SMART DRIVING SKILL EVALUATION SYSTEM USING COMPUTER VISION TECHNIQUES

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Abstract

The idea of project is to create pathway which can be travelled successfully by following all the requisite rules and regulations which is normally required to follow on the roads. The learner-in-action along the pathway is monitored and captured by CCTV surveillance and evaluated using image processing techniques. Suitable grades are given based on driving skill of the learner. High grade scorer can be granted license and others can reappear after improving their driving skill. Thus this system will improve the efficacy of granting license to the right chauffeur.

Keywords: digital image processing, video processing, vehicle tracking, traffic Surveillance, background subtraction, segmentation, moving objects.

Introduction

The existing manual test procedure of driving skill has some limitations like time consuming, expensive and heavily controlled by the experience of examiner. There is the view that due to presence of element of subjectivity there exist the imperfection in measuring the competence of drivers while issuing driving license on the part of issuing authority. This human error could be removed by digitizing whole process of testing the competence of drivers by the inspectors.

Automation of driving skill evaluation system enables to reduce the interpretation of human and increases the accuracy level of assessment while testing the driving ability with traffic requisites. This proposed technological solution encourages the paperless work. As a contribution to the society, this technique can reduce the number of road accidents because most accidents results from lack of planning, anticipation and control which are highly dependent on driving skill.

- Introducing automation in existing manual driving test process and eliminate the limitations of subjective assessment.
- Maintaining the consistency and increase the transparency in driving skill evaluation process.
- Issuing license suggests only on merit and also prevents untrained drivers from getting into the system.
- Strengthening the system of issuing driving license in turn providing competent drivers which will go long way in reducing the number of accidents.

Importance of the proposed project in the context of current status

Target beneficiaries of the proposed work:

- The vision based automated driving evaluation system eliminates human intervention leaving no scope for manipulation and negotiation.

- This system increases the level of transparency in the driving skill test process and decreases the rate of corruption in the process of issuing the driving license.
- Contribution to the society, this technological solution can reduce the number of road accidents because most accidents results from lack of planning, anticipation and control which are highly dependent on driving skill.
- The method is to get the manual evaluation automated. The concept of this project is to create a pathway which can be travelled on successfully only by following all the requisite rules and regulations which is normally required to follow on the roads. The learner- in- action along the pathway is monitored and captured by CCTV surveillance and evaluated using image processing techniques. Suitable grades are given based on driving skill of the learner. High grade scorer can be granted license and others can be asked to reappear after improving their driving skill. Thus this system free of human error will improve the efficacy of granting license to the right chauffeur.

Review of status of Research and Development in the subject

International status:

Various international and national organizations continue to highlight the fatalities on the roads caused by inconsistent process of issuing driving licenses across India [1]. The study conducted by the International Finance Corporation (IFC) indicates that the process of obtaining driving license in India is a distorted bureaucratic one. The independent survey conducted shows that close to 60 percent of license holders did not even have to take the driving license test and 54 percent of them were untrained to drive [4].

The study conducted by IFC also shows that the driving license is in that category of public services that involves corruption of a direct demand and supply of bribes between citizens and bureaucrats. The study also indicates that the corruption is focused on agents that work as intermediaries between the officials and citizens [5]. This practice of agent-usage promotes corruption and subsequently results in higher payment for licenses, reduces driving test quality and this eventually results in unskilled drivers on road. According to recent studies conducted in the US and UK have shown that about 95 percent of the road accidents are due to poor driving skills.

In the present scenario, the candidates who have applied for driving license have to appear for a theoretical examination and a practical examination [2]. The theoretical examination evaluates the candidate knowledge on different traffic signs, traffic regulation and also the basic understanding of simple safety check before using a vehicle. Different ways are adopted for the conduct of theoretical examination. These are oral examination, question paper or computer based examination [3]. Theoretical examination is conducted before the practical examination. A pass in the theoretical examination is a prerequisite for the practical examination. The practical examination comprises of two tests namely off-road test and on-road test. The off-road test is for examining the candidate's ability in controlling the vehicle. The on-road test is conducted in light traffic on normal road.

A new algorithm [10] was proposed to detect the moving objects from a static background scene using background subtraction. A reliable background model is generated after that, morphological filtering is applied to remove the noise and solve the background interruption difficulty. To remove the effect of shadow, contour projection analysis is combined with the shape analysis.

National status

Normally, the on-road test is carried out after completing off-road test. The off-road test is performed on specially designed track. The off-road test tracks are of three types – H, S and 8 shaped tracks. In India, the test track adopted for off-road test purpose varies from state to state [6].

For example, the state of Kerala performs the off-road test using H- shaped track whereas the state of Karnataka performs off- road test using 8-shaped track. In most cases the evaluation of off-road test is done by human intervention. Hence the test result will be highly dependent on the subjective opinion of the examiner which is inconsistent. Hence to make the driving skill evaluation more transparent, consistent and efficient, the paper proposes a smart and automated system for driving skill evaluation.

In JnanaBharathi Regional Transport Office, Bangalore [7], the developed electronic track has been built by Cascade Systems in association with KEONICS at a cost of about Rs. 1.6 crore. The test facility that uses electronic sensor technology has two tracks for motorcycles and five tracks for four-wheelers. While a two-wheeler driving license seeker has to give one test in one lap, four-wheeler driver has to give five tests one after the other. Since sensor is being used to evaluate the testing skill in this system, it may cause for error. To avoid such type of error, vision system using camera and track system containing signals, can be used to capture the process of driving of license seeker continuously from start to end in a single lap.

Automated test facility available at Gandhi nagar [8] has, in different tracks, the set of tests to stop and drive forward on a road with upward gradient without any backward movement, to drive forward on an '8' shaped track, Parallel Parking (Reverse Parking), to drive in reverse in a 'S' shaped track. In this system, sensors are being used. In case any of the sensors are to be disturbed from their position, the computer system would detect all such violations. This developed system might be used for evaluating the testing skill without considering ignorance of the traffic signals of license seeker.

In Pune, Regional Transport Office [9] is planning to establish an automated modern track where license seeker will be able to view their mistakes during the test drive. The trials given by the candidates will be recorded on camera. This method of the evaluation is unable to account violations of traffic signals of license seeker.

Work plan-Methodology

Traffic accidents take place for different reasons. Although troubles with roads or protection facilities (like speed breaker) lead to accidents, most of the traffic accidents are caused by drivers due to violation of traffic rules and regulations, believe pedestrians, and recognize dangerous behaviors. Many vehicle users do not follow the road rules and end up losing their lives. There are lots of types of inappropriate opinion that lead to irresponsible driving. Such thinking includes considering that there is no problem to violate traffic regulations as long as met an accident, even though you are not late but rushing to get to your destination and finally regarding pedestrians on the road as obstacles.

Now a days, transport department gaining prominence role in the economic. So the digitization of driving license issuance will convert unlicensed drivers into licensed drivers which will bring them into organized network. So this will lead to more accountability on the part of drivers. So the driver's contribution will be significant and measurable on the economy.

Designing

Automation of driving test is much more needed to avoid human fatal mistakes while issuing driving license to incapable person. The project is mainly focus on implementing automated license drive test system for testing the person's driving ability.

First, a test track is implemented with wireless CCTV cameras. A track is designed in such a manner which is cable of adhere more number of traffic rules like keep left, light indication while turning left and right, stop before yellow line etc. CCTV cameras are mounted on top with respect to the rules adopted in track. Camera is meant for capturing the video of test drive by the license requested applicant.

Number of cameras are depends on the design of test track. All the cameras are wirelessly connected to the system which is capable of storing videos taken by these cameras.

Here we are going to use some techniques to evaluate riders driving skills at the same time checking whether the person is following driving signals. For example, We are going to check riders signal while turning by background subtraction technique (for hand signals) and pixel analysis (for indicators)

Test Track

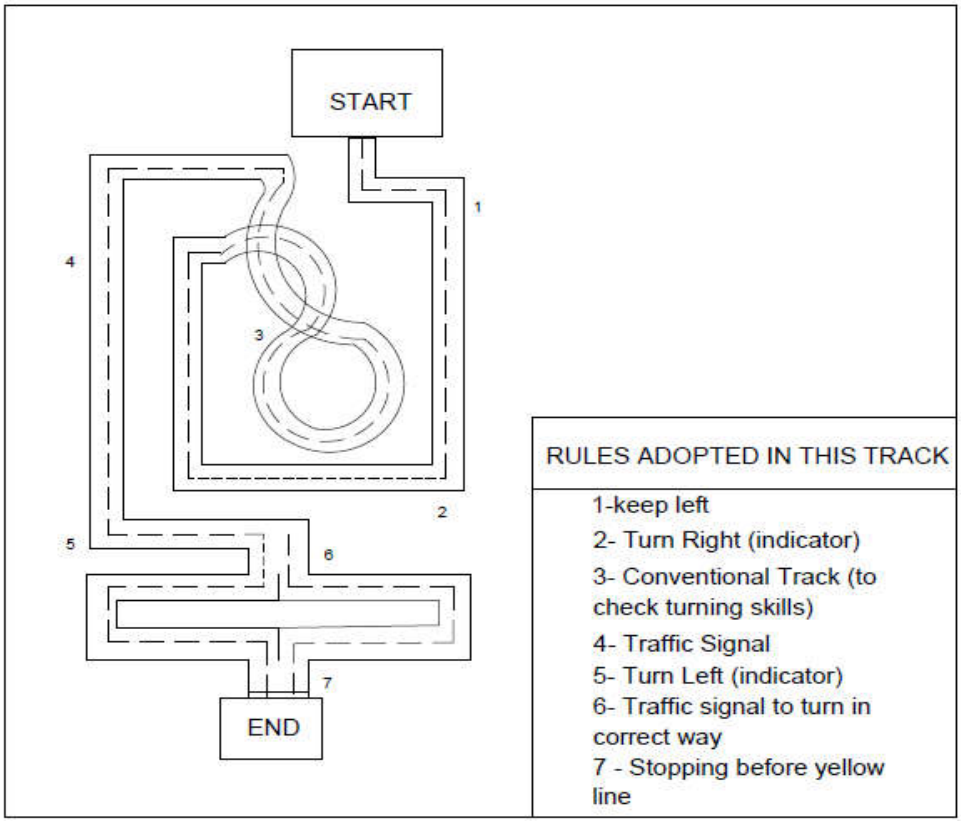
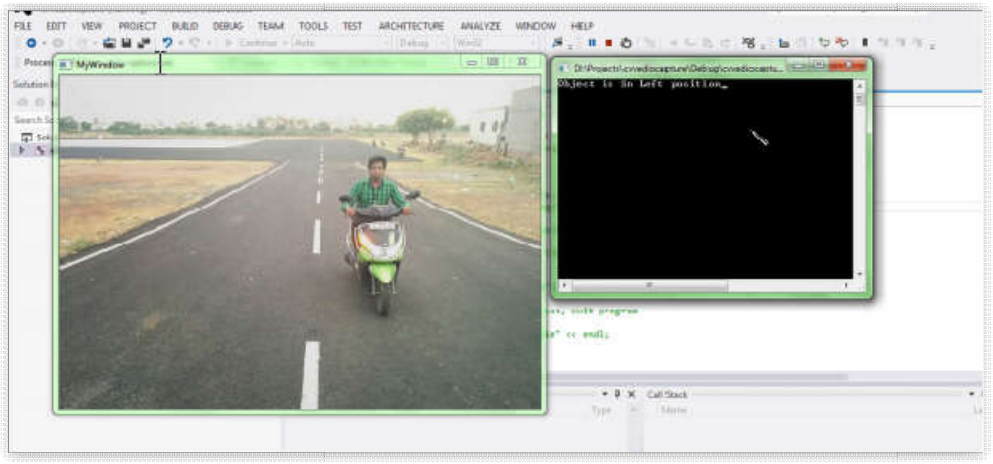


Image Processing Techniques:

The stored videos are processed by image processing techniques such as background subtraction, vehicle detection and classification. Local illumination changes etc. which will be implemented as software in the system. OpenCV is an open source library, used for image processing. Visual studio 2012 is used as an integrated development environment to create, debug and build the solution. The software accepts video as input and produces output in the form of report which explains the behavior of license request applicant while test drive in accordance with the traffic rules in tracks. The project is mainly dealt with image processing techniques, so less cost-effective and more accurate. But some other automation of driving license involves sensors implementation while designing tracks which will be high cost in nature.

Generation of report for decision making:

The output of image processing generates a report which provides decision making details to RTO that is whether the license requested person is eligible to get license or not. The report comprise of several traffic rules adopted in track design with different grades (or) marks. If the license requested applicant is good in test then they got high grade or else low grade. Based on the threshold grades fixed by RTO department, the report says whether the license requested person is eligible or not eligible to get license.



(Sample output of detecting vehicle user is keep left or not)

References

1. Marianne Bertrand, Simeon Djankov, Remma Hanna and SendhilMullainathan, "Obtaining a Driver's License in India: An Experimental Approach to Studying Corruption", The Quarterly Journal of Economics (2007) 122 (4): 1639-1676.
2. "Driver errors cause most road deaths in India". The Times of India on the web. 2010 – 07-04.
3. Government of India. Ministry of Road Transport and Highways. Road accidents in India:
4. India suffers from highest number of road accidents: WHO". The Financial Express on the web. 2011-05-05.
5. India suffers from highest number of road accidents: WHO". The Financial Express on the web. 2011-05-05.
6. Mondal, P, Abhishek Kumar, U. D. Bhangale, and Dinesh Tyagi. "A Silent Tsunami on IndianRoad: A Comprehensive Analysis of Epidemiological Aspects of Road Traffic Accidents".British Journal of Medicine & Medical Research: 1(1): 14-23, 2011. 2011-09-26.
7. http://www.thehindu.com/news/cities/bangalore/electronic-driving-test-track-to-be-inaugurated-tomorrow/article750871.ece
8. RupaliS.Rakibe, BharatiT.Patil, "Background subtraction algorithm based on human motion detection", International Journal of Scientific and Research Publications, Volume 3, Issue 5, May 2013.
9. S. Gupte, O. Masoud, R.F.K. Martin, N.P. Papanikolopoulos, "Detection and Classification of Vehicles", IEEE Transactions On Intelligent Transportation Systems, Vol. 3, No. 1, March 2002

10. R. Cucchiara, M. Piccardi, "Vehicle Detection under Day and Night Illumination", Proceedings of 3 rd International ICSC Symposium on Intelligent Industrial Automation (IIA), 1999

11. M. Betke, E. Haritaoglu, L.S. Davis, "Multiple Vehicle Detection and Tracking in Hard Real Time", IEEE Intelligent Vehicles Symposium, pp. 351—356, July 1996