheld terminal unit are information collection from resistive touch screen, processing that information and sending signals to the remote terminal unit using wireless RF module. Inbuilt touch screen controller receives handwritten signals from the patterns drawn on touch screen with an interrupt signal to the LPC2138. Now, AVR reads this information, processes it and extracts the information contents in the signal. Information contained in the handwritten signal is extracted in relative registers by inquiring Interrupt Request Number (INR).. One by one each touch message is received and processes by the processor. After initialization of the handheld terminal unit hardware, when a pattern was drawn on the screen, the first dot is detected and its co-ordinates are calculated as explained in the explanation of resistive touch screen. As we draw a continue pattern, it is considered as string of dots. All such a dots are collected i.e. a free hand sketch or letter on graphical LCD is drawn that is drawn using the resistive touch screen. This string is then matched. If string matches then data is sent to the remote unit. If string does not match then again operation is repeated and touch screen message is read again
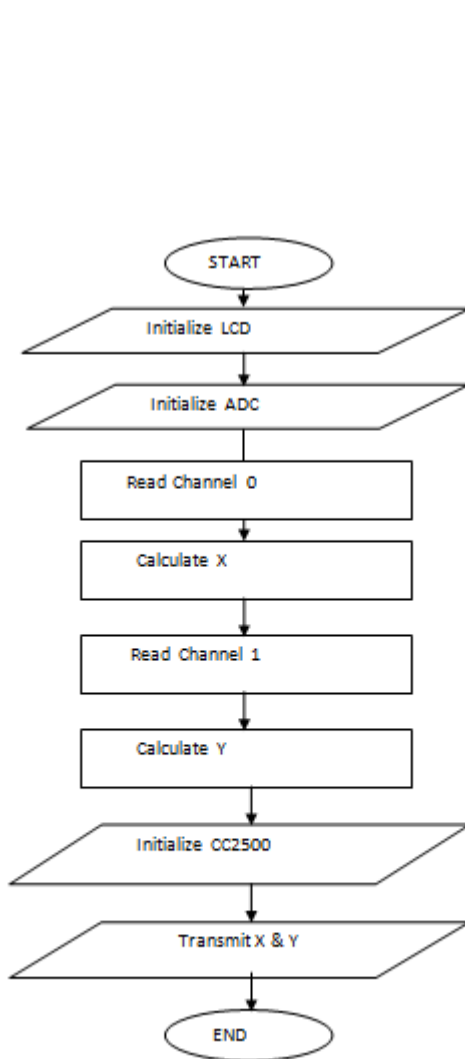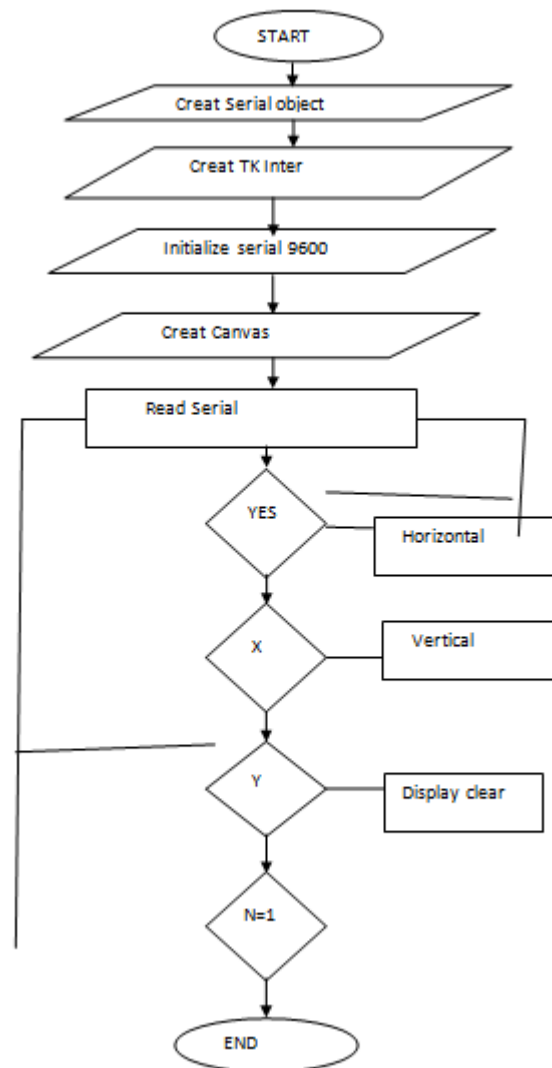

Fig.4 Flowchart for Handheld unit   Fig.5 Flowchart for Remote unit

B. Remote Unit Software Design

Remote unit mainly includes Raspberry-Pi ARM11 board. It receives signals from wireless receiver module in the receiving queue. If the receiving message queue is non-empty then terminal handler reads the information and displays in on the projector using video out interface after analyzing the read information.

If the receiving message queue is non-empty then whole operation is again initialized. Flow chart for operation of remote unit is shown in fig 5. Tasks of information collection, information extraction and displaying information are carried out under the Linux operating system along with embedded C programming for Raspberry Pi module.

V. FUTURE SCOPE

1. The project can be made more efficient by using a capacitive touch pad/touch screen.

2. In this project we can add the feature of letter recognition.

3. By using a proper method like finger print recognition method in the handheld terminal, we can implement the attendance monitoring in the same system.

4. Can provide memory element for showing the different file formats.

5. The proposed system can be efficiently used for the organizations where teacher can teach far distance class from the remote place by adding video calling to the proposed system.

6. Another future prospect is that we can project the text on projector in the standard fonts (Times New Roman, Calibri etc.) using Look up Table Functions in ARM. This can make system more user friendly to teachers and students.

VI. ADVANTAGES

1.Easy to operate and handle.

2.Less power supply is required i.e. 5v supply.

3.This is a portable device.

4.Cost is less.

5.Components are easily available in the market.

VII. APPLICATION

1.In colleges use to give better performance on projector.

2.Traditionally Hospital have utilized erasable smart board to communicate and exihibit caregiver schedules ,staff instructions ,patient data and other medical info.

3.In restaurant uses for display order and menu card.

4.In industries uses for smart board include teaching ,training ,conditioning, meeting and delivering presentation.

VIII.CONCLUSION

This system will reduce the effort of person while giving the presentation in public or in conference. The whole presentation will be controlled through RF module application. This system will be live streaming of presentation work. Vendor will easily control the presentation through its mobile application. In this our

projector will be attached with raspberry Pi where the RF module is also being attached. This will be a low cost, easy to use system.

IX. ACKNOWLWDGEMENT

To put an efforts like this requires the determination and help of many people around us and we would not be doing justice to their efforts by not mentioning each helping hand in person. We feel privileged to acknowledge with deep sense of gratitude to our guide **Prof. Punam Chaudhari,** for her valuable suggestion and guidance throughout our course of studies and help render to us for the completion of the report.

REFERENCES

[1]   Di WU,Yang Zhang "Wireless Electric Board Based on an ARM-based Embedded System", School of Mechatronics Engineering, University of Electronic Science and Technology, Chengdu 611731, China, 978-1-4244-5540-9/10/$26.00 ©2010 IEEE

[3]   "Designing a System Allowing High-Definition Video Transfer with Minimum Latency and Multi-use Access to Projection Device by Wireless", Hamza Osman İlhan, Ahmet Akbaş, IEEE 2010.

[4]   "Interactive electronic board using ARM processor" Mrs. Mayuri Joshi*, Prof. Sunil .S. Morade International Journal of Scientific and Research Publications, Volume 3, Issue 1, January 2013 1 ISSN 2250-3153

[6]   WWW.IEEE.COM

[7]   www.engineersGarage.com

[8]   www.datasheetcatalog.com