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Raspberry-Pi Based Wireless Electric Board

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Abstract - *With the development of the society and economy, more and more advancements needs to be introduced in the field of teaching. Teachers are still writing on black boards using dusty chalks though it cannot fulfill the needs of efficient and advance teaching process. This teaching methodology is day-to-day existence in almost every schools. The boards manufactured by companies like Hitachi and Panasonic costs very high. Designs which are previously invented costs a lot which are not affordable in large quantity use. Proposed design presents a low cost design with added features and user friendly operation. Raspberry Pi is the heart of both handheld terminal unit & Remote unit hardware which uses platform of embedded Linux programming. A resistive touch screen is used to receive handwritten signals from touch message information. These signals are converted in electrical signals which are then processes by ARM11 and transmitted by using wireless module. There is a wireless receiver at the remote terminal unit which receives the transmitted signals. These signals are then collected analyzed and processes by raspberry Pi. These are then displayed on screen with the help of projector which is connected to the video out pin or HDMI port of the Raspberry Pi.*

***Key Words*: Raspberry pi, WiFi, Touchscreen TFT, Linux Programming**

1. 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. A person can write 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 Touchscreen equipped portable device. The chalk, which is simply compressed dust, can bother some educators and students with allergies. In proposed system two systems are designed one is handheld & one is remote unit. Handheld module is controlled by user or teacher. Another module is remote module which is connected to the screen where data is displayed in enhanced form (Projector). Both systems consist of Raspberry Pi board. It is also called as Rpi or RasPi. Handheld unit consist of Raspberry Pi board which is interfaced with 3.2 inch TFT touch screen with graphical LCD. Teacher has to write on a resistive touch screen which is interfaced on Handheld unit. Hand written signals are processed & sent to Remote unit by using wireless module (Wi-Fi). Remote unit collects this signal by using Wi-Fi, these signals will be processed by Raspberry Pi & displayed it in larger form on the screen using projector which is interfaced on Remote unit by using HDMI port of Raspberry Pi. This makes teaching and learning process more easy and efficient for the sake of students and teachers.

2. RELATED WORK

Di WU,Yang Zhang et al[2], used a hardware and uC/OS-II embedded real time operating system for hand-held terminal software. Hand-written signal on a book-sized touch screen will be converted to electrical signal and transferred to the PC terminal by nRF2401 wireless transmission module in the band of frequency of 2.4GHz, then the PC terminal software will process the handwriting signal and display it in a more modified form by projector. But there were some limitations like we cannot store the data for future use.

Dr.G.U.Kharat et al [3] , both of they contain tx and rx unit and use ARM processor , touch screen as input and in tx side the things written on touch screen is display on GLCD and then given to the ARM processor and tx wirelessly to receiver using zigbee module and the student see the things written on the touch screen on projector or PC. However it was not feasible for longer distances.

Mrs. Mayuri Joshi et al [4] , this design of hand held equipment is build using ARM9 processor S3C2240 which can interface to wireless module and 7inch touch screen. The data written on the screen is transferred to PC through wireless medium (Wi-Fi).The use of Linux operating system helps in specification for multitasking and also for writing the application software on the kernel. The application software was incorporated using Qt which is ported to the operating system. But the overall system was quite complex.

Our paper is based on the work of **Swati J. Nimkarde** et al [1],This design of hand held equipment is build using ARM9 processor S3C2240 which can interface to wireless module and 7 inch touch screen. The data written on the screen is transferred to PC through wireless medium (Wi-Fi).Linux helps in multitasking. The application software is build up using Qt ported to the operating system.

3. SYSTEM DESIGN

3.1 Handheld unit:

This device mainly contains Raspberry Pi, 3.2 TFT touch screen with graphical LCD. Touch is sensed by touch screen & converted into electrical signal by using LCD & further it is given to Raspberry Pi. Raspberry Pi has ARM 11 processor to process signals after getting it from LCD & that signal is given to Remote unit using Wi-Fi module which is interfaced with Raspberry Pi. PoWi-Fir supply given to this system is 5v.

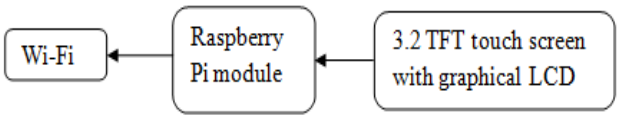

Figure 1.Handheld unit

3.2 Remote Unit:

It consists of mainly Raspberry Pi board Wi-Fi module. Signal received from handheld unit is received by remote unit using Wi-Fi module & processed by Raspberry Pi module & the enhanced signal will be given to projector or monitor to display.

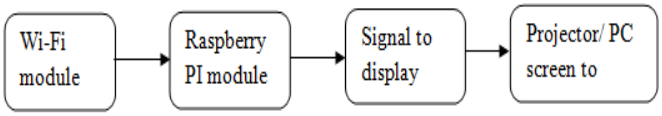

Figure 2.Block diagram of remote unit

4. WORKING

- Handheld unit includes RASPBERRY-PI 3 and TFT touch screen. Touch screen display is used to receive handwritten signals and WIFI interface for sending signal to remote module.

Figure 3.TFT Touchscreen Module

- Operations that are to be performed by handheld unit are information collection from resistive touch screen, processing that information and sending signals to the remote terminal unit using wireless WIFI module.
- Inbuilt touch screen controller receives handwritten signals from the patterns drawn on touch screen with an interrupt signal to the RASPBERRY-PI 3. Now, RASPBERRY-PI reads this information, processes it and extracts the information contents in the signal. Information contained in the handwritten signal is extracted in elative registers by inquiring Interrupt Request Number.

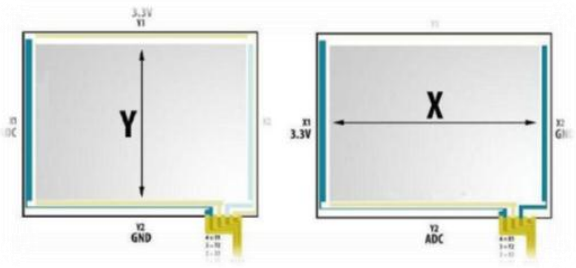

Figure 4. Principle of operation of touch screen

- One by one each touch message is received and processes by the processor. After initialization of the handheld unit hardware, when a pattern was drawn on the screen, the first dot is detected and its co-ordinates are calculated.

5.FLOWCHART:

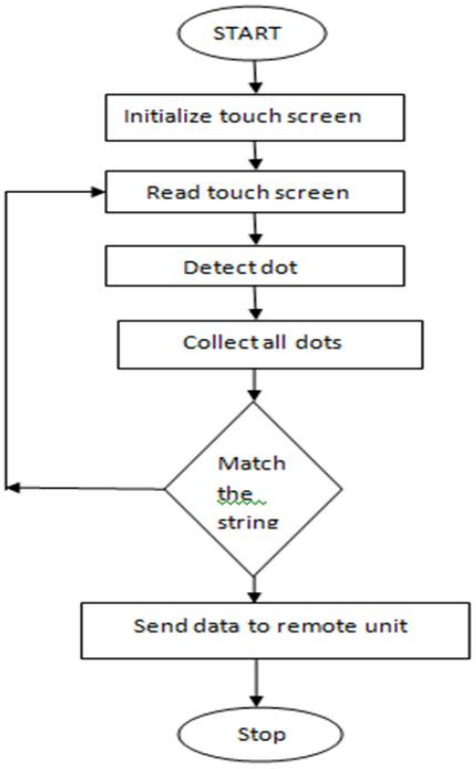

Figure 5.Flowchart of handheld unit

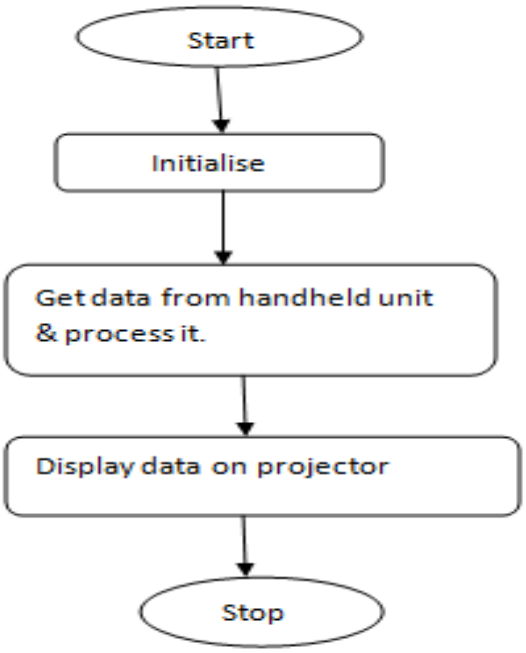

Figure 6.Flowchart of software remote unit

6. CONCLUSIONS

- Now the world is moving towards automation, we have to use the new techniques which will provide fast transmission over long range communication.
- Previously the electric board using GSM was used in that there was limit of messages but in our system multimedia data can be stored on SD card and this data can be seen whenever we want.
- In this project we successfully implemented the system which will allow the person to write on the board.
- We also overcame the shortcomings of traditional chalk-blackboard approach of teaching by replacing it with easy to use portable touchscreen device.
- It is possible to communicate within a network provided by Wi-Fi module
- It is possible to use new technique for teaching than the typical technique.

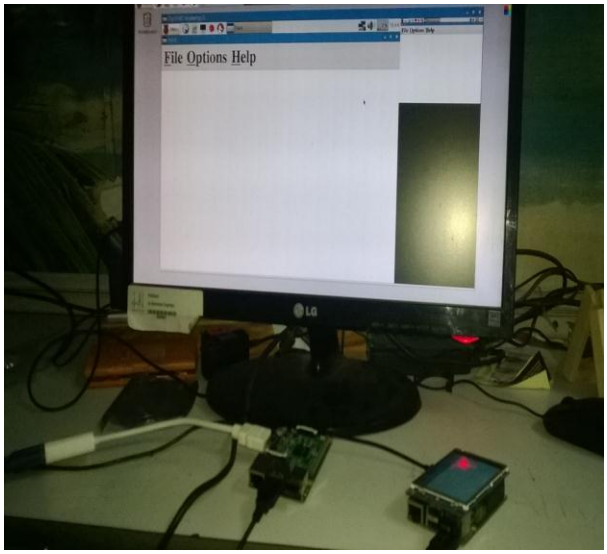

Figure 7.Remote unit results on PC screen

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