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WEB BASED AUDIO/VIDEO PLAYBACK SYSTEM THROUGH TEXT BASED SMS USING GSM AND S3C2440

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ABSTRACT - In recent years, data service has been gaining popularity in embedded system. Most of the audio/video devices today consists of either a internal memory or consists of an interface in the form of I/O device and are being controlled by legacy Infra Red (IR) based remote controllers which has limited range and also suffers from line of sight problem. This paper proposes a method by implementing a simple Short Message Service (SMS) based system using ARM 9 and GSM module without the need of a dedicated memory system or the need of line of sight communication and moreover the range is global.

Key Words: Global System for Mobile communication (GSM), Advanced RISC Machine (ARM), Short Message Service (SMS).

I. INTRODUCTION

The Short Message Service (SMS) has been arguably the most popular wide-area wireless data service worldwide. According to recent data [1] it accounts for more than 80% of data revenue generated for mobile operators. The ever increasing popularity of SMS, along with its universal availability and support by handsets and service providers, has encouraged almost all mobile data service providers to use it as their underlying data transport facility to maximize the reach to their potential customer base. As text messaging becomes an essential requirement to provide convenience to modern life in many parts of the world, cell-phone users rely very highly on it as an instant and reliable means for data communication.

Even more importantly, SMS is being considered for mission-critical applications such as emergency alerts [2] and notification for natural disasters [3], for which reliable operation is of paramount importance. Therefore this paper proposes the design of a SMS based system which integrates a embedded processor with GSM communication. Embedded systems have become a centrally important aspect in a wide variety of applications, such as studying environmental phenomena, data management strategies, aiding security, data services and other fields [4].

At the same time, data services has gained popularity in cellular networks since they were first introduced through the circuit-switched connection [5].As cellular carriers, however, start deploying the circuit switched data service such as Global System for Mobile Communications (GSM)[6], which can provide data services in a more bandwidth-efficient way over the cellular network, thereby increasing the radio spectrum utilization. In data service, one of important application is short message service (SMS), which was first introduced by GSM and which provides capability to send alphabetic/numeric data [7]. GSM leverages the control channel to send out SMS data while allowing users to continue their voice conversations. When the user is using voice channel for talking, slow associated control channel (SACCH) will be used for sending SMS. If the user is not talking, then the user can receive the SMS data using standalone dedicated control channel (SDCCH).In both above discussed scenarios, the SMS is always using a low power transmission channel [8].

II. WORKING PRINCIPLE

The proposed system consists of a GSM modem which receives the SMS through the GSM network and a ARM CPU which is connected to the internet through Ethernet. As shown in Figure 1 ARM microprocessor is connected to GSM modem by RS232 serial interface. By sending AT (attention) commands, communication with GSM modem can be established and SMS communication can be achieved.

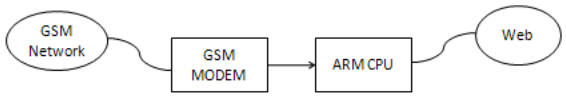

Figure 1 GSM ARM Access

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A. PROCESSOR

The application requires a hardware that can receive SMS from a mobile phone in two different cases. First, it is in the general scenario where it can receive and process the SMS from any mobile number. This could prove to be a nuisance in some applications as when any spectator in the audience in the example 1 cited above will be able to playback a file of his choosing and that may not appeal to the audience. Second, is the scenario where it is programmed to receive SMS only from certain registered mobile numbers to provide and reject SMS from any other mobile number. For example 1, this could mean only those spectators who have been authorized by the event managers based on payment of a fee or recognized members can play the audio/video file on the audio system or the giant screen.

The system should therefore have a facility to decode the SMS and compare with entries the world of internet, retrieve that file and playback via the audio system or on the screen depending on the nature of the file (audio or video).

Considering the numerous computational tasks that have to be performed, it became imperative to design the system around a microprocessor or a microcontroller. This will provide not only a degree of flexibility required to cater to applications that could be diverse in nature but also keeps the hardware compact and user-friendly. User-friendliness is a key consideration in such applications because the users demand a high degree of robustness in duty. For example, music fans will prefer to quickly be able to locate audio files based on categories such as, classical, rock and blues and so on.

Therefore to implement all the above mentioned processes a processor of very high speed, low power consumption and which can decode the SMS in alphanumeric format is required. As the hardware required for this idea is quite complex using a CISC processor will result in high complexity and very high power consumption. Therefore the use of a RISC processor which consumes less power compared to CISC for the same audio video playback system is preferred. The RISC processor used here is ARM (Advanced RISC Machine). Several versions of ARM are available viz., ARM2, ARM3, ARM7, ARM9 and variations of it. The differences and the comparison between these is explained in this chapter.

We use SamSung Company's S3C2440 chip as microprocessor, it is based on the ARM9TDMI core which has 32-bit high-speed processor that can operate in 7 different modes. At the same we configure NAND Flash of up to 1GB or 2 MB NOR Flash with BIOS and 64MB SDRAM which are used to store the boot-up program and system memory respectively. The S3C2440 processor, which is ARM9, is a 289 Fine-Pitch Grid Array (FBGA) processor. In S3C2440 most of the pins are multiplexed pins so in order to determine which function is selected Port Control Register (PnCON) is used. ARM9 is a 32 bit RISC processor (32 bit instructions).

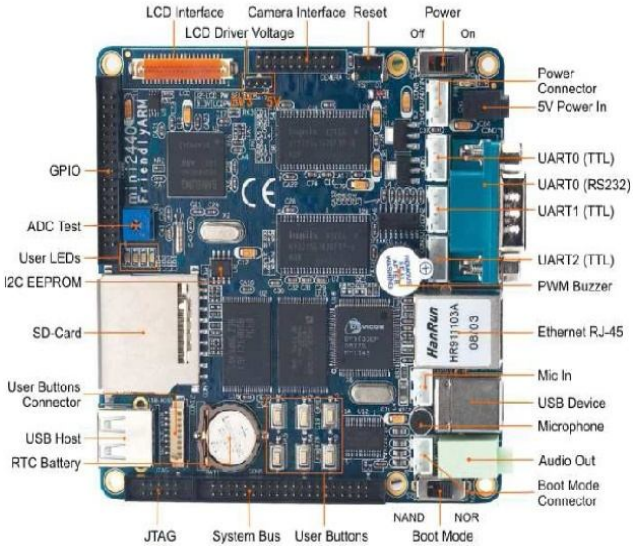

Figure 2 Samsung S3C2440

FEATURES OF ARM9

ARM9 is a 32 bit RISC processor (32 bit instructions). It has 32bit Data Bus and 32-bit address bus. The architecture of ARM9 is a Harvard type bus structure which is implemented in ARM9 to speed up the execution. Instructions of ARM9 can process 8/16/32 bit data types.

It has 7 modes of operations which are User, FIQ (Fast Interrupt Request), IRQ (Interrupt Request), Supervisor, Abort, Undefined and System. Supply required for ARM9 is around 1.2V internal, where as supply required for memory of ARM9 is 1.8V/2.5V/3.3V and for external I/O processor it is 3.3V.It has a total 37 registers each of 32-bits out of which 31 are general purpose registers and 6 are status registers. [9]

Memories available with ARM9 are 64M SDRAM (Synchronous Dynamic RAM), 64M or 128M Nand Flash, 2M Nor Flash and 1GB EEPROM. Separate cache memory each of 16KB for instruction and data is implemented.ARM9 implements MMU (Memory Management Unit), AMBA (Advanced Memory Bus Architecture) bus. [9]

The internal structure of ARM9 is shown in the figure below:

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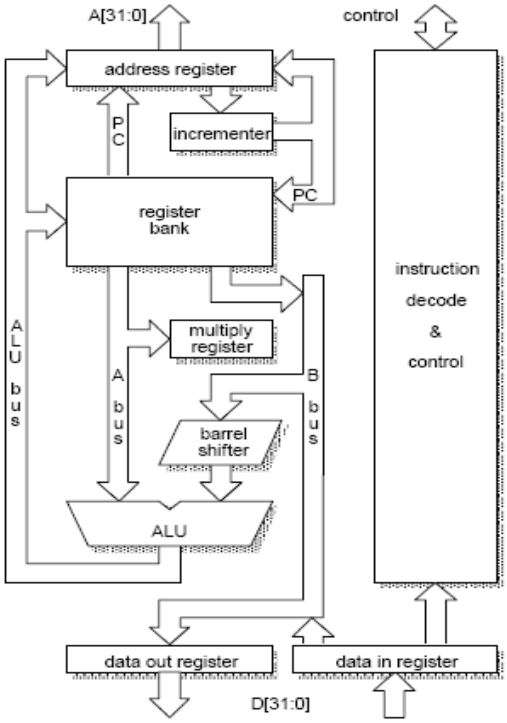

Figure 3 Internal architecture of ARM9

B. GSM MODULE

We use SIMCOM Company's SIM300 as GSM modem. This modem is a 40-pin DIP IC module which operates in 4 modes. Designed for global market, SIM300 is a Tri-band GSM/GPRS engine that works on frequencies EGSM (900 MHz), DCS (1800 MHz) and PCS (1900 MHz). Modem SIM300 provides GPRS multi-slot class 10 capability and supports all the four coding schemes of GPRS viz., CS-1, CS-2, CS-3 and CS-4. With a tiny configuration of 40mm x 33mm x 2.85 mm, SIM300 can fit into almost any space requirement in user application, such as Smart phone, PDA (Personal Digital Assistant) phone and other mobile device. The physical interface to the system is made through a 60 pin connector, which provides all the required hardware interfaces between the module and customers' boards except the RF antenna interface. The SIM300 is a power saving modem, the current consumption to as low as 2.5mA in SLEEP mode.

C. LCD DISPLAY

The LCD used in this audio video playback system is a 4-wire resistive LCD a photograph of which is shown in Figure 4. **Resistive LCD screens** are sensitive computer displays composed of two flexible sheets coated with a resistive material and separated by an air gap or microdots. When contact is made to the surface of the touchscreen, the two sheets are pressed together. On these two sheets there are horizontal and vertical lines that, when pushed together, register the precise location of the touch. Because the touchscreen senses input from contact with nearly any object (finger, stylus/pen, palm) resistive touchscreens are a type of "passive" technology[9].

Figure 4 LCD interfaced to S3C2440

III. SOFTWARE DESIGN MODULE

A. SMS trigger control

To design a short message service (SMS) based system, we use GSM technology and embedded technology. There are three methods to control sending and receiving of message viz. Text mode, Block mode and PDU mode. Text Mode allows the transfer of text one character at a time based on AT commands. In Text mode, the systems application first will set up fixed parameters such as the SMS Centre address which is not the case in block mode. The user's mobile phone then uses those set up parameters to construct a PDU when the application requests it to send a short message. This mode is simple enough to be suitable for terminal emulators and dumb terminals.

PDU Mode shares some characteristics which are common when compared with the other two modes. In Block Mode, it uses a TPDU rather than using raw binary and each character is encoded using HEX format (the characters 0...9,A..F). In fact, if data is encoded in a Block Mode TPDU as HEX format, result is a PDU. In Text Mode, PDU Mode is implemented by using series of AT commands which

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are identical. It is suitable for AT command-based software drivers that do not understand the content of the message blocks.

B. Algorithm Description

1. The first step is initialization (system initialization, memory i.e., MMU initialization; system clock initialization); select Nand Flash to load boot-up program; S3C2440's GPIO initialization; selection serial port (COM1); setup baud rate as 115200; data bits 8, stop bits 1, parity none and flow control should be none.
2. Second step is modem initialization.
3. Third step is setting up hyper terminal.
4. Connecting the Ethernet cable to the Ethernet port provided on the kit and activating the internet connection.
5. Switching on S3C2440 board after which a window will appear on the screen from which booting option has to be selected. Sixth step is to type /tty/dev "10 digit mobile number for sending and receiving messages".

C. RESULT

As stated earlier the idea behind the audio video playback system is to operate the whole system remotely and wirelessly by using SMS and the result is shown in the figure 5 where a video file is played after sending a SMS from the user mobile.

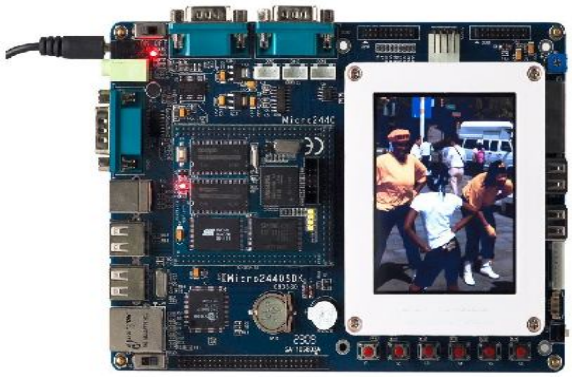

Figure 5 Playing of video file

IV. CONCLUSIONS & FUTURE SCOPE

In this paper, we analysis short message service (SMS) which is combined with the latest embedded technology, GSM technology and then propose a method to design and implement the short message service system based on ARM9 and GSM. We put forward the system principle block diagram and the functional block diagram circuit of GSM modem. At the same time, we give the specific algorithm and software process flow, namely, GSM initialization module. This proposed technique is well suited for various applications and has good prospects.

The S3C2440 board can be used as a mother board for the personal computer. It can also be a replacement for the set top boxes which are used for direct to home DTH technology. This audio video playback system can be used for home automation and also for time based event management and for internet based audio video playback system. [9]

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