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Design of Intelligent Traffic Signal Controller using ARM9

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***Abstract*— Traffic density leads to major problems in many of the urban areas. The Intelligent Traffic Signal Controller is designed and implemented in order to monitor and control the flow of traffic. Intelligent cameras are used to capture the flow of traffic density at different signal junctions. The captured images and videos are observed and the traffic can be controlled at different signal junctions by a single person.**

***Index Terms*— Intelligent traffic control system, S3C2440, GPIO pins, USB camera, Ethernet.**

I. INTRODUCTION

Goal is to optimize transportation flow of people and goods. Many of the urban areas are facing several problems due to traffic density. So in order to overcome raffic problems we are introducing ITSC.

The signal junctions are controlled by normal traffic lights which are having fixed cycle protocol. With this type of system vehicles need to wait for longer times even though there is no traffic at all. Instead of unnecessary long waiting time of vehicles we are introducing ITSC in order to monitor and control different signal junctions from controlling unit by a single person.

The functioning of ITSC is done through USB camera, processor, Ethernet and GPIO pins. Traffic video streams can be captured with cameras from a different signal junction. The video streaming is done through USB. If the captured video steam is high resolution, then convert the video into MPEG video code (low resolution) by using compress technique. Then the MPEG video is send to host computer by using Ethernet port. The person residing at the host computer side will monitor different signal junctions by observing the videos. Here which junction signal has more traffic, that junction signal is controlled and send the command to GPIO pins either ON/OFF state .So different junction signals are controlled by single person.

II.RELATED WORK.

1. ITSC applications

1.1 Heavy Traffic Jams:

We see heavy traffic jams in many of the urban cities at peak times i.e**.,** especially in the morning and evening hours due to schools, colleges, office timings. At this peak times there should be different settings of traffic light delays.

1.2 Even though no traffic, but has to wait:

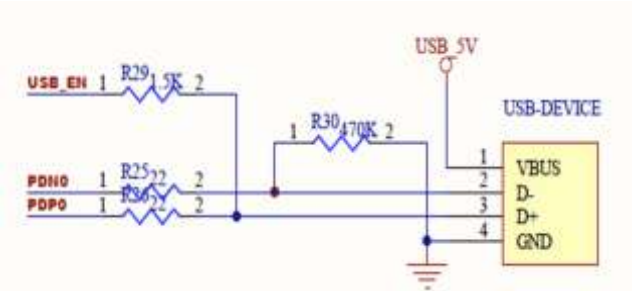
Some times we need to wait for long times even though there is no traffic because of fixed cycle protocol. There is no traffic but still we have to wait until the traffic light turns to green. We can overcome this problem by ITSC.

1.3 If an emergency car stuck in traffic jam:

We see many times that emergency vehicles such as ambulance, police, fire engines stuck in traffic waiting for traffic light turns to green. We should not face such type of problems because those are emergency vehicles in order to save lives of people. With ITSC by observing the videos the struck emergency vehicle signal junction can be released until that vehicle crosses the junction.

A. USB Camera interfacing.

The Mini2440 has two USB interfaces. A USB Host, like an ordinary PC's USB interface, can be used with a USB camera, keyboard, mouse, wifi dongle, etc. The USB Slave is the smaller squarish connector (like you find on printers) and is generally used to download to the target board. When the Mini2440 is running WinCE, it can ActiveSync software with Windows. When the Mini2440 is running a Linux system, there is no corresponding driver and application. Ethernet is usually preferred for data transfer in Linux. The USB Slave can be controlled with a GPC5 register bit to set USB_EN or disable. It can be disabled to conserve CPU resources.



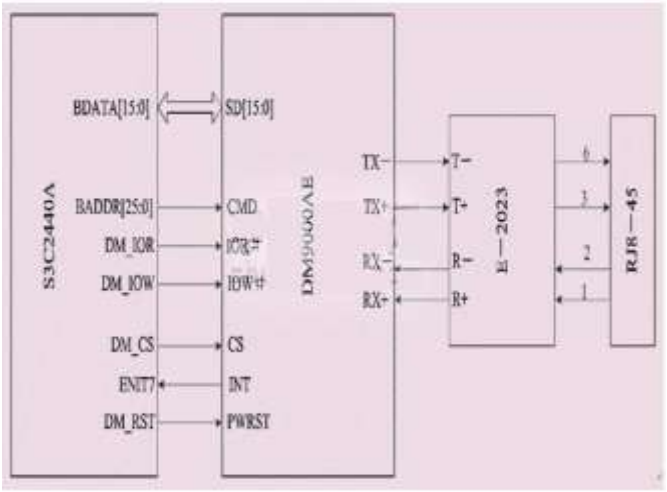
B. Ethernet protocol interfacing.

Interface of Ethernet based on Samsung ARM9 chip S3C2440 embedded system, have adopted the industry grade

Ethernet controller DM9000AEP to succeed in realizing the data interchange of embedded systematic network. The thesis is in explaining the circuit foundation of interface of the network especially, control driver and registration table one of the software some DM9000AEP to make a concrete analysis of to Windows CE system.

When the processor should send the data frame to Ethernet, bale the data into UDP or IP data packets first, and the data that chase bytes and send to DM9000A through 8 bit or 16bit bus are sent while buffering, then pack information such as the length of the data in DM9000AE corresponding register, can order to make to send subsequently, data and data frame information that DM9000AE will be buffered carry on a group MAC of frames, and send out.

When DM9000AE receives the Ethernet data that sends here of outside network, measure the legitimacy of the data frame at first, if the head sign of the frame is wrong or CRC check-up mistake exists, abandon data of this frame, otherwise buffer the data frame to internal RAM, and through stopping marking the location and notifying the processor, bring up the rear to deal with the data that DM9000AE receive RAM in the processor is received.



A. GPIO interfacing.

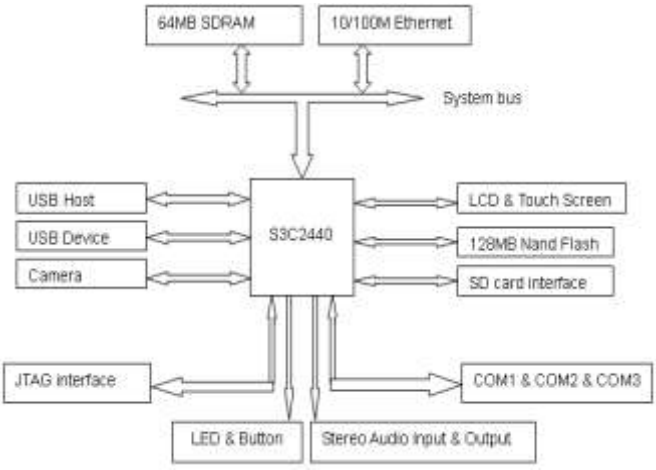
A GPIO pin configured as an input is used to read (to input) the value of one digital signal. In this case the pin is converting the voltage being delivered to the pin into a logical value of 0 or 1 for subsequent use in the program. By convention, when the voltage on the pin is "high" (near Vcc), reading the pin will result in reading a logic 1, while when the voltage is "low" (near GND), reading the pin will result in reading a logic 0.

Any time a microcontroller is reset (including on power up), all the GPIO pins will be configured as inputs. To configure any GPIO pin as an output requires that the software execute specific code to change the default input configuration once the device program starts running. This reconfiguration will typically not happen until some tens or hundreds of milliseconds after power is applied. This means that anytime the device is reset, all hardware that is connected to pins which are intended to be outputs must be able to handle the fact that the device pins are inputs.

III. AN INTELLIGENT TRAFFIC SIGNAL CONTROLLER (ITSC).

SAMSUNG's S3C2440A is designed to provide hand-held devices and general applications with low-power, and high-performance microcontroller solution in small die size. To reduce total system cost, the S3C2440A includes the following components. The S3C2440A is developed with ARM920T core, 0.13um CMOS standard cells and a memory complier. Its low wer, simple, elegant and fully static design is particularly suitable for cost- and power-sensitive applications. It adopts a new bus architecture known as Advanced Micro controller Bus Architecture (AMBA). The S3C2440A offers outstanding features with its CPU core, a 16/32-bit ARM920T RISC processor designed by Advanced RISC Machines, Ltd. The ARM920T implements MMU, AMBA BUS, and Harvard cache architecture with separate 16KB instruction and 16KB data caches, each with an 8-word line length. By providing a complete set of common system peripherals, the S3C2440A minimizes overall system costs and eliminates the need to configure additional components.

Block diagram of S3C2440 interfacing with USB camera, LCD touch screen and Ethernet.



Samsung S3C2440 processor with MMU, and 64 MBytes of 32 bit wide RAM. This thing is fantastic! The four biggest chips are the 64 MBytes of RAM and 128/256/1024 MBytes of Flash ROM, and NOR alternate bootloader. Only 10x10 cm and 1.8 cm thick. The four white sockets on the right of the PCB are power and three COM Ports. The DB9 is COM0. Notice the onboard Mic in the lower right between two white sockets. NOR/NAND boot switch is bottom right, and the power switch is top right. Top edge left to right is LCD and touch screen interface, camera interface, reset switch, and power switch.

IV. IMPLEMENTATION.

Traffic video streams can be captured with cameras from a different signal junctions. The video streaming is done

through USB. If the captured video steam is high resolution, then convert the video into MPEG video code (low resolution) by using compress technique. Then the MPEG video is send to host computer by using Ethernet port. The person residing at the host computer side will monitor different signal junctions by observing the videos. Here which junction signal has more traffic, that junction signal is controlled and send the command to GPIO pins either ON/OFF state .So different junction signals are controlled by single person.

ALGORITHM

1) Start.
2) Capture the video streams at signal junctions using USB camera.
3) If video streaming is high resolution, convert it by using compressing technique.
4) The converted MPEG video code is send to PC through Ethernet port.
5) Observe the videos on PC.
6) When heavy traffic send the command to GPIO pins.
7) Control and monitor the junctions at PC.
8) Exit.

HARDWARE SCREEN SHOTS

V. RESULT ANALYSIS.

The capturing of video streaming is done continuously and are observed from the controlling unit in order to monitor and control different signal junctions. Firstly the control system is designed and implemented according to the previous measurements that happen to specify the time periods for each road intersection. The junction that can be controlled can be observed through the particular junction IP address and the junction signal light can be turned into green or red according to the traffic density.

VI. CONCLUSION AND FUTURE WORK.

The traffic signal controller based on S3C2440 has strong performance to finish real-time collection of traffic signal, signal transmission, and real-time control. The strong function of the traffic signal controller makes the implementation of intelligent traffic possible. To control and monitor different junction points with a single person in any of the urban areas where the traffic density is high and optimizes transportation flow of people and goods.

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VIII.BIOGRAPHIES.

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