International Refereed Journal of Engineering and Science (IRJES)
ISSN (Online) 2319-183X, (Print) 2319-1821
Volume 5, Issue 7 (July 2016), PP.01-05

Study on Intelligent Transportation Moving Targets Detection Based on background Image Difference Method

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Abstract:- Along with the improvement of people's living standards. A car per capita has increased which leads to many traffic congestion. Intelligent transportation system based on video image processing technology moves target detection method by using computer vision. Pattern recognition technology can be easily collected traffic data and real-time transmission to the reasonable channel traffic command center. Based on this, road will be more effectively which will solve the traffic congestion. This paper uses the background difference method to extract moving object in video. Using RGB shadow suppression method to remove shadows moving target and moving target information collected so as to improve the accuracy of motion target detection. On this basis， the virtual window is used for total window of moving targets which is set in the middle of the road. This paper sets up the hardware platform and software programming.
Keywords: - Background extraction, Intelligent transportation system, RGB, Target detection,Accuracy

I. INTRODUCTION

The concept ofintelligent transportation systems (ITS) was came up by the United States in 1960s, the national researchers for video detection technology have made a great contribution and achieved results. But because of the need for real time processing and the uncertainty and complexity of theenvironment, taking into account interference, noise and so on, it puts relatively high requirements [1]. So we have lots of things to do in the video detection areas.

II. MOVING OBJECT DETECTION ALGORITHM -BACKGROUND SUBTRACTION

Background subtraction method was first introduced in 1997, the principle is to subtract the current frame and background images, and then binary differential image detects moving targets, background subtraction algorithm is shown in Figure 1:

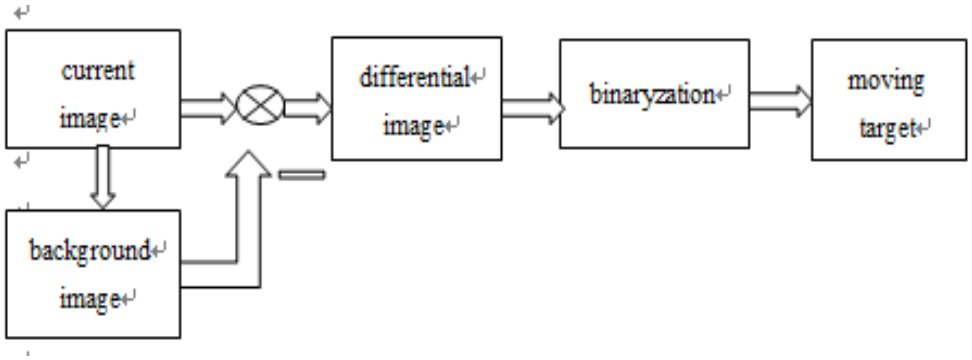

Figure 1: schematic diagram of background subtraction

Algorithm background subtraction expressions are as follows:

$$d_n(x,y) = |f_n(x,y) - b(x,y)| \quad (1)$$

$f_n(x,y)$ forthe current image, b(x, y) for background images, $d_n(x,y)$ for differential image, the differential imagebinary is as follows:

$$F_n(x,y) = \begin{cases} 0, Background\ |d_n(x,y)| < N \\ 1, Background\ |d_n(x,y)| > N \end{cases} \quad (2)$$

If the background image is static, so moving objects will only change in motion, the rest is judged as a background, this is the ideal situation. Background subtraction method is capable of detecting more precise

targets and is the most common method for detecting moving objects nowadays.

III. INTELLIGENT TRANSPORT ALGORITHM FOR MOVING OBJECT DETECTION

3.1 Method of digital image processing and image processing

People's life is closely related to the human eye and visual images brighten our lives. We see images of everyday life that appears in analog forms,if we want to facilitate the process of transformation of the digital signal it must be sampled and quantized. In the modern life, digital image processing technology combined with computer application field is widely used, movement target detection system processing is the CCD camera that comes of video image [2], video image quality will decline seriously and with noise after digital process, that cannot be completely eliminated, so we should pretreat on these noise to get smooth image before traffic detection.

3.2 Moving object detection algorithm for intelligent traffic

Smart traffic is the core of traffic flow video detection of moving object detection algorithm. Video is made up of a frame image, the number of images displayed per second is known as the frame rate, the normal video frame rate is approximately 25[3]. Video image processing workload is considerable because we want to test each frame. The purpose of moving target detection is to separate foreground from background, essentially moving pixels and pixel distinction at rest. And prospects after the distinction between images are for further processing and testing. This article focuses on background subtraction of foreground segmentation and shadow detection algorithm based on moving target detection method for virtual window.

IV. INTELLIGENT TRAFFIC MOVING TARGET DETECTION SYSTEM

4.1 traffic design of moving target detection system

Intelligent traffic moving objects detection based on background subtraction puts high requirements for hardware and software. Image processing operations are substantial, in terms of hardware we use CCD camera and DSPDM642 Video collection [4]; we choose VS2012 and Open CV [5]for image processing in software. Software and hardware used in this chapter are described in detail. System architecture is shown in Figure 2:

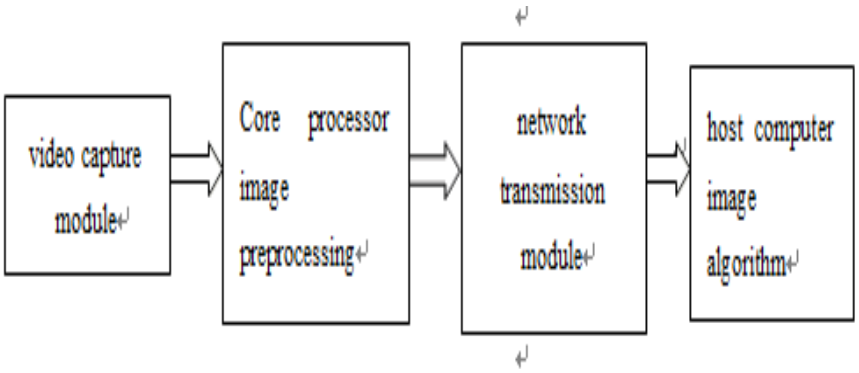

Figure 2 : system architecture

This hardware platform includes video capture module, core manager, network transmission module, software platform, image processing and computer vision algorithms. Firstly video captured by the video module is transferred to the core processor, and then image preprocessing in the core processor is transmitted over the network to the host computer, finally image in the computer algorithm is to detect traffic results.

4.2 Hardware platform

The hardware platform includes video capture module, processor, and network transmission module. Video capture modules are connected to the core processor via the video portwhich is connected to the PC and transmitted over the network module [6]. This system applies video detectionto traffic flow measurement and solves traffic congestion for the intelligent transportation systems which provides real-time trafficinformation. Hardware diagram shown in Figure 3:

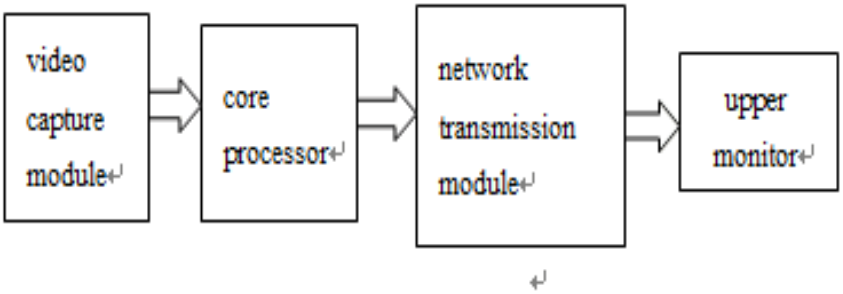

Figure 3: hardware diagram

Video capture is the most important prerequisite for video detection, which is extracted from the image acquisition device simulation in image and converts analog signals into digital signals for subsequent analysis. Stable and clear video for later image analysis and processing plays an important role, determining the quality of the video image of the system. Data is acquired by SONY IR COLOR CCD cameras [7].A CCD camera has the following advantages:

CCD cameras are mainstream video capture devices now and more stable and reliable than other cameras.

CCD camera image quality and excellent picture quality are contrast and clear.

III. CORE PROCESSOR

The hardware core processor uses TMS320DM642-type high-performance digital media processor of TI, the chip is the latest fashion in TI C6000 series DSP, which has excellent image processing performance. Also the Development Board integrates a very complete audio, video and network communication equipment that are applied to computer vision, pattern recognition, network video monitoring and image-processing applications. This DSP core processor with high speed, high stability and high robustness is for video image acquisition and processing

IV. NETWORK MODULE

This system uses the TCP/IP protocol for network programming to streamimages to the PC over the network for display by video. Network module hardware platform and software platforms are interconnected so that they communicate with each other and transfer data from hardware to software platforms.

4.3 Software

In the Windows 7 operating system, programming with Visual Studio 2012 [8] is implemented. Main program are as follows:

```
main()
{Uint32 ip, ipGateway;
CSL_init();
CACHE_clean(CACHE_L2ALL, 0, 0);
CACHE_setL2Mode(CACHE_64KCACHE);
CACHE_enableCaching(CACHE_EMIFA_CE00;
CACHE_enableCaching(CACHE_EMIFA_CE01;
g_vpCapChanParams.segId = SDRAM;
g_tvp5150Params.hI2C =g_dm642I2CHandle;
ip=DEFAULT-IP;
ipGateway = DEFAULT_GATEWAY;
if(Stream_Init(FALSE,ip,ipGateway,g_videoMode,DEFAULT_VIDEO_RESOLUTION,
DEFAULT_FRAMERATE) == 0)
{LOG_printf(&trace, "Network initialization failed\n");} LOG_printf(&trace, "Exit main\n");
```

This system consists of the following parts:

1). Image acquisition. CCD camera videohas gone through TMS320DM642 analog to digital conversion in computer in real time.

2). Image pre-processing. The video needs to be pre-processed, image filter, image enhancement, image sharpened.So as to make the traffic video relatively smooth [9].

3). Moving target detection. Background extraction and shadow removal of moving object extraction algorithm processing from deposited on your computer's video is made.

4). Set the virtual window. Setting virtual window size according to lane width, so that it can accurately determine whether there is the vehicle passing. Detailed system process in Figure 4:

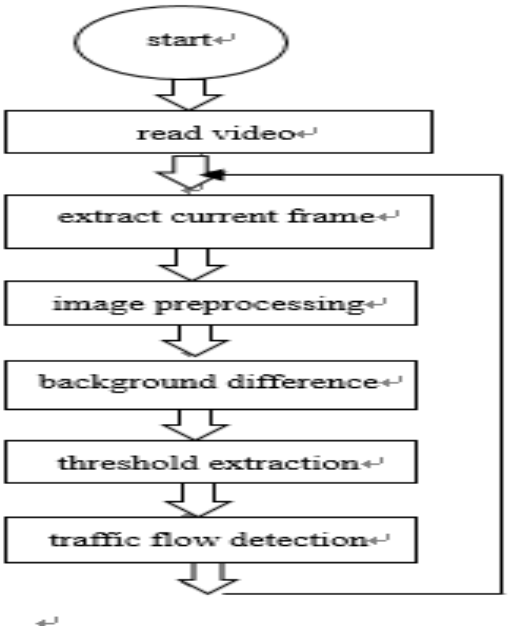

Figure 4: software flow chart

The software process in detail: firstlywe read the current image while extracting the current video image frames and then deal with image of the current frame, finally smooth the image selected by background subtraction method to extract after moving target optimal threshold value to ensure that the moving object is full anddetect the moving target traffic by virtual window.

4.3 Hardware physical composition

The hardware platform consists of ONY IR COLOR CCD camera, type TMS320DM642 DSP, DSP emulator and twisted-pair lines.

4.4 Test result analysis

Procedures to be adopted for traffic load results are compared with the artificial traffic statistics results,also observe test number and the actual number to determine the accuracy of the computer. The paper detected for some time traffic, the results are as shown in table 1:

Table 1. flow test results:

Lane	Program count	Manual count	Number	Accuracy
1	26	29	3	89.7%
3	15	16	1	93.7%
4	17	20	3	85%
5	20	23	3	87%

1) Omission for the following main reasons:

A.When vehicles change lanes temporarily, the size of virtual window is smaller than the threshold for missing phenomenon.

B.When the vehicles detected are too tight,area does not recognize the two carsbut will mistake as a car. And the cameraplacement problem may also cause automobile mutual adhesion in the image so that the image is not

recognized.

C . When the color of vehiclesare close to the color of the road, identified area will be very small, leading to that a virtual window cannot be detected.

2) Some of the recommendations to improve the accuracy:

A. Improve hardware device, use high resolution camera to capture more stable and high quality video images.

B. Algorithm design to solve the problem of vehicle adhesions.

C. Use multiple cameras linked with each other to resolve false detection due to camera angles.

V. CONCLUSION

Intelligent traffic detection based on background subtraction method is an important part of intelligent transportation systems, also traffic control and management play an important role. The paper uses CCD camera to capture video images and transfer imageto PC through the C6000 series DSPafter pretreatment，also uses the computer digital image processing to extract the desired traffic information. Accuracy of the system can be used as a provincial highway and part of the intelligent transportation system of urban Expressway.

Based on the image pretreatment, background updates, moving target extraction, shadow detection, traffic load, and so on, the paper does a lot of work, therefore implements objectives overall.

Intelligent transportation system has important practical significance, with the development of computer technology and maturity of the various algorithms, video detection technology will be even more accurate to real time, traffic roads analysis and early warning. Technology changes your life and video detection technology will become a part of life in the future.

ACKNOWLEDGEMENTS

The authors acknowledge Shanghai University of Engineering and Science for giving financial supports to thisproject with No. 16KY0123.

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