Instructorless Driving Test

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Abstract - The Instructorless Driving Test aims to automate the process of testing a person's driving abilities in the tests conducted by the government. This project aims to reinvent the method of evaluation for the Gradient Track. Our end goal is to improve upon the system in place such that a number of factors such as efficiency and cost effectiveness are improved. Corruption due to human assistance is also hoped to be reduced.

Keywords – Automation, Automobiles, Driving, Microcontroller, Smart City.

1. INTRODUCTION:

Close to 75% of all road accidents take place due to incompetent drivers [1]. Improving the driving tests as well as the method of evaluation for the tests one must pass in order to get a driving permit can reduce these accidents. As of today, the tests require human assistance for evaluation. This leads to two issues, human error as well as corruption. Automation provides a reliable solution to both these issues.

As of the writing of this research paper, the system in place involves the RTO Officer sitting in the car along with the candidate, in order to evaluate his skills. However, this leads to human error as well as corruption. Repetitive work and long work hours only exacerbate this situation. The Instructorless Driving Test will eliminate the need for the RTO Officer to be present for evaluating every candidate. This provides a suitable remedy to the aforementioned issues. This will result in more accurate evaluation and thus an improvement of road safety standards.

The Instructorless Driving Test will improve upon all the faults of the current system on the Gradient Track. The evaluation on this track is automated through the use of strategically placed ultrasonic sensors. These sensors can track the position of the car with high precision. In order to pass the gradient test, the candidate must drive onto the slope and apply the handbrake thus bringing the vehicle to a halt. For the second part, the candidate must start the car and proceed down the other side of the gradient without the car rolling back. The sensors ensure that the car doesn't roll back after halting. In addition to this they can provide data about the distance of the car from either side of the track. Taking all these parameters into account, an appropriate response will be displayed on the display unit. This response will signify the successful or unsuccessful completion of the test.

2. LITERATURE REVIEW:

A few projects have attempted to automate the evaluation of driving tests. 'Zigbee based wireless data acquisition using LabVIEW for implementing smart driving skill evaluation system' [2] is an attempt at automation of the H track using sensors.

Automation of the 'S' track was looked at in 'Smart driving test track' [3]. This used the Arduino microcontrollers and infrared sensors. 'A smart automation system for monitoring license test drive using embedded system' [4] makes the use of proximity sensors. None of these projects have made use of the HC-SR04 ultrasonic sensors which provide substantially more accurate data.

3. METHODOLOGY:

A. Hardware:

1. Arduino UNO R3

Pictured below is the Arduino Uno R3. It is an open source microcontroller board based on the microchip ATmega328P microcontroller. The Arduino board has different analog and digital input (i) and output (o) pins. The board has 14 digital (i/o) pins and 6 analog (i/o) pins. Arduino is programable with Arduino Integrated Development Environment (IDE). It accepts voltage between 7 and 20 volts.

This microcontroller board will perform all calculations and required operations to provide the output on the 16-bit LCD screen (elaborated upon below) based on data obtained from the various sensors.

The microcontroller will receive data from the HC – SR04 Ultrasonic sensors regarding the position of the candidate's vehicle. The microcontroller will further check whether the position of the vehicle is within the specified parameters. It will also display whether the

candidate has been successful in the test using the LCD screen.

2.   16 Bit Parallel Display

The LCD1602 is a parallel display being utilized to facilitate the display of the output based on the required parameters. LCD1602, or 1602 character-type liquid crystal display, is a kind of dot matrix module to show letters, numbers, and characters and so on.

It's composed of 5x7 or 5x11 dot matrix positions; each position can display one character. There's a dot pitch between two characters and a space between lines, thus separating characters and lines. The model 1602 means it displays 2 lines of 16 characters. Hence it is capable of displaying 32 characters at a time.
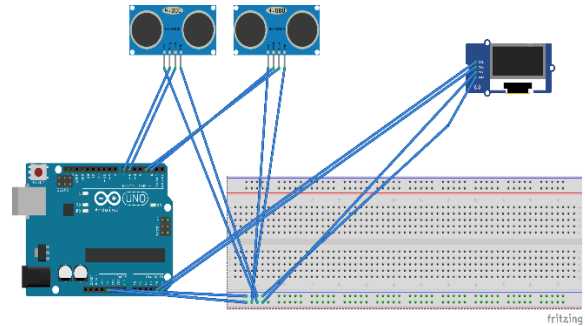
3.   Ultrasonic Sensors

An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. High-frequency sound waves reflect from boundaries to produce distinct echo patterns. The Ultrasonic Sensors being utilized in this project are the HC-SR04 sensors. They are capable of accurately measuring distances as low as 2centimeters and as far as 4.5 meters. These sensors will provide the microcontroller board with accurate data regarding the position of the candidate's vehicle.

4.   Schematic:

The following diagram shows the connections of the sensor to the Arduino microcontroller board and that of the 16-bit display as well.


B.   Software Implementation

All software for the implementation of this project was written in the C/C++ language using the Arduino IDE for compilation.

Following is the algorithm:

The ultrasonic sensors continuously retrieve the distances between them and the objects in front of them.

When the vehicle is detected, the function for detecting the position of the vehicle is called. It checks if the vehicle is within the specified boundaries. It also detects if the vehicle rolls back. Based on these conditions, certain values are stored in variables.

Finally, when the time is up, the function for giving the result is called. It gives an appropriate result based on the values stored in the variables from the previous function.
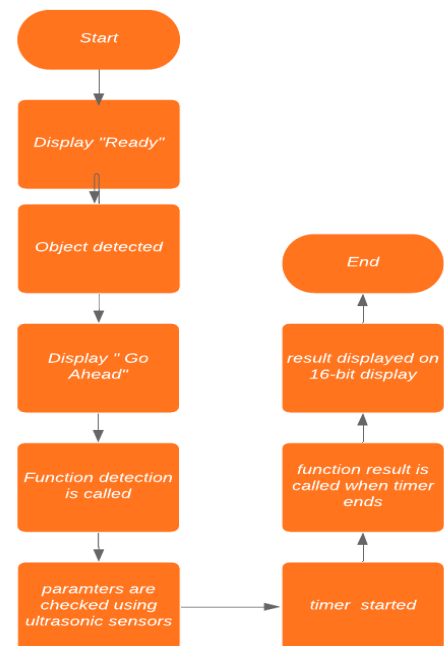
Thus, the program can evaluate the skills of the candidate.

4. RESULTS AND DISCUSSIONS

A. PRESENT THEORIES

Process for Issuing the DL (Driving License):

In the present situation, there are two examinations conducted while issuing the DL. Theoretical examination is conducted before practical examination. Basic understanding of traffic signals, traffic regulations and safety check before using vehicle are evaluated in theoretical examinations. And in practical examination, driving ability of the driver is evaluated [5].

Survey showing Corruption: -

A Study Conducted by The SaveLIFE Foundation Reveals That 6 Out of 10 Get Driving License Without Giving A Test In India. Have you visited the RTO recently to get a driving license? If you did, you will notice that one has the freedom to pay for their driving license and doesn't even have to attend the test to get it approved.

The shocking revelation was confirmed by a study conducted by the SaveLIFE Foundation. SaveLIFE Foundation, a group that advocates road safety conducted a survey in 10 cities which includes metro cities as well as they have the highest number of vehicles. According to the survey, 6 out of 10 people in India hold a driving license without even riding the vehicle or giving a test. According to the study, only 12% of Agra drivers got their license by promptly giving a test. The remaining 88% of people agreed that they did not get their DL the honest way. Further, about 72% in Jaipur, 64% in Guwahati, 54% in Delhi, and almost 50% in Mumbai confessed that did not give a test to get their DL [6].

Video recording of Driving License Test proposed by High Court: -

The Delhi High Court has proposed that practical tests for the procurement of Driving Licenses should be video recorded so as to check discrepancies in the issuing of licenses, both private and commercial to all unskilled drivers. Headed by Acting Chief Justice Gita Mittal, a Bench asked the Delhi Government if video recording of practical tests is possible and the government hopes to examine a possibility of the same.
This was during a petition hearing by a social activist who talked about how a number of corrupt officials in the Department of Transport have been providing licenses without the need for a proper test and hence endangering lives of the general public [5].

Driving license test with automated tracks: -

With an aim to improve driving habits in the city, Gurugram will now get automated tracks for driving license test. The move comes from the officials to improve the evaluation process while approving a driving license. An automated track facility is already function in Delhi's Sarai Kale Khan area. Thanks to a tougher driving test, there will be an increase in the number of quality drivers on the road [6].

The automated track project is being set up as a result of a partnership between with Institute of Driving and Traffic Research (IDTR). Gurugram will become the second city in the region to have such a facility. At present, the track has been proposed only for four wheelers and will have an A-bend, 8-bend, H-bend, and a roundabout to ensure steering control skills of the driver. Moreover, in order to determine how far or close a vehicle is from the boundary while being driven, a 4-inch strip with sensors will also be laid along the side of the track. According to the authorities, the facility will be developed in collaboration with auto giant Maruti Suzuki, which currently runs IDTR centers elsewhere [5].

B. COST ANALYSIS:

For the project we need the following components. For sensing the motion of car at each and every point, the project requires 2 ultrasonic sensors which cost Rs.99 per piece. The total amount of required for sensors is Rs. 198. The microcontroller board being used, the Arduino Uno R3 is priced at Rs. 470.For displaying the result to the candidate the LCD display required is a 16-bit display which has a price of Rs.225. Breadboards and jumper cables are needed to connect all the components together. The total cost of the prototype is around Rs.1100.

C. FUTURE SCOPE:

In Future ultrasonic sensors will work more efficiently than camera and can give us more accurate data. The data that we collected can be sent to the higher authorities using GSM. Also, the exact location of the vehicle and the track can be found out through GPS system.

D. CONCLUSION:

The proposed methodology for the evaluation of the driving test on the gradient track will vastly increase efficiency and reduce costs associated with it to a considerable extent. The evaluation will be completely automated. Thus, the need of human assistance is eliminated. Which by extension, results in more accurate, efficient and corruption free evaluation of the driving abilities of the individual.

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