Transmission Of Compressed Image Over Wireless Network: An Embedded Approach Using ARM9 Processor

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Abstract- The study of the transmission of image over wireless network based on the Embedded System. We have to compressed image on the S3C2440A processor belongs to ARM9 family, then transmit that compressed image to PC or Laptop . This transmission of image from server to client will do through Wi-Fi connection. The throughput of ARM processor can be calculated after the image transmission. Here, image as a input given from standard database. Compression of image using RLE algorithm which is lossless. This compressed image gives as input to S3C2440A processor and transmits to the PC or Laptop as output. The transmission of compressed image give the speed gain , calculate the percentage of speed and throughput of ARM9 processor.

Keywords – S3C2440A,Wi-Fi, RLE.

I. INTRODUCTION

The rapidly advancing information technology, the design of the embedded system turns to be a new world. It includes many fields just like industry control, consumptive electronic products, net communication, scientific study, military, etc. With development of the living standard of the people , wireless image transmission turns to be important part of the information industry step by step and it will be tendency that people use the embedded system to realize it in tomorrows days.[1]

The embedded system is used as control processing unit. The embedded system adopts ARM9 processor S3C2440A and Linux operating system. With the advances in wireless communications and embedded systems , efficient storage and transmission of images and video over limited bandwidth is required. We define an embedded system as a processor-based entity which has no or limited facilities for reprogramming from the outside. While most embedded systems use standard processor devices combined with memory devices and application specific ICs on a single board, there is a growing tendency towards the integration of processor cores, memory and application specific extensions on a single integrated circuit, usually called system-on-a-chip (SOC).

Image compression is method which reduces the size of the data to reduce the amount of space required to store the data. However compression increases bit dependency that in turn introduces error extension effects. Another problem unique to wireless networks is the extremely hostile and random nature of the channels that introduce distortion and considerably degrades the image quality . Error control coding is used to control the errors, however ,the addition of check bits that carry no information further increases the data rate and consequently the bandwidth. For the transmission of images over wireless communication channels, bandwidth limitation and high probability of error are two major concerns. Therefore is applied to the transmitted data in order to conserve the bandwidth. For transmission over wireless network protocols and wireless solution are important factors.

II. Survey

Author	Paper Title	Result and Conclusion
Huo Chunbao, Gao Liduo, Liu Yuwei	Wireless Image Transmission Based on the Embedded System	Wireless transmission based on S3C2440A processor and embedded technique, transmitted image data successfully.
Xiaoli Chen, Zhongdong Hu	Design of Embedded Wireless Video Surveillance System Based on Internet	The embedded wireless remote monitoring technology's application domain is very widespread and suits in many bad conditions, and it also is applied in somewhere that the people are not easy to reach or cannot pause frequently to gather some field data.
Manoj E. Patil, Dipti V. Patil	Study and review of various technologies used for transmission of images over wireless network	Selection of suitable technology should depend on application. The Wi-Fi technique as compared to other gives fast transmission between devices. The communication range and data rate is greater here. Image transmission between more clients gives reliable communication as compared to others
Deepali Javale , Bharati Dixit	Performance Evaluation of Wireless Image Transmission : An approach using embedded system	Using this implemented system successful transmission can be done.Also the quality factor can be decided on the applicability.
M.A.Patil, S.G.Deshmukh	ARM based design for JPEG encoder	There is experimentation JPEG lossy technique on ARM platform with 90 to 95 % image compression.
Dnyaneshwar D. Ahire Vijayshree A. More	Platform Independent JPEG Encoder	Here the compression done upto 90% to 95% using platform independent encoder
Author	**Title**	**Result**

P.Naga`Vardini, T.Giri Prasad	Research of Image Acquisition and Decompressing Based on ARM9 System	Using lossy technique , image compression of image upto 90% to 95%
N.N. Ganvir	Explore the performance of ARM Processor using JPEG	Using lossy technique , image compression of image upto 90% to 95%

III. Proposed Work

A. Overall Architecture of Embedded System

Figure shows the connection and data flow within the system. Here we evaluate the percentage of speed gain by the ARM9 processor. Also using the throughput evaluation of the processor we can generate results for performance of processor. The throughput can be calculated by average rate successful image delivery over a communication channel. The throughput is measured in bits per second.

$$\text{Throughput} = \frac{\text{Actual time in second}}{\text{Size in bytes}}$$

The communication across wireless network can be done using TCP protocol. Use of TCP protocol gives the acknowledgement each request. It may be slow communication than UDP, but reliable. The ARM7 processor has no USB port, also the compression results on this ARM7 are not good as compared to ARM9 processor.

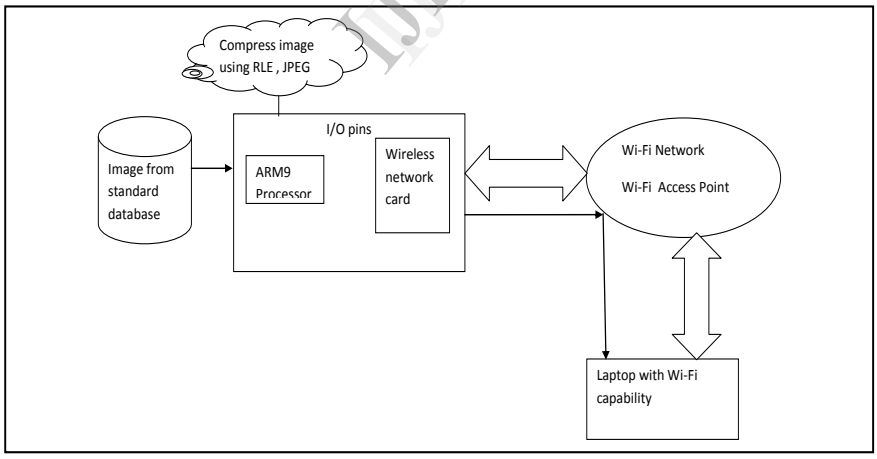

Figure 1. Wireless Transmission based on Embedded System

B. Hardware Design–

Figure 2.Hardware Shematic Diagram

SAMSUNG's S3C2440A processor is the kernel of this system which is developed with ARM920T core and is designed to provide hand-held devices and general applications with low power, and high-performance microcontroller solution in small size. As the ARM 9 microprocessor integrated USB HOST controllers and its USB host interface can directly access USB wireless card, we can use them directly from it without having to add additional chips. This is the reason we don't use ARM7 microcontroller for that it doesn't support USB host interface and need a separate USB host controller chip.

Here in this system the Laptop should be with Wi-Fi capability. The router gives the wireless communication between S3C2440A processor and Laptop. The socket programming gives reliable communication using TCP protocol.

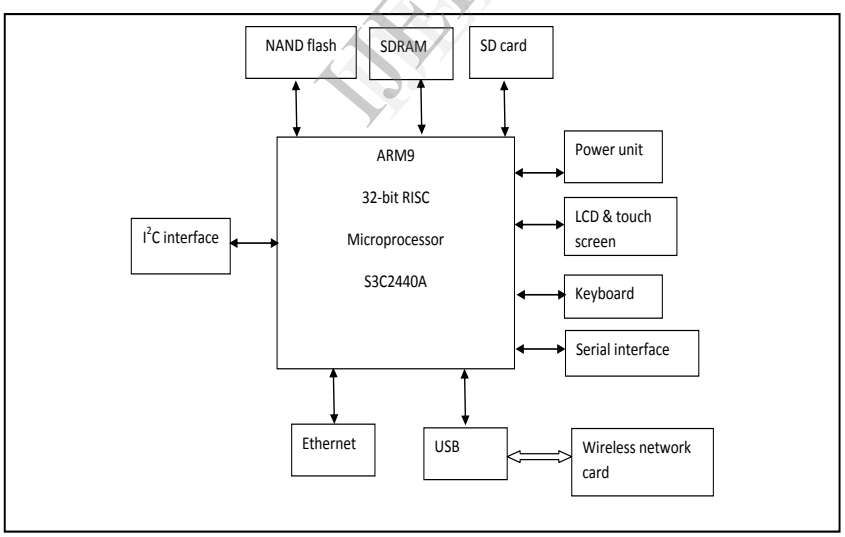

Figure 3. Hardware structure of S3C2440A processor based on ARM9 family

Features of ARM processor :-

Following are the features of ARM processor:

a) On-chip integrated oscillator operates with external crystal in range of 1 MHz to30 MHz or with external oscillator from 1 MHz to 50 MHz.

b) Power saving modes include idle and Power down.

c) Individual enable/disable of peripheral functions as well as peripheral clock scaling down for additional power optimization.

d) Two 32-bit timers/external event counters (with four captures and four compare channels each), PWM unit (six outputs) and watchdog.

e) Low power Real-time clock with independent power and dedicated 32 kHz clock input.

f) Multiple serial interfaces including two UARTs (16C550), two Fast I2C (400 kbit/s), SPI™ and SSP with buffering and variable data length capabilities

g) Vectored interrupt controller with configurable priorities and vector addresses.

h) Up to 47 of 5 V tolerant general purpose I/O pins in tiny LQFP64 package.

i) Processor wake-up from Power-down mode via external interrupt or Real-time Clock.

j) Single power supply chip with Power-On Reset (POR) and Brown-Out Detection (BOD) circuits:– CPU operating voltage range of 3.0 V to 3.6 V (3.3 V ± 10 %) with 5 V tolerant I/O pads.

k) Memory capacity of S3C2440A processor is upto 1GB.

C. Software Design–

Software design is based on the hardware and overall needs of the system development. The characteristics of embedded system makes an own unique method of software development, and we need a suitable software development environment. Linux is a real preemptive multi-tasking, multiuser, multi-threaded operating system, which performs very stably, powerfully, could run on many hardware platforms, has secure layered and could support up to 32 kinds of file system, supports a large number of external devices. Linux support three types of hardware devices: character device, block device and network device. Character device can be read and written directly, which has no buffer.

Wireless network card belongs to net-equipment. All of the Linux network drivers follow a common interface which is based on object-oriented method. An object is a device (device structure), which has its own internal data and methods. The first parameter is the device itself when the method of the device is called, so this method can access its own data. The most basic method of a network device is to initialize, to send and receive. As shown in Figure.

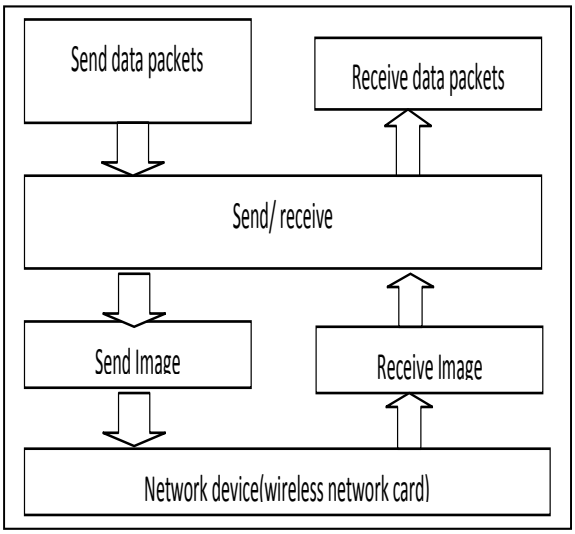

Figure 4. Structure of linux device driver

IV.CONCLUSION

The proposed work shows, image compression is possible using RLE algorithms. The Performance of ARM 9 processor will be evaluating here using this proposed work. The percentage of speed gain can be evaluated using the calculation of throughput of ARM9 processor. So as per application the image compression can be done. The compressed image can be transmitted as early as the transmission of original image. By doing this we can improve the percentage speed gain.

V. REFERENCE

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