

Dedicated Path Transit by Use of Virtual Track for BRT's and Trams

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ABSTRACT: As increase in population and traffic density the passengers travelling by BRT bus have also increased tremendously. And there is necessary to increase the passenger caring capacity of bus. So by adding one extra coach or increasing the length of bus can solve the problem. But as addition in length or coach becomes difficult to drive and which is unsafe. And the solution for this problem may be to use the dedicated path drive. So this paper proposes whether the virtual track can come into use in BRT or tram in India.

Use of the virtual track maybe beneficial for following main two reason one for the safety and other to maintain discipline, increase the passenger capacity and make the buses driverless.

KEYWORDS: Virtual track, Safe drive, driverless drive, line following robot, public transport, future bus, pneumatic trams.

I. INTRODUCTION

Transportation system is most important system in our society. As this system is complex and have different moods too. In this paper the study has made whether the virtual track can be come into use in BRT and tram which will solve the problems related to safety in transportation and to maintain the discipline in traffic increase the passenger carrying capacity. As there is a separate lane especially for BRT bus and so bus or trams using virtual track system can come into consideration.

Virtual track is nothing but the trackless track, where there will not be any cost of track construction where in bus will be fitted with the sensors and track will be the painted dots on road which path the bus will follow.

II. OBJECTIVE

- To make the drive more safe.
- To make use of virtual track system in BRT.
- To increase the passenger carrying capacity.
- Reduction in fair.
- To maintain discipline in traffic.
- Punctuality in public transportation.
- Reduce construction cost.
- Reduction in accidents.
- Include tracking device.

III. PUBLIC TRANSPORT PHENOMENA

Taking into consideration the traffic of Pune city the BRT running in Pune city itself are much higher and passengers only BRT are 9,00,000 Plus passengers.

But the passengers caring capacity of BRT bus is not fulfilled and so there have to be some solution to solve this problem and increase the passenger caring capacity.

And also the accidents caused by the public transportation has to be considered and the drive should be safe and Hence some action has to be taken for safe and cheap drive and so the dedicated path drive is to be considered.

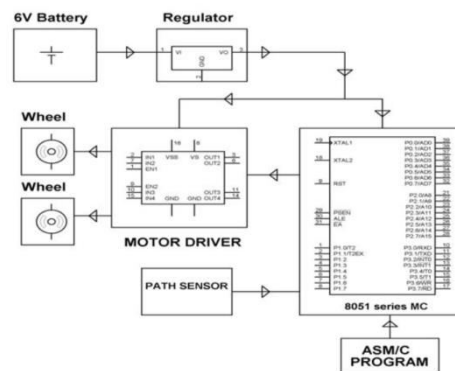
IV. VIRTUAL TRACK

- Virtual itself means not physically existing as such but made by software to appear to do so.
- The virtual track is a trackless track. Where in the bus or trams will be fitted with some kind of sensors which will allow bus or trams to follow the line or dots painted on the road.
- It is also called as autonomous transit (AT).
- AT uses its sensor technology which understands the dimensions of road, which allow it to track the guiding system that laid out, without the need for metal rail.

V. VIRTUAL TRACK TECHNOLOGY WORKING PRINCIPLE

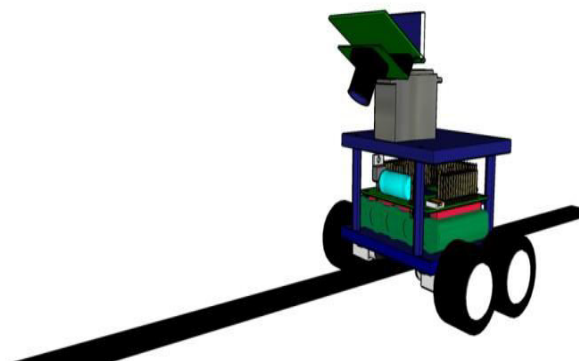
A Line Follower Robot, as the name suggests, is an automated guided vehicle, which follow a visual line embedded on the floor or ceiling. Usually, the visual line is the path in which the line follower robot goes and it will be a black line on a white surface but the other way (white line on a black surface) is also possible. Certain advanced Line Follower Robots use invisible magnetic field as their paths the same technique can be used for brt and trams.

This application is depends upon the sensors. Here we are using two sensors for path detection purpose. That is proximity sensor and IR sensor. The proximity sensor used for path detection and IR sensor used for obstacle detection. These sensors mounted at front end of the robot. The microcontroller is an intelligent device the whole circuit is controlled by the microcontroller.



Block Diagram of Line Following Robotic Vehicle with Microcontroller

VI. WORKING OF BLACK LINE FOLLOWING ROBOT



Two IR sensors are used for line detection logic, they are

1. IR LED
2. Photodiode

They are placed side by side in reflective pattern that is the light emitted by IR led will be reflected and detected by photodiode

The following image shows the working of a typical IR Sensor

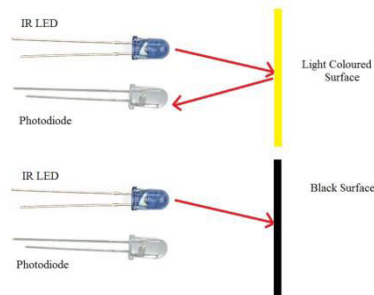


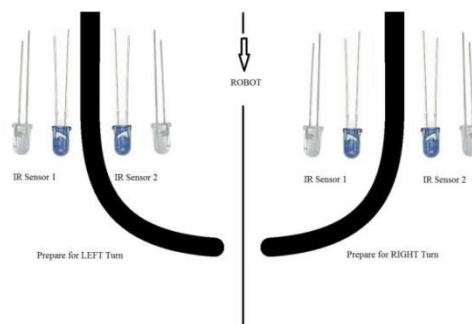
Fig:(a) shows the black colour absorbs the light and doesn't reflect to photodiode

Using the same principle, we will setup the IR Sensors on the Line Follower Robot such that the two IR Sensors are on the either side of the black line on the floor



When the robot moves forward, both the sensors wait for the line to be detected. For example, if the IR Sensor 1 in the above image detects the black line, it means that there is a right curve (or turn) ahead.

UNO detects this change and sends signal to motor driver accordingly. In order to turn right, the motor on the right side of the robot is slowed down using PWM, while the motor on the left side is run at normal speed.



Similarly, when the IR Sensor 2 detects the black line first, it means that there is a left curve ahead and the robot has to turn left. For the robot to turn left, the motor on the left side of the robot is slowed down (or can be stopped completely or can be rotated in opposite direction) and the motor on the right side is run at normal speed.

UNO continuously monitors the data from both the sensors and turns the robot as per the line detected by them.

VII. USE OF LINE FOLLOWING TECHNOLOGY FOR BUS

- The above described is one of the technology which can be used to set a dedicated path and also for driverless drive.
- Use of this technology will allow the size that is to increase the length of the bus as driving difficulty will not be any concern.
- Also using this technology the pneumatic tyres tram can come into consideration as there are separate lanes for BRT.
- Also the accidents caused due to human error that is due to drivers can reduce.
- Passenger carrying capacity can be increased as length will be increased

VIII. POINTS TO BE CONSIDERED

- The study of curves on road to be studied
- As length of bus increases many road parameters changes which should be considered.
- Bus using this technology should be electric bus as diesel engine will require separate batteries for this assembly.
- There will be difficult for passenger in-grace and out-grace.
- The length of bus-stops to be modified according to new-dimensions.
- There will have a limitation of speed.

IX. CONCLUSION

- Using this system the drive more safe.
- To make use of line following Robert technique in BRT
- Passenger carrying capacity will be increase as the length will be increased and tram can come into consideration
- As the passenger caring capacity increase there will be automatic reduction in the fair.
- As driver will not have any control discipline in traffic will be maintained.
- Separate lanes and dictated path with vehicle tracking will maintain Punctuality in public transportation.
- As there will be no track use which will automatically reduce construction cost.

REFERENCES

- 1) Florin Codrut, Dorin Laurentiu Buretea and Luigi Gabriel Obreja “Comparative Assessment of Virtual Track Circuit Based on Image Processing”Urban Rail Transit (2015) 1(2):131–137.
- 2) Nagamalai D, Renault E, Dhanuskodi M “(2011) Advances in digital image processing and information technology”In: firstinternational conference on digital image processing and patternrecognition, DPPR 2011, Tirunelveli.
- 3) Flammini F (2012) “Railway safety, reliability, and security: technologies and systems engineering” IGI Global.
- 4) [Autonomous Rail Rapid Transit – Wikipedia “https://en.wikipedia.org/wiki/Autonomous Rail Rapid Transit”](https://en.wikipedia.org/wiki/Autonomous_Rail_Rapid_Transit).
- 5) Train that runs on virtual track unveiled in China.“[https://en.wikipedia.org/wiki/Autonomous Rail Rapid Transit](https://en.wikipedia.org/wiki/Autonomous_Rail_Rapid_Transit)”.
- 6) Arduino Line Follower Robot - Electronics Hub“<https://www.electronicshub.org/arduino-line-follower-robot/>”.
- 7) Prananjali Koppad and Vishnu Agarwal “Sensor Based Black Line Follower Robot”Vol. 3 Issue 9, September-2014.