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Research of Image Acquisition and Processing Based on Visual Guiding Intelligent Vehicle

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Abstract. Accurate traffic information collection and identification is a basic work for the intelligent vehicle autonomous driving, is the important premise to decide whether it stable high-speed vehicles. Road recognition technology and digital image processing techniques play a very important role. On the one hand can really simulate human vision, on the other hand also can get large amount of information, in this paper the research content of intelligent transportation system, image acquisition device and digital image processing technology in the application of intelligent transportation system and so on has made the detailed analysis and research.

Introduction

With the rapid development of social economy and the rapid improvement in traffic motorization level, the problem of the urban traffic is more and more serious, many domestic cities especially large and medium-sized cities increasing traffic, traffic jams, traffic accidents occur frequently, people are enjoying the great convenience brought by the motor vehicle at the same time, also faces the problem of heavy traffic, road extension on simply cannot completely solve the traffic problems [1]. Under the existing conditions, set up and improve the intelligent transportation system is one of the effective method to solve the traffic problems, and how to establish intelligent transportation systems, fast and effective land for traffic monitoring, scheduling and control traffic has become a urgent problem to be solved.

Intelligent transportation system

Intelligent transportation system is the ground transportation in the 21st century science and technology, operation and management of the main development direction, is one of the effective ways to solve the traffic problem, is a transportation revolution, its importance is being recognized by more and more people. Western Europe, North America and Japan completely developing intelligent transportation system, formulation and implementation of the research and development plan. Developing countries also began to the comprehensive research and development of intelligent transportation system [1]. Road traffic information such as the number of cars, cars, the basic traffic parameters such as speed, vehicle trajectory of acquisition is the premise and foundation of ITS function.

With the continuous development of computer and image processing technology, traffic video image detection technology is more and more become an important part of modern intelligent transportation system (its). Due to many advantages of video detection method, in some developed countries abroad, such as America, Britain, Canada, Germany, Japan, etc. , application of the advanced computer, image processing and communication technology, video technology research first, and developed a distinctive products [1], such as: TIPS Auto scope in the United States, Britain, Germany's Siemens ARTEMIS and Belgian Traficant.

Traffic information acquisition

Traffic flow information collection is a very important part in intelligent transportation system of the constituent elements, or historical statistics of traffic flow data of real time information is the foundation of further study. Traffic flow information, including traffic events, run through red lights, etc., traffic accident and traffic flow and lane occupancy, speed and travel time, traffic parameters and the information such as road congestion occupies very important position in the traffic flow data. Traditional acquisition and measuring method is only applicable to make investigation in the short term, is not suitable for real-time traffic control and traffic flow guidance [2]. Or automatic acquisition technology applied to a lot of, can be measured at the same time a variety of traffic parameters.

Standard of PAL video signals: camera scans 25 images per second, each two points, odd, even, odd field before they even field, so the scanning 50 images per second. Standard PAL video signals by the composite sync signal is compound blanking signal and video signal [2]. The video signal is the true image signal, for black and white video camera, the image is black, the lower the voltage, the image is white, the higher the voltage. The video signals include two images, is divided into odd and even fields. Because the array CCD camera based on interleaved in the points on the image, so the odd field contains only odd lines of image signal, and even field contains only the even lines of the image signal. When scanning a line, end it outputs video signals is lower than the lowest video signal voltage level, and maintain a period of time. It is a sign of scanning line. After the present signal and will appear at the same time less than the minimum video signal voltage level, and maintain a period of time.

Video sync separation chip LM1881. LM1881 is currently widely used video sync separation chip (figure 1), it has a variety of packaging form, only eight pins [3]. Here are a few key pin.

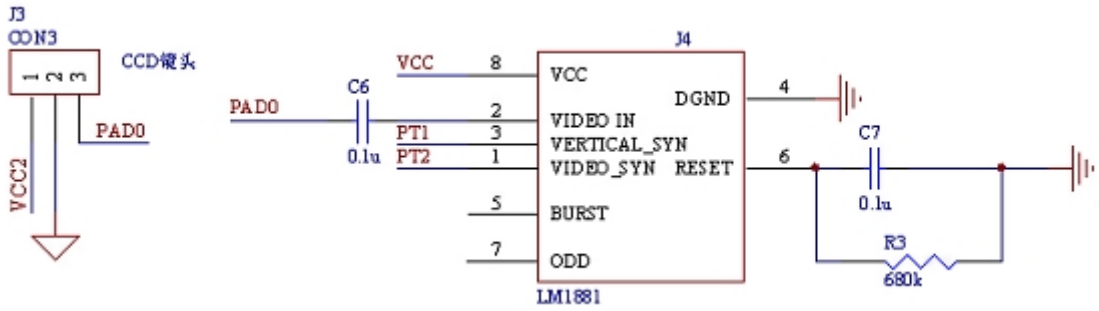

Fig. 1 The principle diagram of the video sync separator

Pin 1: line sync signal output terminal.

Pin 2: input video signal.

Pin 3: field synchronization signal output terminal. When a camera signal a synchronous pulse arrival, the client will become a low level, maintain commonly 230us, and then turned back to a high level again.

Output pin 7: parity. Using high and low level according to the current is odd or even. When the camera signal is in a strange field, will be the end for the high level, when in the dipole field, as a low level.

Image processing sequence work normally when the sequence diagram as shown in Fig. 2:

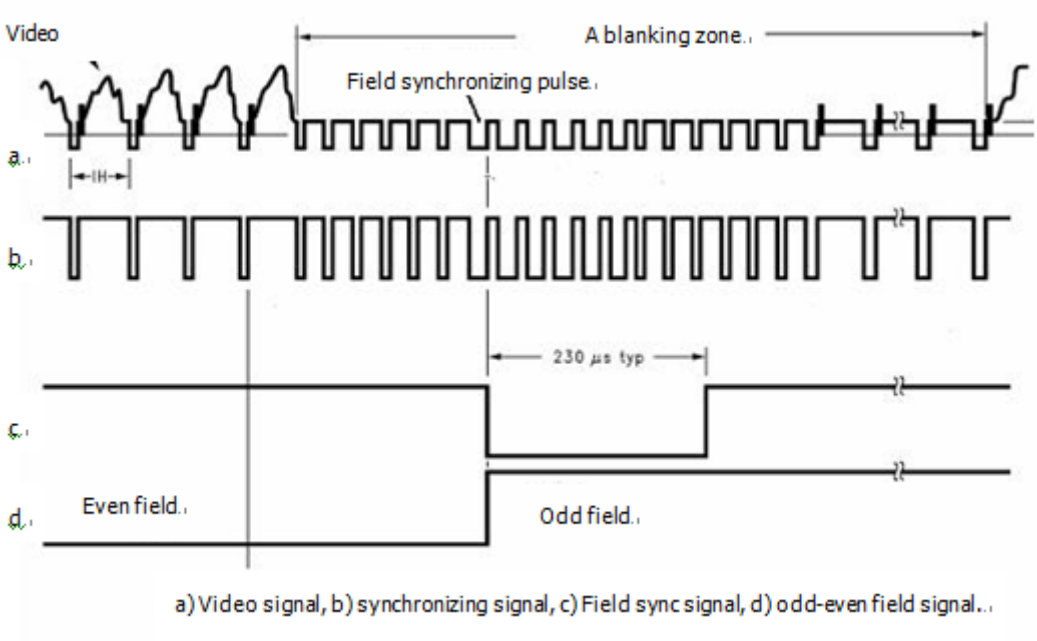

Fig. 2 Image processing sequence diagram

Intelligent transportation information of the image processing

Traffic parameter extraction method based on video image is the trend in recent years, a new method of traffic parameters to obtain a blend of computer vision, image processing, pattern recognition and information fusion, and other areas of knowledge, compared with the other traffic parameter extraction method, has obvious advantages: without tearing up the road, simple installation, easy maintenance; Can obtain the traffic information is rich, multi lane detection, traffic models, share, and the speed of the car traffic information; To provide the traffic administrative department of the visual image, etc. Therefore, based on computer vision detection technology has gradually become the mainstream in the traffic flow parameters detection technology.

Image processing technology in the intelligent transportation system. Image processing technology in intelligent transportation system is road traffic images captured by the image sensor, and then using the computer for image processing and recognition to imitate human visual function, intelligent transportation system of useful information you need. Here includes both 2D image data, such as color images, black and white images, including 3D data, such as image sequence [4]. The image processing technology of intelligent transportation systems can be divided into two broad categories. Frame processing: the processing object is a frame image, generally includes image enhancement, image restoration, edge detection, target recognition, etc. Interface processing: generally includes moving target detection and tracking, shown as figure 3.

Frame processing generally includes pixel value transformation, window operation, the deformation of 2D line and curve, area and boundary detection, detection, feature extraction and target recognition, etc. Interface processing generally includes stereo matching, the optical flow, moving target detection, etc., and interface processing can also be combined with forecast and tracking [4]. The purpose of the digital image processing mainly has three aspects:

1) Do some transformations of image gray level? Enhance the useful information; restrain useless information, to improve image quality by, so that the human eye observation, understanding, or computer for further processing. These treatment technologies mainly include image enhancement, image restoration and image coding.

2) By some special means extraction, description and analysis of the images contained in certain characteristics or special information, main purpose is to facilitate the computer for image for further analysis and understanding, often as a pretreatment of pattern recognition, computer vision, etc. These kinds of image processing including image segmentation, image recognition, feature extraction, etc.

3) The compressed image data, so that the image storage and transmission.

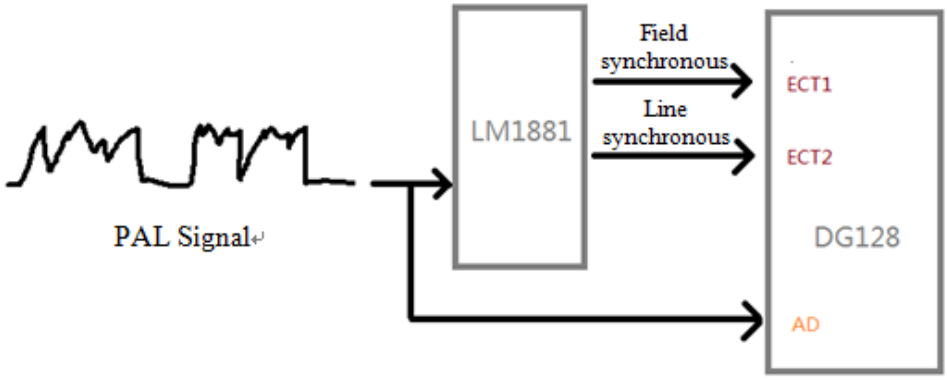

Fig.3 PAL signal image conversion

In the field of image processing in ITS application. Image processing have very broad application in the field of ITS, such as traffic monitoring, traffic statistics, and so on, but one of the most direct and most interesting is the intelligent vehicle navigation and traffic control [5].

In intelligent vehicle navigation many complex and challenging task, is the most important path tracking, it includes two main parts road detection and obstacle detection, obstacles include vehicle around the vehicle and driving an obstruction on the road. The path of detection can be divided into structured and unstructured road two kinds big [5]. The former general is better roads, highways and part structured unstructured road generally lower for structured in urban road, this road no lane line and clear boundary of the road, and turn radius may be larger, so often to use the model to detect more complicated way. Obstacle detection usually refers to the road vehicles and other foreign matter. In general, obstacles can be defined as the vehicles driving on the road with the object of a certain height. Method to detect obstacles in general is inconsistent in the corresponding image of road area looking for clues, such as gray level significantly change and grain boundary, which has abnormal gray areas. Around the vehicle detection vehicle is a special kind of obstacles, most of them with a camera located in the same lane, and speed. In the rural highways and roads, it is necessary to detect and track vehicles ahead in order to decide whether to follow or overtaking.

In the application of the traffic control. It is different from the application of intelligent vehicle navigation, to control the traffic cameras generally installed beside the road and parking lot or above, to monitor the traffic area. Traffic flow detection is one of the most important information in traffic control; using image processing method can get important areas such as the intersection of two dimensional traffic flows, which can all traffic flow information statistics. Traffic management is one of the cores of vehicle detection and recognition. That can usually be achieved by image matching and license plate recognition method. Since the 1970 s, foreign researchers began the study of vehicle detection in traffic environment [6]. Can say that the current vehicle video detection research has quite mature, its overall trend from the highway to the urban traffic transfer, structured road to unstructured road; Detection and motorcycle and intersection, bicycles and pedestrians target detection of this kind of difficult to modeling will become the focus of future research.

Traffic accident automatic detection is of great significance for traffic safety. Can generally by monitoring the vehicles driving, such as accident parking, for testing. Under the bad weather, traffic accidents and traffic jams are significantly increased [6]. So monitoring road traffic and weather, and it is necessary to provide the relevant information broadcast to the driver, therefore also needs corresponding monitoring system and alarm system. In an actual urban traffic environment, especially in such a typical mixed traffic system in our country, non-motor vehicles and pedestrians are the main participants in the urban traffic, together with the motor vehicle traffic main body, should not be ignored. In the mixed traffic, the number of non-motor vehicles reached 25% ~ 55% of the total traffic, and non-motor vehicles is given priority to with the bike [7]. Quite a long period of time in the future, motor vehicles, non-motor vehicles and pedestrians of mixed traffic flow will continue to be significant characteristics of urban traffic in China. Carried out and the current research of urban traffic system, the vehicle as a key, the main evaluation index for motor vehicle

delay, queue length, etc. , and for pedestrians and non-motor vehicles related research is how to influence the urban traffic system is woefully inadequate.

Because of non-motor vehicles and pedestrians on the material, outline and trajectory are related to motor vehicle has the very big difference, so the system used for determination of motor vehicle is not very well suitable for the detection of non-motor vehicles and pedestrians [7]. Motor vehicles, compared to a non-motor vehicle video detection and traffic parameter extraction difficulty bigger, study of non-motor vehicles and pedestrians traffic data acquisition has become the emphasis and difficulty in traffic data automatic acquisition technology. Foreign researchers have used the United States Auto scope system and British TIPS to detect pedestrians and non-motor vehicles, but the effect is not very ideal. Universal existence from the perspective of the urban transportation of domestic, including motor vehicles, bicycles, motorcycles and a variety of human phenomenon of motorized traffic flow of pedestrians, study of non-motor vehicles in the mixed traffic flow characteristic parameters is of great importance.

Summary

Because of the complexity of the intelligent transportation system, and the characteristics of the multidisciplinary, although the current study some good results have been achieved, but at the same time also want to see, there are still many unanswered questions. Traffic, vehicle speed, vehicle trajectory acquisition is still the basic traffic parameters, such as the difficulty in intelligent transportation system. These problems mainly reflects in: as a result of non-motor vehicles and pedestrians in the particularity of material, on the contour, there exists such target modeling has difficulty, the light and the climate change also brought very bad influence to the accurate detection. Object of mixed traffic flow, the mutual interference between the "failure" problem caused by state space model, increased the difficulty of accurate target tracking;In actual traffic scene, is difficult to obtain relatively stable background image from the scene real-time, the accuracy of detection is also a larger degree of interference.

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