

Research on key technologies of unmanned driving Based on binocular vision

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Abstract

In the process of the development of modern society, the use of cars has become popular, and almost every family has a demand for cars. The large increase in the number of cars has brought some pressure to modern traffic safety to a certain extent. On this basis, the research on unmanned driving technology has become hot, and this technology is gradually becoming mature, which has once become a hot topic. Binocular vision based unmanned driving technology is playing a very important role in the automotive industry. Therefore, this paper focuses on the identification technology of the existing binocular vision unmanned driving technology in the process of road form. The main projects involved are as follows: lane recognition, image acquisition and processing, image correction, fuzzy control, judgment of obstacles and so on.

Keywords

Binocular vision; Unmanned driving technology; Lane recognition; Image acquisition and correction, Road condition analysis.

1. Introduction

The generation of self-driving technology for the development of automobile industry is a major change, the generation of this kind of technology is mainly through the use of computer programming, road recognition analysis, sensor and so on the way to certain control of existing automotive systems, and, even without the driver to take the initiative to the operation of the operation can also make it more secure, Ensure security in formal process. In this study, "Binocular based" mainly collects images of the surrounding environment and obstacles in the process of vehicle driving through the direction of the two cameras. At present, people mainly use our common infrared, radar, ultrasonic and other forms of induction in the process of use, and then analyze and process the collected images to ensure that the car can achieve a safe driving state under the condition of unmanned control. Although the technology brought great convenience to people's travel, but in its use in the process of need to afford the corresponding cost, the installation of the instrument, the system is relatively expensive, and, because of market management, the emergence of these technologies and instruments are good and evil people mixed up, for a better quality of some. People need to pay more expensive fees, in the process of using it but also for regular care, later maintenance costs are higher. Therefore, using the technology of "Binocular" machine, two cameras can be used to collect and merge the surrounding information, and this way to some extent simulates the stereo recognition function of human eyes on the surrounding environment, the collected information will be relatively more comprehensive, and the cost that people need to bear will also be reduced. Therefore, In this paper, "unmanned driving technology based on binocular vision" is studied in order to better serve people's work and life.

2. The status quo of binocular vision unmanned driving technology

Abroad: Relatively speaking, the development of the automobile industry in the West is relatively fast, they are more advanced in this aspect of consciousness, in a very early time to realize the importance of unmanned driving, and actively engaged in the experiment of unmanned driving, has also achieved certain results. Take the development of unmanned driving technology in the United States as an example: since the 1950s, the United States has been engaged in the research of unmanned driving and has made great achievements in this field. The emergence of the first driverless car is mainly through the way of camera detection of the surrounding environment in the process of vehicle form, and combined with the use of radar to identify the surrounding obstacles to a certain extent, and finally successfully completed the unmanned driving test. In 2004, Carnegie Mellon University drove the farthest in the first DARPA Unmanned Challenge. Up to now, Google in the United States has a relatively mature appearance in the field of unmanned driving research, and has developed the representative Google Driverless Car and other test vehicles. The emergence of these vehicles is mainly through a number of cameras, infrared sensors, radar and so on to control the driving of the car, in the form of navigation to complete the specified driving route. During tests on the vehicles, there were no injuries, despite some bruising.

Domestic: start in the research on driverless cars in China is relatively late, coupled with foreign about the technology of the high degree of confidentiality, as a result, in the process of study of the needs of time and economic cost is higher, although in recent years in the process of study of the obtained certain achievements, but relative to developed countries, is still relatively backward [1]. China began to research self-driving technology in the 1980s, and the first prototype car was announced in 1996. Until 2005, China's unmanned driving technology has made further breakthroughs in road perception and path tracking. In the following period of time, Tsinghua University, Beijing Institute of Technology and other institutions have made some breakthroughs in the field of unmanned driving, truly realizing the goal of precise driving of vehicles under unmanned operation.

So far, Baidu's research on self-driving technology is of a certain level, and its core technology is mainly completed through "Baidu Car brain", which can be used to more accurately perceive the location and obstacles in the process of vehicle driving. So that the car can complete the task of safe driving in the state of unmanned driving.

3. The benefits of binocular vision unmanned driving

The emergence of unmanned technology for modern automobile driving technology is an unprecedented reform, the emergence of this technology to a certain extent endowed with car "consciousness", make its can be in the state of autonomous driving better service for human being, to reduce its participation in the process of people, make people can free limbs, and achieve real freedom of driving.

Due to the use of self-driving technology is set up by computer program and camera equipment to control, the degree of precision in the driving process of accuracy degree is higher than human manipulation of the driving, and could be in ensuring the precision of cases, to realize the combination of high efficiency and safety, to reduce the errors in the process of driving. On the one hand, the road environment we now face is relatively complex. On the other hand, people don't have relatively skilled technology in the process of complex driving. These two reasons are the biggest reasons for the frequent occurrence of modern traffic accidents. According to incomplete statistics, in 2013, there were more than 200,000 traffic accidents caused by improper driving and clear analysis of road conditions, resulting in a tragic situation of up to 60,000 deaths. Moreover, some people needed to pay very high medical expenses after injury [2]. Thus, a series of direct and indirect losses have reached more than 30 billion yuan. To a certain extent, research on unmanned driving technology can reduce the losses caused by traffic accidents and better guarantee the safety of people, money and material. In the process of research, it is found that the use of unmanned driving technology can make

more accurate planning of the route to drive, effectively avoid congested roads, shorten people's travel time, and thus reduce the probability of traffic accidents.

Along with the advance of self-driving technology, in addition to being able to provide certain convenience for people's work life, also it can be used to in the process of the military field, through the use of self-driving technology the way to a certain control, military training can be reduced or military threat to their personnel in the process of operation and the status of the casualties [3].

In addition, the emergence of driverless technology can also better help some people with poor driving skills in the process of driving, and realize driverless parking and other functions, thus becoming a blessing for these people. At the same time, through the continuous maturity of unmanned driving technology, it can also inject more new elements into its use form, guarantee the diversification of people's use process, so that unmanned driving technology can better serve human beings.

4. The principle analysis of binocular vision

"Binocular vision" in the process of working is mainly through the way of simulating human eye on things around certain judgment and awareness, using two cameras to drive the two Angle of view of things at the same time in the process of acquisition, and then through the two images are collected location difference comparison, to complete the 3D information extraction. (The specific principle is shown in Figure 3.1)

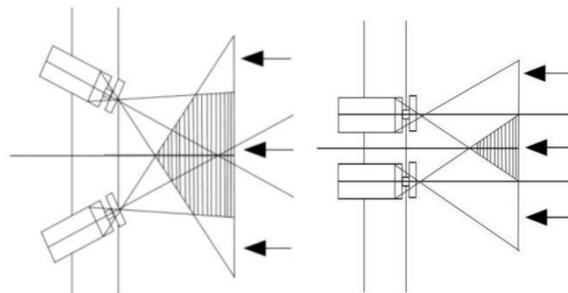


Fig. 1 Working principle diagram of binocular vision technology

When the convergence mode camera is used, it can be collected through the large area of intersection of stereo images presented by it, but because the camera needs to be installed from different angles, the collected area will be different to some extent [4]. And the distance is inversely proportional to the width of the image. The larger the distance is, the smaller the width of the image captured by the camera will be. In this case, the usable information collected will decrease. In addition to the above situation, the camera layout may also encounter parallel distribution, which will widen the distance between images because of the increase of the distance between objects in the process of vehicle driving. (The specific working mode is shown in Figure 4.2)

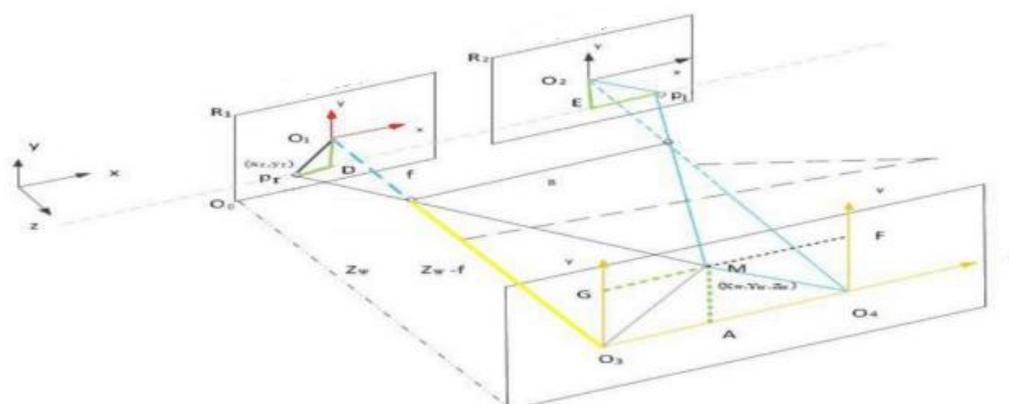


Fig.2 Working principle of binocular vision in horizontal condition

Secondly, in the process of binocular vision image acquisition, the 2D image information of the subject body is mainly transmitted to the central control through the camera, and the information transmitted in the central control is identified and analyzed [5]. When selecting the equipment for "binocular vision", the equipment with higher definition should be selected as far as possible to work on it, and the material of the camera can be used for image collection in various environments, so as to better guarantee the clarity of image collection and meet the requirements of image collection in the process of unmanned driving.

Was collected in the process, object and deformed phenomenon can occur, the causes of this phenomenon is mainly due to the object under the action of light through the camera will produce a bending deformation of the state, this is in the process of acquisition of have no way to avoid, therefore, need for deformity correction technology [6]. In the process of correction, the characteristics of the collected image can be extracted to determine the center of the image and the coordinate of the whole image, which is determined as the coordinate after deformity; Then, through the way of parallel line to determine its proportion, and then get the due standard coordinates; Finally, the center of the whole Image is taken as the benchmark and analyzed and processed according to the adjacent standard coordinates to determine the variables of the malformed Image. The Image Correction function is used to display the malformed Image, and then the existing Image is corrected by the Correction rules.(The specific calibration procedure is shown in Figure 4.3)

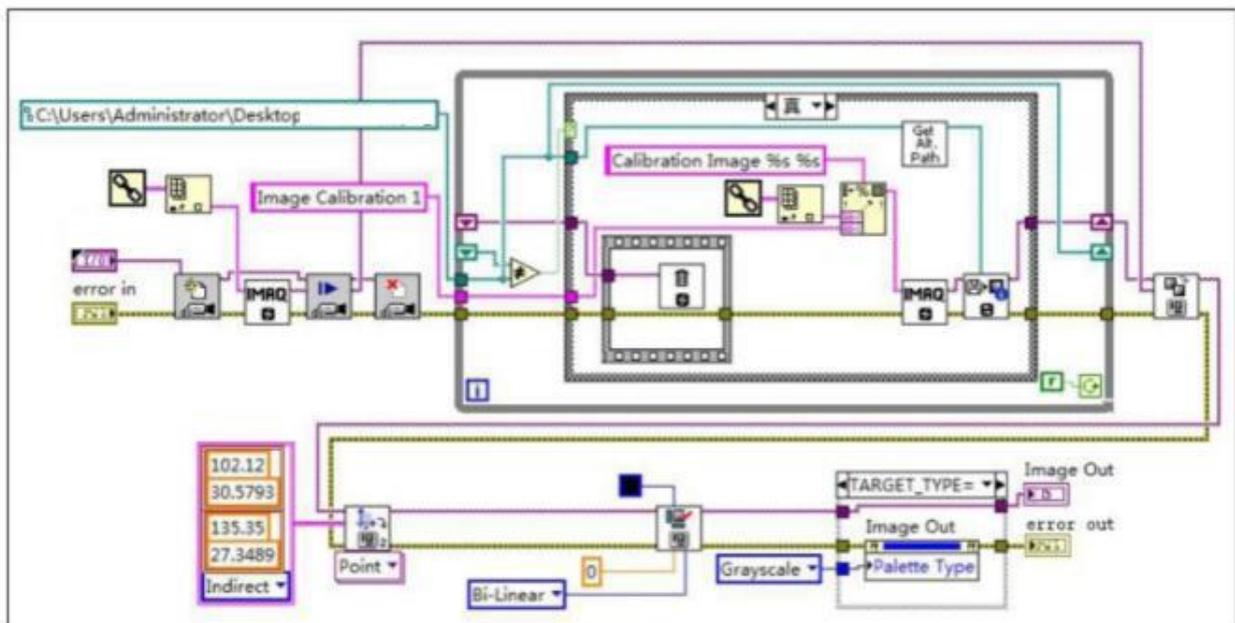


Fig. 3 Image correction program diagram

In the process of road obstacle detection, it is necessary to establish the coordinate system of the camera used and calibrate the linear model, and then analyze the calibration results to ensure that the camera can accurately capture the information around the car in the working state and make a better judgment on road driving [7].

5. Conclusion

To sum up, the technology based on binocular vision is studied in the process of, just the principle has carried on the simple structured, in addition to the above principle, binocular vision in the process of work also use to fuzzy control, to control the traffic lanes in the process of recognition and a series of other content need to be calculated. The research process of binocular vision is complicated. In addition to the existing technology, researchers also need to better break through the existing

technology, especially for some advanced technology to carry out in-depth research, so as to make the unmanned driving technology get better development.

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