

Research on the Application of Pattern Recognition in Intelligent Transportation System

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Abstract

Intelligent transportation system is a hot topic of research and application in the field of transportation, which integrate multidisciplinary advanced technology, pattern recognition, computer technology, artificial intelligence and other technologies. In terms of information processing, it has obvious advantages, and future development potential is great, especially vehicle detection technology of traffic system, as an important composition part, compared with traditional vehicle detection methods, has incomparable advantages. In order to make the intelligent traffic better service for the city, based on the introduction to pattern recognition technology of traffic system, the application of the pattern recognition technology in intelligent transportation system is analyzed in detail, to provide reference and help for the further research of pattern recognition in the intelligent transportation system.

Keywords

Intelligent Transportation; Road Safety; Pattern Recognition; Vehicle Detection.

1. Introduction

The traffic has a great effect on the development of city. With the rapid development of economy, the intelligent trend of city traffic in China has been further improved, and many of the city's traffic is changed from the traditional traffic into intelligent traffic. Traffic is a sign of the level of urbanization. In modern cities, because of the large population, there are many problems in traffic, such as traffic congestion, traffic accidents, serious traffic environment and so on. In order to solve the problems existing in traffic, it is necessary to carry out a strong means to manage the traffic. The traditional human management system has been unable to adapt to the current situation of the rapid development of traffic [1-2]. As a result, we should realize the traffic intelligence. In recent years, the graphics recognition in intelligent transportation system has become a hot topic of discussion. Intelligent transportation system (ITS) [3] is a new technical field appeared to solve many difficult of ground transportation increasingly serious from the fundamental level, it is the integrated application of high technology represented by information technology in road transportation, and it is also a comprehensive management system with the combined application of the advanced information technology, data transmission technology, control technology, computer processing technology and so on, making people, vehicles, road and environment harmoniously combined, attracted worldwide attention and developed extremely rapid. In order to make intelligent traffic play its due role, it is necessary to make a reasonable use of the traffic system graphics recognition technology.

2. Pattern Recognition Technology

Pattern recognition technology needs to use the computer and other electronic equipment to complete through a series of work. For example, graphics collection, coding, transmission; graphics synthesis and graphics generation; graphics display, graphics formation and graphics output; graphics changing, graphics response, graphics construction and so on. In addition, the graphics recognition technology includes the technologies related to the design and production of systems. The main purpose of pattern recognition is the following: first of all, carry out special treatment of the graphic gray-scale, add useful information on the graph, make the useless information weak and the graphic quality

improved, which is convenient for people to observe and understand it with eyes directly or to process graphics through the computer [4]. Secondly, extract and analyze the special information contained in the graphics and features. Its main purpose is to facilitate the calculation in the work to understand and process graphics, such pattern recognition including pattern recognition, graph segmentation and so on. In the end, the graphics are processed to facilitate the storage and transmission of graphics.

3. Application of Pattern Recognition Technology in Intelligent Transportation System

3.1 Vehicle Detection

Vehicle detection is a basic technique in intelligent transportation. In intelligent transportation, in order to achieve vehicle recognition and tracking, it is necessary to accurately separate vehicles from the background, only in this way can it ensure that all parameters work in measuring traffic are smoothly carried out. Therefore, measurement detection is the basis of vehicle traffic parameters measurement, such as speed, density, traffic flow and so on [5-6]. Measurement and detection work is carried out based on the color of the road. The three methods commonly used are: background subtraction, edge detection, and road color model. Research on license plate pattern recognition technology in intelligent traffic has always been the main research direction of intelligent traffic, because the license plate number is the only identification of vehicle. Although there are large differences in the format, content, material, and appearance of different motor vehicles, from the current actual situation, in the world, the license plate number is still the precise identification of vehicles [7]. It can realize the automatic recognition of the vehicle by using image recognition technology, and it automatically identifies the vehicle authentication, so the vehicle traffic control, traffic management automation, and the process of charging have been further strengthened, and the process is shown in Figure 1. In-depth study on automatic recognition of license plate technology in intelligent traffic is of great significance in the realization of intelligent management.

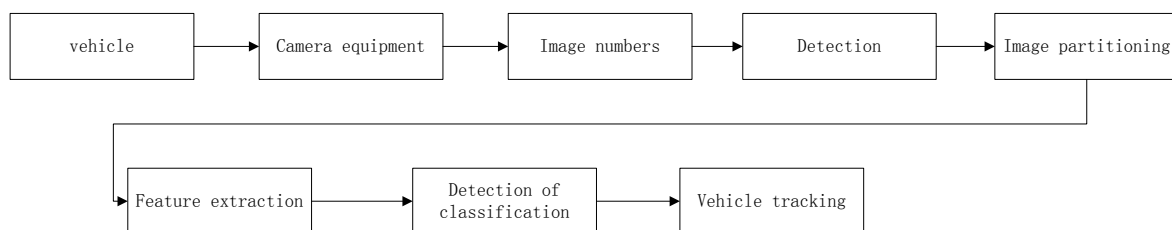


Figure 1. Figure recognition processing flow chart

The specific process of the license plate recognition is as follows: acquire graphics, extract and segment license plate of vehicle, and recognize characters in the license plate number. The specific steps are as follows: firstly, make use of camera or a video camera to take the cars on the road to complete the acquisition of graphics work; secondly, extract the license plate number is the extraction of the license plate number of the vehicle positioning pictures graphics; then, the segmentation is to segment characters based on the characteristics of row plate; finally, the license plate recognition is the identification and extraction of Chinese words or characters existing in the license plate after segmentation [8]. Vehicle license plate automatic recognition system has a wide range of application space in road traffic monitoring system, and it has a high economic value, so it is a kind of technology that is worth being popularized.

3.2 Electronic Monitoring System

Electronic monitoring system has been widely used in modern intelligent transportation, and its pattern recognition technology covers many aspects. According to the difference of function, the technology can be divided into four kinds, which are graphic filtering, graphic coding, image watermarking and encryption, and pattern recognition [9]. The purpose of graphic filtering is to clear out the interference noise existing in graphics, and extract effective audio in the transportation system

graphic; graphic coding is to compress the traffic system graph so that its size can meet the demand of current information transmission; graphics watermarking and encryption technology is mainly focused on encryption of useful graphics and to ensure the safe use of graphics; graphic recognition technology can identify behavior or object existing in the traffic system in the graphics, thus realizing the object identification. For example, the detection of daily traffic running a red light.

3.3 Road Identification and Obstacle Detection

Road is the base of vehicle navigation, and the road identification has a certain difficulty in the course of practical research. The road environment is complex, especially the rapid development of modern cities making the road traffic environment become more complex, and different roads may have similar characteristics. For example, there may be a large number of the same construction in terms of the width of the road and the shape of the curve [10]. At the present stage, the main methods of road recognition are the following: respectively based on the edge, region, graphics filter, and template. The application of these four methods in the intelligent traffic has obtained a good effect, which also makes the using range of graphics recognition technology in the intelligent traffic monitoring system has been further expanded. Before the tracking calculation, obtain position information of the moving target every time. Although the relationship between each object is unknown, in the theory it is the correct moving target, so the detection target is used to make judgments, simulate the best matching tracking algorithm based on color feature ideas, and according to an optimal rectangular matching algorithm, verify whether the target tracking exists. Thus, a simple framework is established, which is divided into three parts, start tracking, the correction of tracking, and the end of tracking, whose algorithm model diagram is shown in Figure 2 [11].

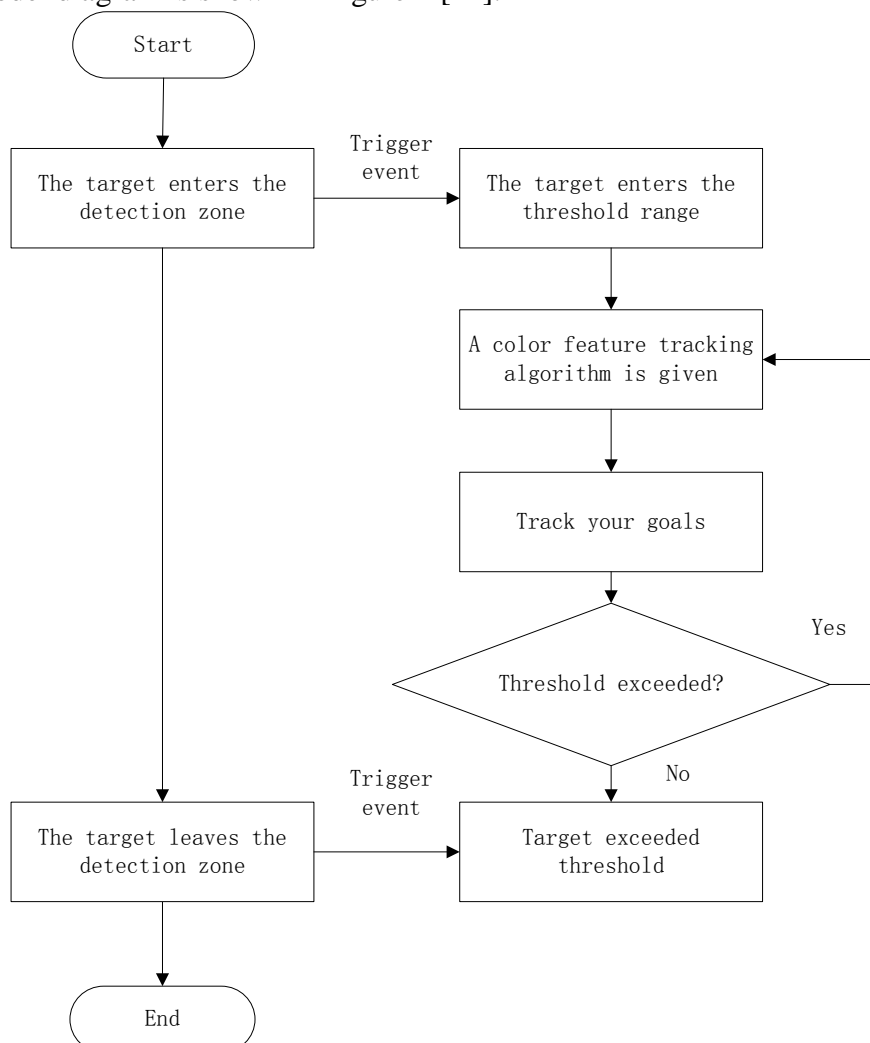


Figure 2. Image tracking algorithm based on color feature

In addition, pattern recognition technology is also widely used in the obstacles detection in intelligent transportation system. The obstacles on the road can be the bicycle, motor vehicles, traffic signs and so on, the detection accuracy is of great influence on the vehicle safe driving. The obstacle detection method commonly used is only operated based on the following three aspects: optical flow, vision, and background motion [12]. Judging from the current situation, these three kinds of detection methods have been widely used in the intelligent monitoring system, and achieved good effects.

3.4 License Plate Recognition

In the intelligent transportation system, one of the key points of the application of graphic recognition technology is the vehicle license plate recognition system. The system, taking the vehicle license of a vehicle moving on a highway as the target, uses pattern recognition technology to automatically identify the license plate number, color and other useful information, which is the focused object in the application of computer vision and simulation recognition technology in intelligent traffic and it has important significance in the development of modern intelligent transportation. A complete license plate recognition system needs to go through multiple steps in the actual application process. Graphics preprocessing needs to carry out filtering, enhanced boundary and other processing operations on the license plate pattern obtained, convenient for the smooth development of the future work, as shown in Figure 3 [13].

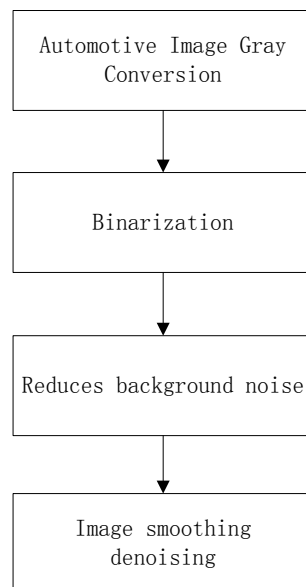


Figure 3. Auto image pretreatment process

3.5 Character Segmentation

Character segmentation is the major representation of the application of graphics processing technology in the intelligent transportation system. The gray-level pattern in the license plate region that the traffic system processing technology obtained cannot be carried out with single character segmentation in processing. On the contrary, it is necessary to make binarization processing of the pattern. The so-called binarization processing transfers the gray-image obtained to binarization graphics, and the graphics that has completed transformation only has white and black two gray values on the gray level. The edge information of the license plate image has an important influence on the accuracy of the recognition results. As a result, the geometric characteristics of the license plate should be maintained as far as possible when the license plate image is processed with binarization processing. The flow chart is as shown in Figure 4 [14].

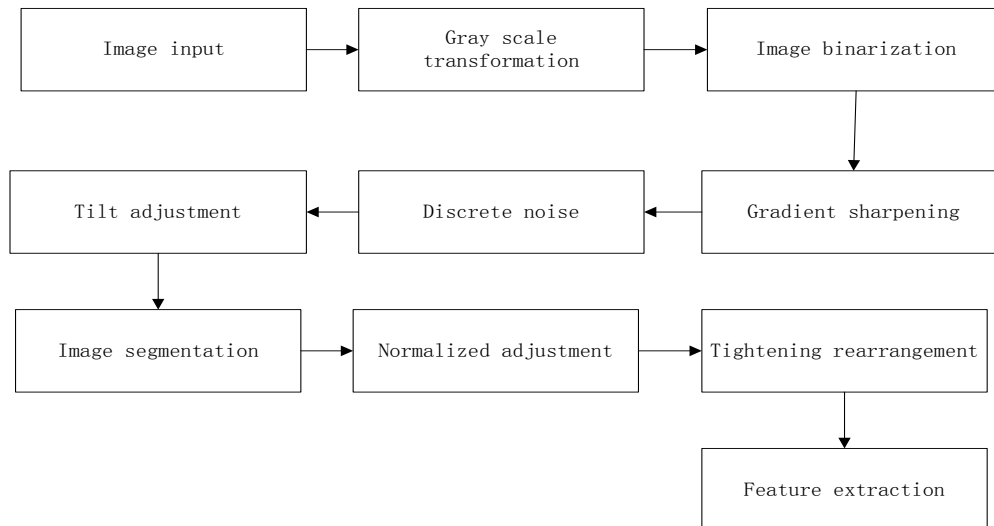


Figure 4. License plate segmentation process

4. Conclusion

Pattern recognition technology has become an essential technology in the field of modern intelligent transportation. The hardware development of traffic system pattern recognition is very rapid, but in the actual operation process, it still needs to strengthen the research of the traffic system graphics hardware, and the software development cannot stop. In the intelligent transportation system, an eternal research topic is to study on the pattern recognition technology [15]. Although the pattern recognition technology in the intelligent transportation system has made some achievements and it is also widely used in license plate recognition, vehicle detection, and obstacle detection, there still exist a certain gap with the expected effects. In consequence, in the future research, it is still necessary to strengthen the research on image recognition technology in transportation system so that it can play a greater role in the intelligent transportation system.

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