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Band Teacher-Student Interaction Based on Smart MIWI Technology

V.Vinothbabu[*1], Ms. P. Thamarai[2], Dr. T.V.U. KiranKumar[3]

[*1,2,3] Department of Electronics and Communication Engineering, Bharath University, Selaiyur, Tamilnadu, India

vinothbabuias@gmail.com

Abstract

Our goal is to build a device called E-Pad which is 65k color QVGA TFT touch screen display eReader/eWriter device connecting teacher and the students. This E-pad allows the teacher to create a presentation to the students and create problems which the students have to solve and present an answer to the teacher. The teacher can view the answers of each student on his/her e-pad screen. It allows the teacher to manage permissions in order to allow students to annotate (highlight, underline and taking note) the learning material being presented. The teacher or student can save the presentation being displayed on the screen onto the local external memory for future reference. The device has many advantages; especially it is useful for math, science and engineering classes where the curriculum itself is about solution given for the problem.E-Pad device will replace the text books, note books and reduces the weight of the bag carried by school children, and also reducing the educational cost. It is designed for multipurpose; a single device is used for reading text book, writing notes, put pen to paper, storing class presentation and it will help us to maintain teacher student relationship. This is the future classroom device that we propose in educating every student of our country.

Keywords: Wireless sensor networks module, E-pad, MIWI, and ARM Cortex-M3

Introduction

A wireless sensor network (WSN) is composed of many sensor nodes which use wireless links to perform

Distributed sensing tasks; it has the characteristics of low cost, energy consumption, low data rate, self-organizing networks. Here network is a classroom and it is consists of sensor node as E-Pad is shown in the below diagram

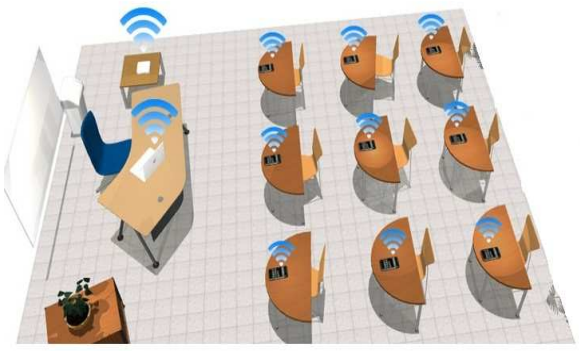

Fig.-1 Classroom with E-Pad

For reliable communication in the classroom ,Microchip MiWi P2P Wireless Protocol is a variation of IEEE 802.15.4 is used, using Microchip's MRF24J40MA 2.4 GHz transceiver and any Microchip 8, 16 or 32-bit microcontroller with a Inter Integrated Circuit (I2C). The protocol provides reliable direct wireless communication via an easy-to-use interface the program. It has a good feature set that can be compiled in and out of the stack to meet a wide range of customer needs while minimizing the stack footprint.

Here E-pad is consists with Quarter Video Graphics Array (also known as QVGA, Quarter VGA, or qVGA) is a popular term for a computer display resolution. Quarter VGA displays are most often used in personal digital assistants (PDA), mobile phones and some consoles. The term refers only to the display's resolution, QVGA resolution is also used in digital video recording equipment as a low-resolution mode requiring less data storage capacity than higher resolutions, especially in still digital cameras with video recording capability, and some mobile phones. It is consists with each frame is an image of 320×240 pixels. QVGA mode usually describes the size of an image in pixels, commonly called the resolution; various video file formats support good resolution.

The rest of the paper is organized as follows. In section 2.MIWI Techonolgy 3.E-Pad Network

MIWI Technology

In wireless communication MiWi development give solution for developing applications offered by Microchip. It an alternative approach for ZigBee, the most common and widespread wireless protocol for a good application developers. MiWi aims to be light, to minimize the disadvantages of ZigBee.MIWI technology is simple, low-cost, low power consumption, and low data rate. Therefore, MiWi protocol provides an easy-to-use for simple wireless communication. It is particularly for making smaller applications that needs relatively small network size, with few hops. The maximum number of hops between is 4. MiWi has 2 interfaces to manage it. One is MiMAC interface used to communicate with Microchip RF transceivers and the other is MiApp interface used to interact with application layer.

The MiWi P2P (peer-to-peer) protocol modifies the IEEE 802.15.4 specification's MAC layer by adding commands that simplify the handshaking process. It simplifies link disconnection and channel hopping by providing supplementary MAC commands. IEEE 802.15.4 and the MiWi P2P protocol support two topologies: star and peer-to-peer. The MiWi P2P protocol uses its own two-step handshaking process as shown in Fig. – 2.

1. The initiating device sends out a P2P connection request command.
2. Any device within radio range responds with a P2P connection response command that finalizes the connection.

This is a one-to-many process that may establish multiple connections, where possible, to establish a Peer-to-Peer topology. Since this handshaking process uses a MAC layer command, CSMA-CA is applied for each transmission. This reduces the likelihood of packet collision.

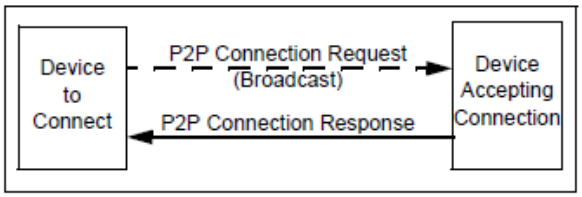

Fig. - 2 Handshaking process for MIWI P2P Wireless protocol

E-Pad Network

The E-pad Network model is shown in Figure 2.It is consists of two sections as E-pad device for teacher and E-Pad device for student.

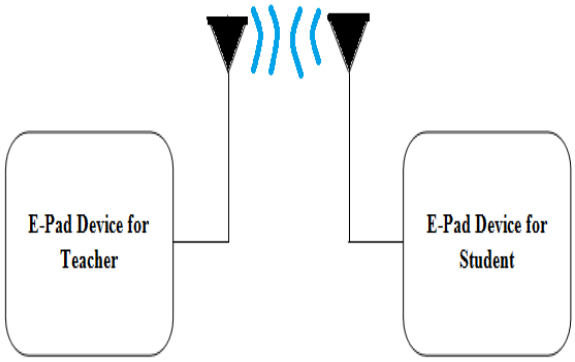

Fig. - 2 E-Pad Network

As the network is provided with E-Pad device the block diagram for E-Pad device is shown in Figure 3 as shown below,

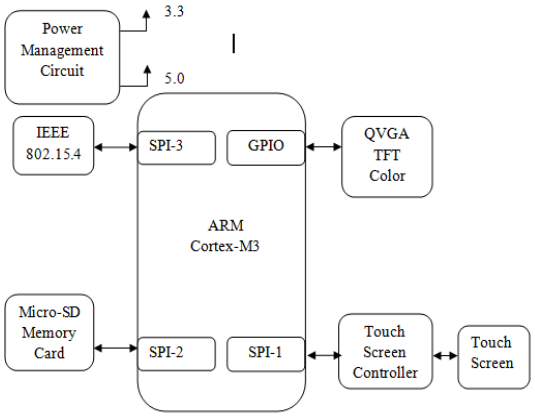

Fig. - 3 E-Pad Device

In the block diagram, the major is LPC1313 ARM Cortex-M3 processor is leading 32-bit processor for highly deterministic real-time applications and has been specifically developed for high-performance low-cost platforms. For a broad range of devices including microcontrollers, industrial control systems, automotive body systems and wireless networking and sensors.

The processor is highly configurable enabling a wide range of implementations from those requiring memory protection and also powerful trace technology through to extremely cost sensitive devices requiring minimal area.

ARM Cortex-M3 processor, running at frequencies of up to 72 MHz.ARM Cortex-M3 built-in Nested Vectored Interrupt Controller (NVIC).32 kB on-chip flash programming memory.8 kB SRAM.In-System Programming (ISP) and In-Application Programming (IAP) via on-chip bootloader software.Serial Wire Debug and Serial Wire Trace port.High-current output driver (20 mA) on one pinHigh-current sink drivers (20 mA) on two

I2C-bus pins in Fast-mode Plus.Three reduced power modes: Sleep, Deep-sleep, and Deep power-down.Single power supply (2.0 V to 3.6 V). I2C-bus specification and Fast-mode Plus with a data rate of 1 Mbit/s with multiple address recognition and monitor mode.

A resistive touch screen works by applying a voltage across a resistor network and measuring the change in resistance at a given point on the matrix where a screen is touched by an input stylus, pen, or finger. The change in the resistance ratio marks the location on the touch screen. Here the teacher can at any moment (before or during the lecture) create a question attached to a slide by clicking on the icon for this option. The first thing to do is to def me the type of question to create: simple selection, multiple selection, sequence definition or free format. After that, the question and the possible answers (in the case of a selection or sequencing question) has to be created by

Freehand sketching and enclosing the sketch with an "L" gesture. This will create de required elements. The role each created node will play is defined by chosen the right answer(s), the wrong answer(s), and the questions buttons (see Fig. 4a). There is no limitation for the number of alternatives. A question can be sent to the students by clicking on the "send" option. The teacher decides whether the question will be sent to individual students or a whole group. The view the students will have when they receive the question in their devices is shown in Fig. 4.b. As already discussed in the introduction of this paper the advantage of having questions anchored to the presentation its that they can be made in the context of the learning material being presented, without changing the focus of attention of the students. They can also help the teacher assess whether the students understand the stuff

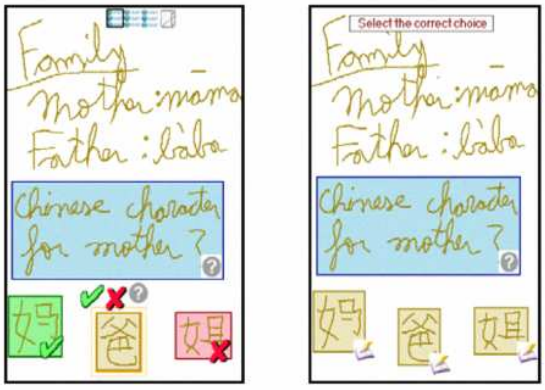

Fig. - 4 a, 4.b. Teacher creation, Students view

Conclusion

In this paper, shows how MIWI technology is used to achieve the interaction between students and teachers. This technology used for data acquisition and transmission, wireless transmission module using a star network topology, Peer-to-peer topology to achieve the data from students end to teachers end node for wireless transmission. Choose low-power hardware equipment and transport protocol, add the node sleep mechanism, so that the system has low energy consumption, large communication range, high stability characteristics. Using the teacher-student interaction platform, can realized the application of practical teaching. The results show that, the system can implement the basic functions of student-teacher interaction system. The system of MIWI technology wireless sensor network, modular design, with the characteristics of scalable. Slightly modified, the application can be ported to other systems as a future work.

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