Traffic Data Analysis Using Automatic Traffic Counter-Cum-Classifier

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Abstract

Objective: With the advancement of new technologies, traffic data can be collected for the development of existing and new infrastructure. In this study, traffic data has been collected using traffic counter-cum-classifier. Method: The automatic data collection system based on pressure sensor has been studied. The instrument collects the data by sensing the hits made by the tyres of the moving vehicles. The paper discusses about the hardware and software set up of the instrument. Findings: The instrument is able to collect and analyze the macroscopic as well as microscopic characteristics of traffic. It senses the hits produced on the Pneumatic Tube by the running vehicles and data is recorded. This recorded data is then converted into the useful information by the software and according to the calibration of the software. The data can be collected and stored on a number of sites and analyzed by the software. Instrument is able to provide the various results related to characteristics of the traffic like total vehicle counts, classification, 85% speed, peak hour, time headway etc. The reports related to analysis of data can be generated in the form of graphs and pie chart etc. Improvements: Further field testing of the instrument in Indian condition can be done and accuracy of the instrument can be compared with manual methods and other automatic methods.

1. Introduction

Traffic is the movement of people, goods or vehicles between the two locations. It includes both motorized and non-motorized vehicles. Traffic analysis plays a crucial role for planning and designing of roads, flyovers, bridges and other road infrastructures as lots of capital is to be invested on them. Methods available for collection of traffic data are manual methods and automatic methods. Simple and equipment aided manual methods are relative inexpensive but involves many challenges like coordination of personnel, accurate observations etc. Now these days various automatic methods are available for detailed studies of traffic. They are able to collect and analyze the macroscopic as well as microscopic characteristics of traffic. One of the automatic method is based on the pneumatic sensors. The basic principle of working of this method is that it senses the hits produced on the Pneumatic Tube by the running vehicles and data is recorded. This recorded data is then converted into the useful information by the software and according to the calibration of the software. Automatic traffic counter-cum-classifier is a combination of both hardware and software whose working takes place simultaneously. It information about various microscopic...
and macroscopic like classification of the vehicles, flow of the vehicles, speed of the vehicles, density of the traffic spacing of traffic, direction of traffic, spacing of vehicles etc. The information provided by the instrument is in the form of graphs, charts, pie-charts etc.

2. Instrument Setup

Initiation of the instrument has been done in two stages.

2.1 Hardware Setup

At this stage of working, installation of Automatic Traffic Counter-Cum-Classifier at the selected site of traffic study is done. The dealing is done only with hardware components of the MetroCount. Automatic methods requires less personnel efforts and gives more and important information regarding traffic.

2.1.1 Equipment Used

Pneumatic tubes, Road Side Unit 5600 (RSU), Camera (Sony Handycam), cleats, bitumen tape, standard rolled nails, hammer, Laptop with installed software (MC Setup, MC Report), Central lawn flaps, washers, Measuring tape, Heavy duty utility Knife, Crow bar, Scissor, Marking Spray, Cloth tape, Bitumen tape, Locks, Heavy duty hammer, Nail pads, Vent plugs.

2.1.2 Installation Procedure

a. Listed instruments are taken to the site of traffic study.
b. Select the site at least 50 meters away from any intersection as per traffic study requirement.
c. Throw the roll of the pneumatic tubes from one side of the road to the other side so that they can be opened properly without forming any knots.
d. Pass the tube through the cleat in a certain way that they remain firm while stretching the tube.
e. Then insert the nail with washers through the cleat into the road by using hammer.
f. The pneumatic tube should be stretched with 10% tension to avoid any lateral displacement.
g. Fix both ends of a pneumatic tube on each end of the road with nails and cleats.
h. Make sure that pneumatic tubes fixed on the road should be at right angle to the direction of flow of traffic.
i. For installation of second tube mark a point at fixed distance (generally 1 m) on either side of already installed tube from inner side with the help of the lumber crayon.
j. After marking install the second tube similar to the one already installed.
k. Put a colored tape on one of the tube, reason being while connecting them with the MetroCount in which there is a first and second tube may act as A and B for direction purposes.
l. Cut the bitumen tape and cloth tape according to the required size. Use cloth tape below the bitumen tape so that the tubes does not sticks to the bitumen tape.
m. Rest of the setup has been done with MCSetup software. This software starts and stops the Road Side Unit (RSU) and also calibrate it according to the required study.

2.2 Software Procedure

Start the Road Side Unit with the help of the computer software of Metro Count. Then the following are the steps for initiating the Road Side Unit:

a. Connect the Road Side Unit with the laptop via a standard communication port containing USB port on one side and other side is connected with the Road Side Unit.
b. Then open the software and press RSU to connect the Metro Count with the computer software. As this indicates the name of the Metro Count at the top of the screen only after connection is successful.
c. Now, it also shows a dialogue box of ‘RSU status’ which includes following information about Data, RSU, Battery, Hits, and Memory.
d. Close all the previous dialogues and press on the setup. This will open the new dialogue box consisting of SETUP files.
e. There are many options like Site Name, Location, Start time, Spacing etc. Press OK if the instrument is to be started at an instant or change the time as per requirement.
f. The instrument is in running condition now if the white light is flashing after every 1 sec.
g. Now the instrument is left to record the vehicular data for required duration of time.

2.3 Post-Recording Procedure

a. Connect the MetroCount with the Computer Software by connecting the USB of the instrument on the same port.
b. After that click on the RSU unit for connecting.
c. Then press on the Unload Button there is an option of saving it into the computer.
d. The software also asks about whether to stop the metro count or keep it in the running condition.
e. If you Tick for stopping the program then the instrument shuts down. This is indicated by the flashing of white light after 8 seconds. The data will be saved in computer.
f. After saving the traffic data, the information is processed and analyzed by using MCReport.

Software available with the instrument consists of standard vehicle classification system which is not according to the Indian Classification system. The software is has been calibrated with Indian vehicle classification system as shown in the Table 1.

### Table 1. Indian vehicles classification

<table>
<thead>
<tr>
<th>Class</th>
<th>Name</th>
<th>Axles</th>
<th>Spacing* (meters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2-wheeler</td>
<td>2</td>
<td>Spacing (0)=0.00 -1.50</td>
</tr>
<tr>
<td>2</td>
<td>3-wheeler</td>
<td>2</td>
<td>Spacing (0)= 1.50 -1.65</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Spacing (0)= 2.10 - 2.68</td>
</tr>
<tr>
<td>3</td>
<td>Car-Jeep</td>
<td>2</td>
<td>Spacing (0)= 1.65 -1.85</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Spacing (0)= 2.10 – 2.68</td>
</tr>
<tr>
<td>4</td>
<td>LCV (light commercial vehicle)</td>
<td>2</td>
<td>Spacing (0)= 2.68 – 3.40</td>
</tr>
<tr>
<td>5</td>
<td>Bus/Truck</td>
<td>2</td>
<td>Spacing (0)= 3.40 – 5.80</td>
</tr>
<tr>
<td>6</td>
<td>3-Axle (Truck)</td>
<td>3</td>
<td>Spacing (1)= 2.25</td>
</tr>
<tr>
<td>7</td>
<td>m-Axle</td>
<td>&gt;3</td>
<td></td>
</tr>
</tbody>
</table>

2.4 Procedure for Data Analysis and Representation

a. The recorded data is analyzed in the software MC Report.
b. This software provides the various results related to different microscopic (like time headway, space headway etc.) and macroscopic (total counts, classification etc.) characteristics in the form of tables, chart, graphs etc.
c. It provides us class bins, speed bins, detail of each individual vehicle i.e. the vehicle timing, number of axles in the vehicle, speed of that vehicle etc.

3. Data Collection and Analysis

Traffic data was collected using automatic traffic counter-cum-classifier on Madhya Marg in Chandigarh between PGI Chowk to Matka Chowk. A 12 hour data was collected on this site. The following was the result.

a. The total vehicle counted was 17652.
b. The 53.9% vehicles were the cars and jeeps, 18.2% vehicles were the two wheelers and rest are the other vehicles.
c. The 85th percentile speed was 56.9 km/h with minimum of 10.4 km/h and maximum of 144.4 km/h Figure 1.
d. Most of the vehicles (82.4) travelled within speed of 30 to 60 km/h.
e. The time headway ranged from 3 seconds to 5.5 seconds. Figure 2.

4. Conclusion

The collection of large traffic data by manual method is very tedious work and chances for the human errors are more. Automatic traffic Counter-Cum-Classifier which is based on pneumatic pressure sensor is fast method for traffic data collection. This instrument is able to provide detailed information about various microscopic (time headway, speed statistics etc.) and macroscopic (total count, vehicle classification etc.) traffic characteristics in the form of table, charts, graphs etc. This instrument is useful for collection of large data on weekly, monthly and yearly basis.
5. References