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Smart writing board

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Abstract – *Technology is changing the way our life functions and if it's good for us, then why not go for it! Use of multimedia devices is very common in these days for classroom teaching. The traditional way of teaching uses chalk board system that produces chalk dust which causes air pollution. Some students and teachers caught by allergic reaction due to chalk dust. Whereas, due to use of technology in classroom for education built more interaction between teacher and students. The smart board saves you from distress and won't let you develop any health issues later. This project is mainly concerned to the effective use of technology for teaching purpose. It includes two units. The handheld transmitting unit is portable and controlled by user. The remote receiving unit consists of Raspberry-Pi board. When teacher writes on handheld touch screen using stylus, the signals get converted into electrical signal and transmitted to ARM 11 board via Bluetooth. The remote unit receives, processes and displays it on screen using projector.*

Key Words: **Atmega-16, Raspberry-Pi, Wireless, Bluetooth, Python.**

1. INTRODUCTION

Though the technology has been everywhere, In India teachers are still using chalk board system for teaching purpose. Every time when teacher wants to write or draw something, he has to approach to the board. We all are familiar with the allergies due to chalk dust. Also there are many electronic types of equipment like computer which are dust sensitive. Companies like Hitachi and Panasonic manufactures smart boards but these boards are very costly. The proposed system make possible to write on board remotely. In this AVR Atmega-16 and Raspberry-Pi are used in two units. Anything which is written or drawn on the resistive touch screen gets converted to the electrical signal. It is then transmitted by the Bluetooth module connected to Atmega-16. The signal received by Raspberry-Pi is then displayed on the screen through projector which is connected to the HDMI port of Raspberry-Pi module.

2. SYSTEM OVERVIEW

The proposed system consists of two subunits. The handheld transmitting unit consists of Atmega-16, touch screen and Bluetooth for wireless transmission of signal. Remote receiving unit is consisting of Raspberry-Pi module 3, projector connected to the HDMI port and screen.

2.1 Handheld unit

The resistive touch screen senses the touch and the electrical signal equivalent to the resistive signal are processed by Atmega-16 controller. This signal is transmitted by Bluetooth wirelessly.

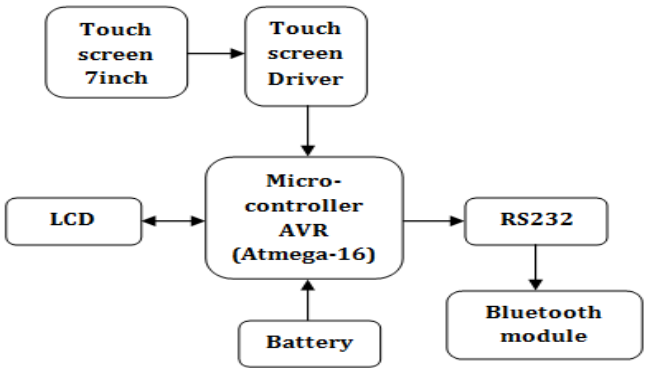

Fig-1: Block diagram of handheld unit

2.2 Remote unit

The remote unit consists of Bluetooth connected to Raspberry-pi which receives the transmitted electrical signal and process it. The projector is connected to Raspberry-pi board via HDMI port. The projector displays the processed data on the large screen.

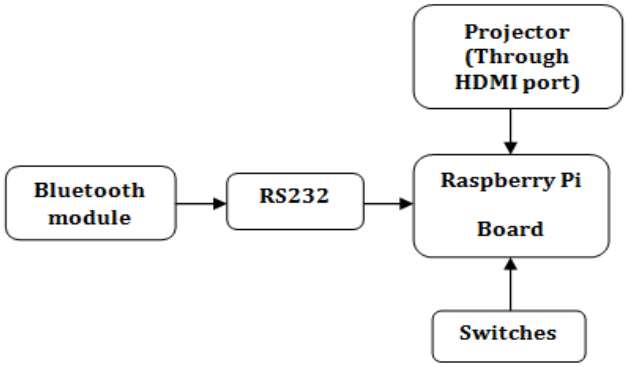

Fig-2: Block diagram of remote unit

3. HARDWARE SYSTEM DESIGN

3.1 Handheld transmitting unit design

The high performance, low power, Atmel, AVR 8-bit microcontroller is used at transmitting unit.
Touch screen is used to write or draw the pattern.
The Bluetooth module is used for transmission of signal by wireless technique to the receiving unit.

A.Atmega-16

The Atmega-16 is CMOS low power 8-bit microcontroller based on the AVR enhanced Risk architecture. It has speed grade 0-16 Mhz. various peripheral features of Atmega-16 are 3 timer/counters, 8-channel 10-bit inbuilt ADC, SPI serial interface, JTAG (IEEE std. 1149.1compliant) interface. In this project we have done the programming in Embedded C language and program is run in AVR studio 4 software. For design of circuit diagram Proteus_v 7.8i is used. Touch screen is interfaced with Atmega-16 which takes the electrical signal, process it and sends to Bluetooth module interfaced with it.

B. Touch screen

Touch screen is computer display which is sensitive to the pressure. The touch screen we are using in this project is 4 wire resistive type. A resistive touch screen consists of number of layers. When the screen is pressed, the outer layer touches to the inner layer which senses that presser is being applied and resisters input. A resistive touch screen is versatile as it can be operated with finger, fingernail, stylus or any other object. To know the location of touch we have to read x position and y position consecutively.

C. Bluetooth transceiver

Bluetooth is the foundation of transformative wireless connectivity. A Bluetooth device uses radio waves for wireless transmission of signal. In this project we are using HC-05 serial port module.HC-05 is an easy to use Bluetooth SPP, designed for transparent wireless serial connection setup. It is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps modulation with complete 2.4GHz radio transceiver and baseband.

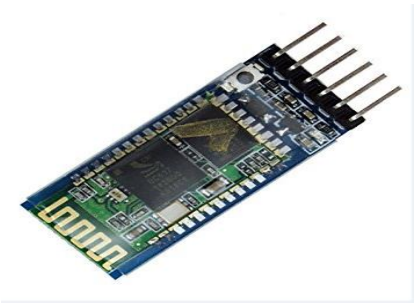

Fig-3: HC-05 Bluetooth module

3.2 Remote Receiver unit design

A. Raspberry-Pi

Raspberry pi is credit card size computer and powered by Broadcom BCM-2835 System-on-a-Chip(SoC) originally designed for educational purpose. This Soc contains 64-bit quad-core ARMv8 CPU with clock rate 1.2 GHz and videocore IV GPU. In this project we are using Raspberry-Pi 3 model B which have Ethernet, wireless LAN , Bluetooth 4.1, Audio and video output (HDMI port), camera connector, SD card slot.

4. SOFTWARE

4.1 Handheld unit software design

When the battery is ON the power is given to the ADC of Atmega-16.The ADC, RS232, GPIO of Atmega-16 are initialized. When the signal is passed, channel0 and channel2 of ADC get read. Calculation of X and Y position is done by ADC and signal is given to the transmitting unit.

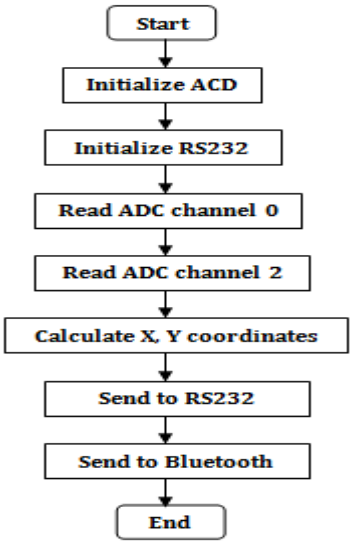

Fig-4: Flow chart for handheld unit

4.2 Remote unit software design

When the signal from the transmitting Bluetooth is received at remote unit, the RS232 of receiving unit is initialized and Bluetooth reads the signal. Bluetooth is connected to Raspberry-Pi which processes the received signal according to the switches. As we are using switches there are conditions given 1 and 2 respectively. If the user chooses condition 1 then we can show PPT ,PDF which will be displayed on the screen by the PD which is connected to the Raspberry Pi .If the user need to draw any hand written pattern then condition 2 is selected and by using touch screen we can draw the pattern.

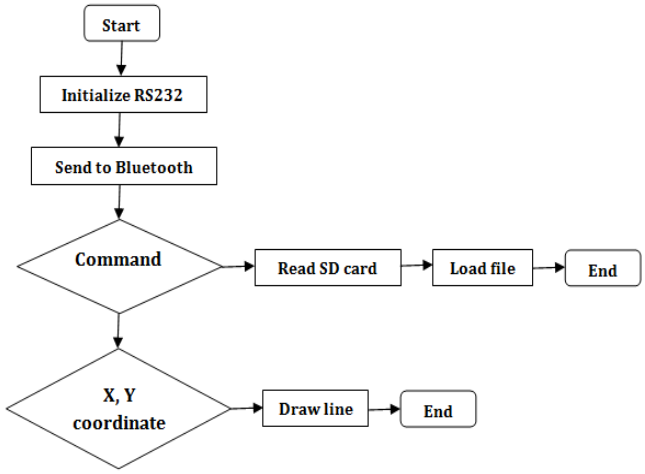

Fig-5: Flow chart for remote unit

5. FUTURE SCOPE

1. We can change the font of the text into standard fonts (Times new roman, Cambria etc.)And make it more users friendly.
2. Another future scope is that, we can store the written text or pattern and resume when we want by doing appropriate memory interfacing.
3. We can use Wi-Fi module instead of Bluetooth for long range purpose.
4. We can add video calling function so that teacher can teach from far distance.

6. CONCLUSION

In this paper we have successfully implemented the system by which teacher (user) is allowed to write on the screen from a distance (10-15m). From our project we have overcame the shortcomings of traditional chalk black board approach of teaching by replacing it with a handheld unit. The pattern or handwritten signal is drawn on the screen which can be resized and we can change the colour of the pattern. We can also show the PPTS, PDF on the screen. Our project is cost effective as compare to the present white board. It also has similar features like laptop.

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