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The Network Inspecting of Peccancy Monitoring System Based on UDP Protocol and Nios Processor

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Abstract: *According to the traffic management departments to monitor the needs of vehicle violation, by detecting video image processing algorithm to achieve the illegal vehicle by using Nios processor, combining the real-time video capture, compression, wireless network transmission technology with database technology together and Achieving the network monitoring system of vehicle violation based on UDP protocol and Nios processor. Having high stability, easy operation, convenient maintenance, environmental adaptability features of system and having positive significance of the future vehicle violation of road traffic safety and management.*

Keywords: *Nios processor, Monitoring system, Image acquisit*

1. INTRODUCTION

With the continuous development of science and technology, this changing between material and spiritual pleasures is growing and obvious. At the same time, the degree of popularity of the vehicle which is fast, convenient and comfortable are also increasingly (Kopits et al., 2015). Despite its convenient for people to enjoy outdoors at any time of the great fun, it also brings some problems to solve, which parking, reversing, retrograde and so on are the current solutions and it could seriously interfere with normal life of road safety. Generally, the traditional method of traffic control which get stuck in a groove aren't able to adapt themselves to the times and it is not a highly-developed method of traffic control with flexibility and comprehensiveness, which would lead to road deaths which are remaining obstinately high(YAN Zhang, 2000). There is another problem that motorists get lucky are so mind at play. So, people begin to turn to with high-resolution, stricter controls, low-budget films, wide-ranging application system which has more advantages than others. The vehicular traffic monitoring and recognition technology is well developed after several years of trials (DENG Yue-hua et al., 2004). Nios is ALTERA came up with a pipeline technique, 32 bit RISC processor and then also gives some advises of application of SOPC and the complex logic device (CPLD). Not only did ALTERA SOPC Builder build and configure Nios, but also creating new logical operations, which can be easily to interface with own logic and build application of SOPC having become more powerful of Nios(Peng Chenglian et al., 2004). In this paper, The Network Monitoring System of Vehicle Violation Based on UDP Protocol and Nios Processor finally is designed, and the system can more accurate, more reliable, more efficient, more quickly than others, so security and safeguard can effectively conducted in the education of ideology, psychology and morality based on solid facts such as photograph and video, thus improving the consciousness of the motor vehicle driver, enhancing the awareness of traffic safety and reducing traffic accident, traffic jam and traffic chaos caused by lack of security-conscious, which have a profound and far reaching significance were now more relevant than ever for traffic safety(XU Da-ke et al., 2004).

2. DESIGN DESCRIPTION AND SYSTEM STRUCTURE

A complete vehicle monitoring system has an enrollment process and a verification process. the function for identifying the cars that is it a similar to violate traffic regulations is based on comparing the existing type of violation between information stored in a database system to the relationship between car routes and traffic marking, if not, then give up to save the information data; Conversely,

the real-time information data were sent to database (Lehtoranta, O et al., 2005). The registration function is that added the illegal vehicle route and information is transmitted to the monitoring center to store (AJ. Bharucha et al., 2006). By designed by mixed with the hardware and the software, the system has general and wireless network transmission. The hardware of system based on SAA7113 camera chip and FPGA to complete the information data collection, UDP wireless network protocol to complete the data transmission and the software processing of data acquisition based on Nios Processor, which Oracle database for data storage and the webpage as to communicate with the users. The system consists of four parts: data collection, automatic data processing system, UDP network transport protocols and the central monitoring system (Zuo Zhen et al., 2007). The Nios II series embedded processor was used as the source of data that it managed to cope with the demands of the image processing speed must meet the real-time requirements. Designing a 32 bits Nios II CPU with SOPC, The system contains 512k RAM to temporarily store data, 32MB to control data cache, I2C bus to control the working status of video processing, Ethernet networks to send and receive data (Xinbo Huang et al., 2007). Avalon bus to realize the network connection on Avalon agreement of network between the Nios processor, buffer circuit and interface circuit and provide a high speed networks data path, multi-channel and real-time processing ability. We can also automatically generate exchangeable Avalon bus with SOPC Builder. The system structure is shown in figure 1.

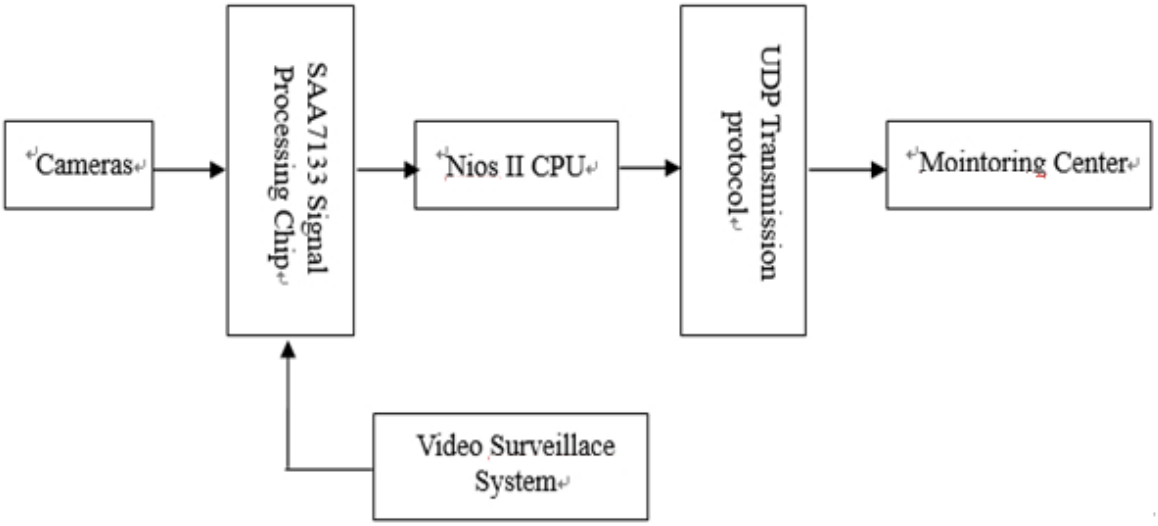

Figure1. *Peccancy Monitoring System Structure*

2.1. Hardware Design

The system hardware is shown in figure 2, in which, a single FPGA contains of Nios processor, SRAM controller, SDRAM controller, Flash controller, device drivers, UART and external SRAM controller. Take advantage of SRAM could be used for Memory-storing of video associating video collection which achieved with Verilog language with the network transmission are realized by Nios. if we want to keep these data, the bus switched automatically into reading from a camera device the video file, that was at the Quartus II, however if we want to send data the bus switched automatically into writing from a camera device the video file that was at the Nios II. We choose EP2C5T144 of ALTERA chip which was well equipped with 1024KB SRAM and 32MB SDRAM.SRAM and SDRAM were used for the Nios processor to running program and storing data, Flash is used to store temporary information of illegal vehicle. Considering better integration and flexibility for our design, we can use Nios soft core CPU as the core processing module, thus we can increase speed of operation by using an instructions of the user's. At the same time, the ALTERA corporation also provides us some free IP core which including the UART, SDRAM, Flash and SDRAM controller. Using SOPC Builder, we can easily customize the Nios processor which is what we need and if we want to change, reconfiguring the application in the SOPC Builder. Software such as the system On Programmable Chip (SOPC) Builder provides an integrated development environment. A program

involving both high level language instructions and implemented using user defined blocks written in hardware description language, can be integrated together, compiled, and downloaded to the programmable chip. Using the SOPC Builder system design tools, we can specify connections between both Nios bus masters and any Avalon slaves in our system such as memory and peripherals. SOPC Builder automatically inserts arbiters as required.

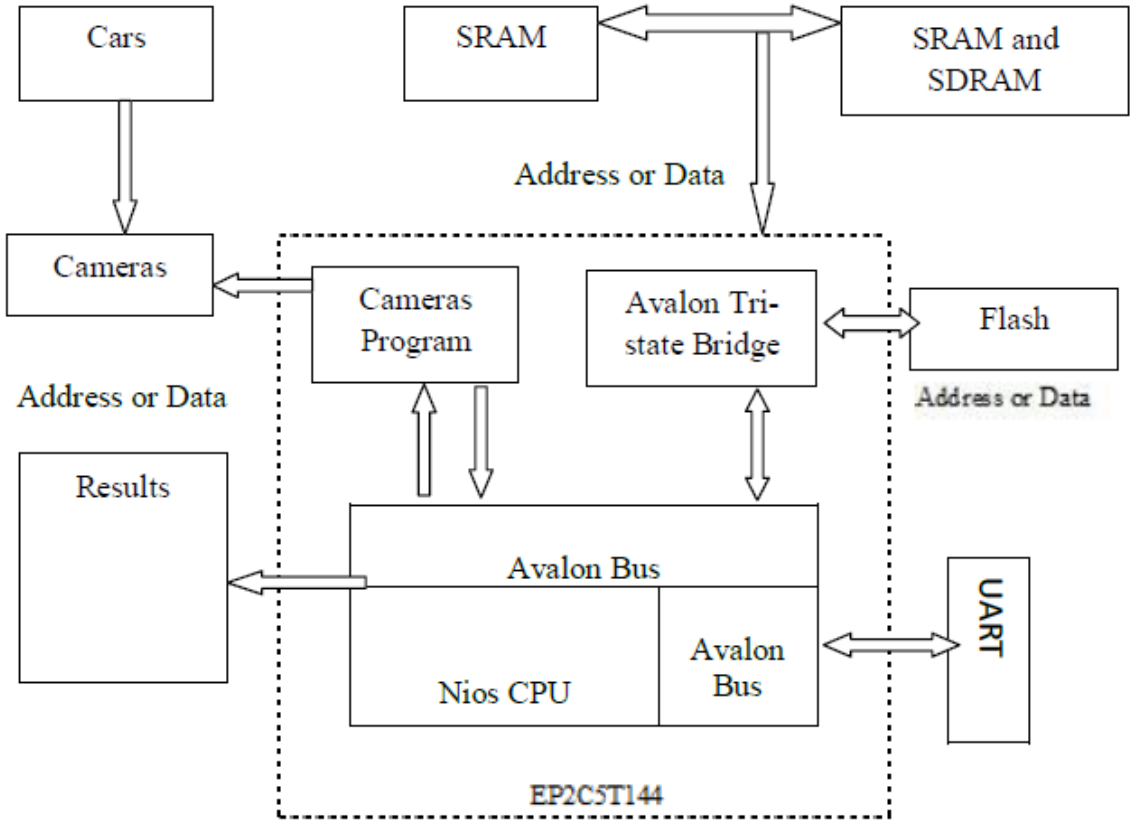

Figure2. *Nios processor System*

2.2. Software Design

In order to detect the moving and still vehicles effectively and meet real-time system requirement, we set a direction area in the acquired signal. This meant intercepting the needed image data by the control circuit, and save data into the on-chip RAM through Avalon bus to improve the processing speed effectively. The whole system adopts a PLL (phase locked loop)which input clock frequency of 50 Hz, output clock frequency of 100 Hz, 2ns physical clock offset, physical clock of SDRAM frequency of 100 Hz and clock input is used to control Video Capture frequency of 100 Hz, moreover, Both models which in zero delay buffer mode and with no compensation are available for PLL. We can take advantage of the higher-performance processor of Nios and turn off second-level cache which are the Initialization vectors was set to CFI, abnormal vectors was set to SDRAM, a input PIO and a output PIO and the input signal is latched on the rising edge of CLK while the output signal is latched on the trailing edge of the CLK. Input CLK is written to the reading audio signals and output CLK is written to the writing audio signals of Nios. The system control program contains the procedure of extracted signal features, the edge signal monitoring program, recognizable inspection of cars program and transmit information program. Recognizing illegal vehicle by extracting video information which capture by high-definition camera. If there is illegal act of vehicle, we should store information to database in order to transmit to center conductor for looking at, otherwise, dropping the collection information. Nios II has two mainly functions: read cache in SRAM image data and the transmission through the UDP protocol, while the realization of the two functions are realized in the interrupt service function. As shown in figure 4, these are the detailed steps of the operation in the flow diagram.

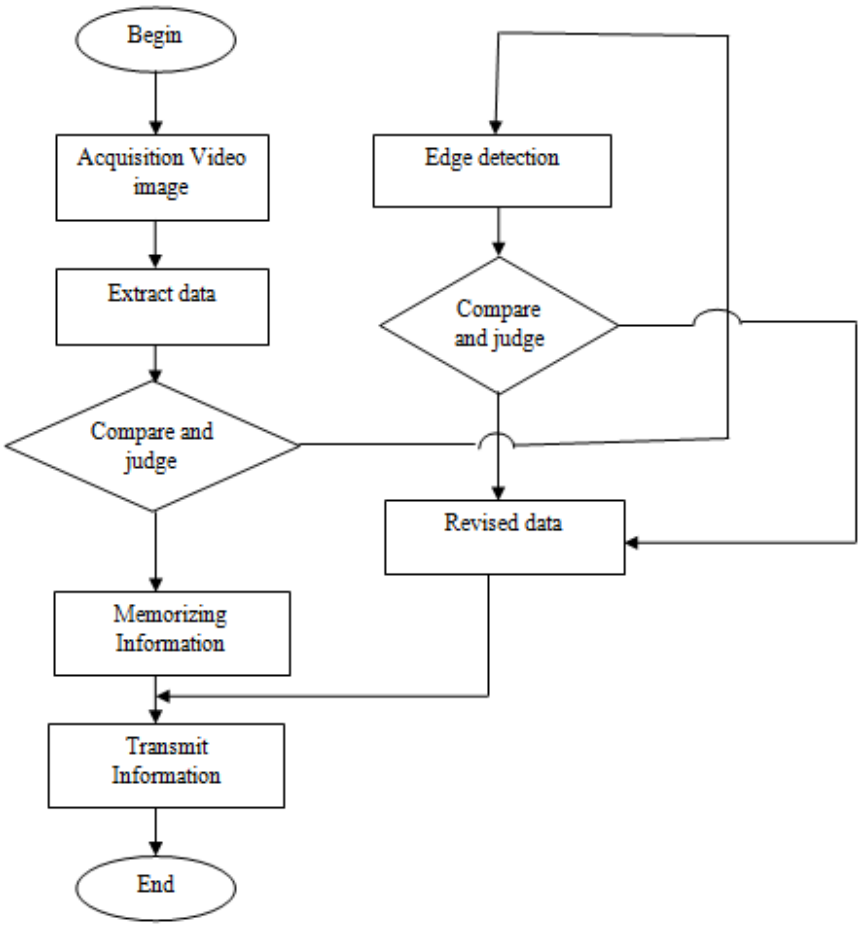

Figure3. *Software design diagram*

Some key codes an experiment is carried as following:

```
//read data
   for(j = 0;j < 76800;j++)
{
      a[j] = IORD(SRAM_16BIT_512K_0_BASE,j);
      b[j] = IORD(SRAM_16BIT_512K_0_BASE,j) >> 8;
  }
//write data to SRAM
IOWR(PIO_1_BASE,0,1);
for(i = 0;i < 1;i++)
{
      for(k = 42;k < 1506;k++)
      {
            SND[k] = 0;
      }
      TransmitPacket(SND,1510);
      // Send repetitively 1468 bytes of data.
}
for(i = 1;i < 106;i++)
{
      for(k = 42;k < 1506;k++)
      {
```

```
            if((k%2) == 0)
                SND[k] = a[k/2 - 21 + i*732];
            else
                SND[k] = b[k/2 - 21 + i*732];
        }
        TransmitPacket(SND,1510);
        // Send repetitively 1468 bytes of data.
    }
```

2.3. Performance Parameters

Performance parameters include correct identity rate test(shown in table 1) and identity time test. Following is the experiment data of the system operation.

Table1. *Correct identity rate test*

Sample Quantity	Correct Identity	Correct Identity Rate	Wrong Identity Rate	Error Acceptance Rate
100	99	99%	1%	1%
100	98	98%	2%	2%
100	99	99%	1%	1%
100	95	95%	5%	4%
100	96	96%	4%	3%

3. CENTER DATA MANAGEMENT SYSTEM (CDMS)

The system is to intermingle with advanced data communication terminals, software and other technology, which could been achieved a variety of unattended environment parameters (temperature and humidity, pressure switch, etc.) of the real-time data acquisition, storage and automatic monitoring and alarm processing. Center monitoring data management major provides interface for user, as shown in Figure 4, includes user management, video monitoring, video playback, vehicle, electronic map query, system settings, click on the corresponding link to open the corresponding management page, vehicle violation information through the data stored in the Oracle database through the interface, which can query all kinds of violation vehicle.

Figure3. *Monitoring research Center*

4. CONCLUSION

SOPC is both a software tool and IP design methodology. This is probably the best choice for Peccancy Monitoring System prototype development and research. The whole acquisition process is controlled by software on the computer. The experiment results show that the system have a good performance. The experimental results show this design methodology can efficiently solve the traffic management problems on the Nios platform mentioned above well.

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