Design Approach of Projector Interface Device using ARM

Pranjali Khiratkar
M.E 3rd SEM (ESC)
G.H.R.C.E. Nagpur

Prof. P. P. Rane
M.Tech (Electronics)
G.H.R.C.E.Nagpur

ABSTRACT

In this paper we present a proposed work of projector interface device using ARM. Embedded system substitutes for the personal computer system, the latter usually plays role of player for projector nowadays. The projector interface device solves the problem of cable complex layout of projector . Though Now a days USB projectors are available but we will implement projector interface device which can support every kind of projectors so that mostly PC dependent projectors become laptop or personal computer independent. Our projector Interface device will support SD Card, USB interface. It has advantages of no PC, low cost, low power consumption, and high convenient. This paper gives the hardware and software architecture of the projector interface device, and discusses the design in detail. At last, we show a prototype and the validity of the proposed system.

Keywords

Projector, Projector interface device, Embedded Microprocessor

1. INTRODUCTION

With the rapid advances of modern technology, projectors are widely being adopted in many fields, such as school education, modern business conference and domestic entertainment. However, some common problems disturb the effective use of projector currently, these representative problems are as follows. Projector depends on extra computer device. In fact, an individual physical projector typically requires image display device, so it must cooperate with a play device. The best common play device is Personal Computer (PC) or laptop. When a special PC is assigned to a projector, it has little efficiency, but the total setup costs of whole system which includes projector and PC will be more expensive.
At last, PC station often has few stability and reliability.
       A common scenario is as follows, in a business forum, everyone who will give a lecture have to pull out the cable of projector from the previous PC and plug it in his notebook PC, it's too inconvenient. When we often pull out and plug the cable interface many times, the spins of cable interface will be broke likely, so the projector doesn't work no longer until the old cable interface is replaced. Though now a days USB projectors are available but there is still requirement of PC in some situation like when engineer want to demonstrate software via projector. some institutes cant afford advanced projectors in that case we will connect our projector interface device to traditional PC dependent projectors so that it become PC independent, scalable and efficient to use.
Park [2] presents a framework of automatic embedded projector player system with wireless network. The new player system not only has no trouble with cable layout, but also has independence of PC or notebook. And we can operate the player system and physical projector by a new remote control handle with a uniform way. Park [3] designs the SXGA network and multimedia projector system, and focuses on high-

resolution large screen. Tsunashima [4] describes a compact display system which is capable of displaying multiple PC desktop screens from remote PCs connected through a network on a single projector screen. But they also receive video signals from an external server device such as a PC. Some papers [5, 6, 7] study on other new directions in the projector industry, such as multi-planar displays, multi-projector Displays and 3D projector.

2. OVERVIEW OF PROJECTOR INTERFACE DEVICE

We have three key ideas to design projector interface device and the new player system will resolve above problems for general applied scenes of projector, which presents common files such as Word files, PowerPoint files, PDF files, JPG files, MPEG files and so on.
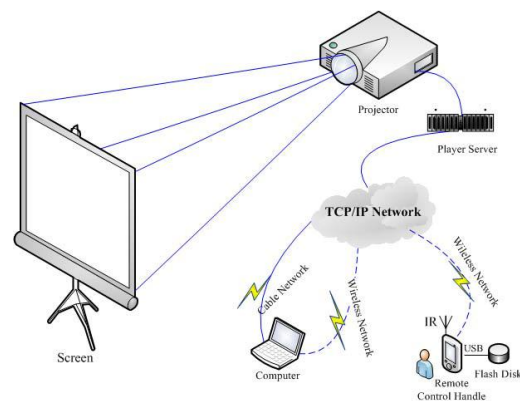

**Fig 1. Physical Topology of projector interface device**

The projector interface device plays a core role, it charges the tasks of receiving and playing files. The remote control handle mainly charges reading files from removable storage, sending these files to projector interface device over network, and remote controlling both the projector interface device and physical projector. Projector interface device able to accept data from USB and SD memory card as well as from Ethernet card from LAN. IEEE 802.11b network protocol is taken, so conventional personal computer and notepad also access the projector interface device and send files to it.

3. HARDWARE ARCHITECTURE
3.1 Projector Interface Device

The proposed hardware architecture of projector interface device is composed of ARM microprocessor, VGA output module, ethernet module, storage module and power module. The specific hardware structure of Projector interface device is

shown in Fig 2. Microprocessor S3C2440A-40 (ARMV4I) including ARM9 core is selected as main CPU, which frequency is 400MHZ. By providing a comprehensive set of common system peripherals, the S3C2440A-40 minimizes the overall system costs and eliminates the need to configure additional components. The main features of it are: 64MB SDRAM, 256MB NDFLASH, and supporting up to 4GB SD card. These features can ensure the smooth running of the operating system and application software. We use AT2440EVB-IV as development board, which integrates VGA/AV/S-VIDEO output ports, so it can send image signal to LCD/CRT displayer, TV set and S-port displayer. The display resolution of VGA is 800*600, so it can meet the requirements of ordinary projector, it plays video files smoothly and no splash screen happened. If a LCD-VGA video transfer card is added to current development board, the display resolution can reach 1204*768 or higher.
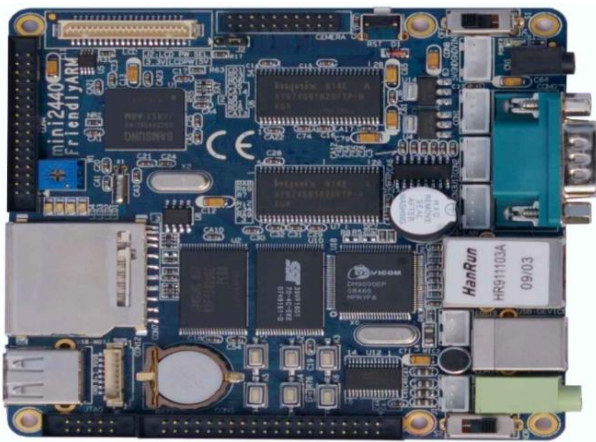

Fig 2 Hardware Structure of projector interface device

The display module uses the chime 3.5 inch TFT LCD with touch screen, which resolution is 320*240. The removable storage includes flash disk, removable hard disk, or SD card. We mainly going to use the USB interface to connect the removable storage. User can just plug a removable storage in the board, without taking a notepad. Through modifying the USB driver inPW2440, the system can support high-capacity removable hard disk to meet users' demand.

4. SOFTWARE ARCHITECTURE AND DESIGN
4.1 Embedded Operating System Enviroment
We select Windows CE 5.0 embedded operating system, which has some characteristics such as: instant power up, Low ISR (Interrupt Service Routine), real time, a lot of drivers for diversiform devices, especially supporting wireless protocols and USB, it becomes perfect to almost every industrial process [7]. Windows CE has capabilities with advanced Windows technologies, so the application developers can gain enhanced productivity and the cycle of development can be reduced evidently.
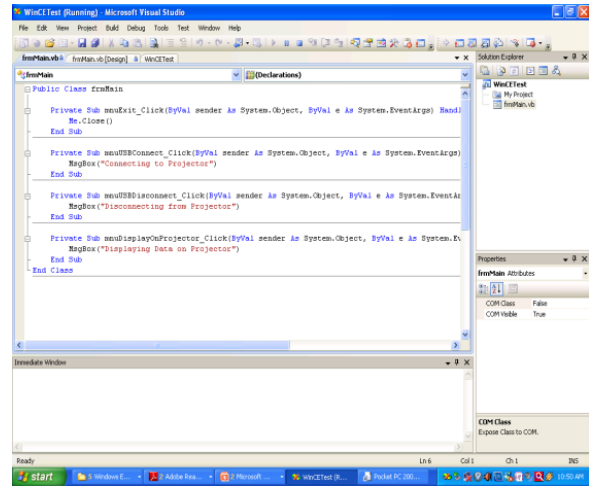
Fig. 3 Platform Builder and Configuration

To develop an OS design based on the Windows CE OS, the following tasks must be completed, i.e. customizing BSP (board support package), customizing device drivers, customizing additional projects and catalog items. The BSP is middle software lied between Windows CE OS and hardware, which supports the boot loader, OEM adaptation layer (OAL), and device drivers for a specific hardware platform. We use the sample BSPs provided by Microsoft Windows CE for the SMDK2440A Samsung MCU Development Kit to quickly evaluate Windows CE OS features.

3. ACKNOWLEDGMENTS
We have described the proposed work of projector interface device for projectors. The system will controlled by uniform way, and it doesn't depend on PCs and digital signal cables. We present the hardware and software architecture of the interface device , we also give the design details. The main limitation of our current solution will be that all of application software packages are required to run on Windows CE OS. We will continue to improve the interface device support more software of mainstream OS platform in one single embedded hardware. Instead of buying new USB projector, our projector interface device will support all traditional projectors and new projectors so that it become pc or laptop free.

4. REFERENCES
[1] Xudong Li , Shuiqing Wang. Automatic embedded projector player system . IEEE Transactions on Consumer Electronics, 978-1-4244-7874-3/10/$26.00 ©2010 IEEE.

[2] In Gyu Park. Development of a network multimedia projector system. IEEE Transactions on Consumer Electronics, Val. 48, No. I , February 2002, pp90-98.

[3] Kenji Tsunashima, Tetsuro Shida etc. Compact Programmable Network Display System for Portable Projectors. IEEE Transactions on Consumer Electronics, Vol. 55, No. 2, MAY 2009, pp312-315

[4] Mark Ashdown, Matthew Flagg etc. A Flexible Projector-Camera System for Multi-Planar Displays. Proceedings of the 2004 IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR'04).

[5] Niranjan Damera-Venkata, Nelson L. Chang etc. A Unified Paradigm for Scalable Multi-Projector Displays.

IEEE TRANSACTIONS ON VISUALIZATION AND COMPUTER GRAPHICS, VOL. 13, NO. 6, NOVEMBER/DECEMBER 2007. pp 1360-1367.

[6] M.B. Vieira, Luiz Velho etc. A Camera-Projector System for Real-Time 3D Video. Proceedings of the 2005 IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR'05).

[7] Arvhind Raman, Mini Jain, T etc. Low-cost Wireless Projector Interface Device using TI TMS320DM270. 2004 IEEE International Conference on Multimedia and Expo (ICME),pp321-324.

[8] Jiang Min,A Design of Embedded Terminal Unit Based on ARM and Windows CE, The Eighth International Conference on Electronic Measurement and Instruments(ICEMI), 2007, pp336-340.