

Title: Lane Detection Technology Based on Visual Technology

Industrial Applications □Intelligent Manufacturing ■Intelligent Driving □Intelligent Life □Smart Medicine □Smart City

[Overall background]

The application background belongs to the field of driving safety in intelligent driving, and the specific technology involved is lane detection technology based on visual technology. With the rapid growth of vehicle ownership and the increasing traffic accidents, traffic safety has increasingly become the focus of attention. When the driver is driving for a long time, the perception ability of the surrounding environment, the ability to judge the situation and the handling capacity of the vehicle have different degrees of decline. The traffic accident is easy to happen. The investigation and study of the causes of traffic accidents in the Indiana University found that 85% of the accidents are directly related to drivers themselves and their driving behavior. At the same time, other studies have shown that at least 60% of the rear end collision accidents, 30% head-on collision accidents, and 50% pavement related accidents can be avoided by the driver in 0.5 seconds before the collision. If there are 1.5 seconds of early warning, the 90% accident can be avoided. Therefore, based on artificial intelligence technology, it is of great significance to improve the safety of our country to reduce traffic accidents. The lane detection technology based on visual technology is a key in intelligent driving, which is of great significance to the driver's fatigue judgment, vehicle driving area analysis, and lane keeping function.

[Problem description]

This competition involves the core technology in the field of intelligent driving, which is of great significance based on visual analysis and lane keeping. The competition questions mainly evaluate the accuracy, speed and robustness of the technology.

[User expectations]

The event organizers will provide training and verification images to participants in different weather conditions, including lane lines and other targets. Lane information of each image will be tagged and saved, and information for training and validation can be supplied to the contestant with the image. The test data will not be provided to the contestant and used for a performance judgment of the contestants. The participants will submit the algorithm library file and the example source code of the windows environment schedulable algorithm library file, which is used to provide test results to evaluate the accuracy of the contractor. The submitted documents will be tested in CPU i7, memory 8G and operating system is win7. If the algorithm processes a frame of more than 400ms (image resolution 640*480), it will not be used to calculate the final score, and all algorithms need to run in single thread.

[Expected economic effect]

The area covered in this competition is the field of traffic safety. Following is the main analysis of the market prospects of traffic safety: with the increase of car ownership and the rapid development of electronic technology and wireless communication technology, in recent years, the

vehicle intelligent system has been developing rapidly in the world. Compared with the international development situation, the development of China's vehicle intelligent system is still at the initial stage, but the momentum is fierce, and the future market space cannot be estimated. The driving safety market is still in the beginning stage, and the domestic similar mature products as well as applications are not much, but according to the market statistics and the results of our research, it can be predisposed.

The future market prospect is very optimistic. It is possible to enter the explosive growth period. There are some data here to explain the problem:

There are some market background data that can be explained here:

1. China's auto market once again made the highest record of global production and sales with 22 million 116 thousand and 800 cars and 21 million 984 thousand and 100 vehicles, and won the world's first fifth consecutive years in 2013. By the end of 2013, the number of motor vehicles held in China was 250 million, of which 135 million of public vehicles, 53.9% and more than 85 million private cars, 13 times more than that of 10 years ago. Over the past two years, the number of private cars is still growing at an average speed of about 14000000 vehicles per year. The Chinese Academy of Social Sciences issued the "China Auto social development report 2012 - 2013" in early 2013. The report shows that in 2012, there were more than 20 private cars per 100 households in China, and it is expected that China's private car ownership will soon break up to billion. Meanwhile, each hundred car ownership will reach or close to 60 vehicles in the next 10 years or so. The vigorous development of China's automobile market is likely to bring huge demand for vehicular systems.

2. In April 18, 2011, the Ministry of communications, the Ministry of public security, the Ministry of industry and information and the four Department of the General Administration of safety supervision jointly issued the "notice on strengthening the dynamic supervision of road transport vehicles", which put forward the hardship of the compulsory installation of the vehicle monitoring system for the bus transportation industry and is called "two passengers and one danger". According to "2010-2013 years of China security video surveillance equipment Market Analysis Investment Value Research Report" shows that the current passenger vehicle compulsory installation of vehicle video monitoring system is only a start, the scope of its application will gradually extend to buses, taxis, public service vehicles and private cars, the vehicle safety supervision is expected. The scale of the control system is up to hundreds of billions.

Another scientific research shows that if the driver gets 0.5 seconds before collision, early warning can avoid at least 60% rear end collisions, 30% head-on collisions, and 50% pavement related accidents; If there are 1.5 seconds of early warning, the 90% accident can be avoided. Therefore, if there is a system of automatic early warning according to the driver's condition and outside environment information, it will undoubtedly reduce the occurrence of traffic accidents. A survey by the Chinese consumer newspaper showed that 35% of the respondents wanted to provide traffic safety services, and combined with the current rapid increase in car ownership in China, it could predict that the traffic safety warning system would have an unlimited market and should be available soon. In addition, the existing intelligent vehicle system manufacturers are positioned in the industry customers (such as public transport, etc.), while ignoring the broader market of the public.

All of these provide a broad market prospect for our project development. It is based on the above social significance and market prospect that we provide relevant competition questions,

hoping to promote the progress and development of related technologies.

[Technical path]

At present, the technical route that can be used in the field of traffic safety includes the method based on image analysis, the method of contactless wearable equipment, the feedback of vehicle sensor information and so on. The method based on image analysis is the main direction of the development of traffic safety early warning in the world because of its direct, non intrusive, and high correlation with a variety of traffic safety functions. At the same time, taking into account the future application of industrialization and cost requirements, we choose the method based on image processing to achieve the standard of competition.

The basic ideas adopted by the team are: 1) Organizer provides image data and annotated information. Participants can also record vehicles and lane video on their own and carry out annotations; 2) Training the lane line model; 3) Detecting lane lines in the test images we provide.

[Technical indicators]

The required technical indicators include lane detection accuracy, processing speed and robustness to the environment. The participants will submit the algorithm library file and the example source code of the windows environment schedulable algorithm library file, which is used to provide test results to evaluate the accuracy of the contractor. The submitted documents will be tested in CPU i7, memory 8G and operating system win7. If the algorithm processes a frame of more than 400ms (image resolution 640*480), it will not be used to calculate final score. In the evaluation, we will first rank the algorithm according to speed and accuracy, and the final ranking will be ranked according to $0.7 * \text{ranking} + 0.3 * \text{speed ranking}$, and the final ranking results are given.

[Submission standard]

The example code provided by the contestant needs to be saved in the specified format. A given format is required before the competition.

[Task list]

Participants are provided: training data and verification data (about 2500 sheets); training and verification of data annotation information; output data preservation format.

[Reference tool]

Technology used: target detection technology, visual imaging technology, artificial intelligence
Yes, c/c++ and so on.

[Reference data]

Opencv, MATLAB, computer vision, pattern recognition

[Data interface]

None