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Assignment 6

NYC Webcam Report Part 3

Abstract

Low resolution camera already installed throughout the United States can be used as a way to better resolve irregular traffic flow within a given area. This could possibly be of interest to civil engineers and law enforcers in order to get traffic problems resolved quickly as possible and possibly reduce the amount of personnel needed for a job at a given time or even automate certain tasks when possible.

Introduction

Webcams used today can be used to record normal traffic patterns within a given location. This data can then be used to teach a system what normal traffic flow is within a given time. Then by using this data traffic lights could be automated to change timings when traffic flows falls below or above the norm. A system can also send off a warning when traffic patterns fall far away from normal traffic flows. This wouldn't be easily detectable by normal means considering traffic congestion is normally a slow gradual increase of standing waves and can be easily over looked until it is too late. This could potentially help redirect traffic flow early enough so that the system avoids a potential problem in the future.

Figure 1.1

Method

Webcams were use in three different places of New York City, since this location particularly has many but fairly consistent traffic patterns. Data is collected in certain chunks of time and the average amount of cars, Max number of cars, and standard deviation on the screen on a given street is collected and observed. Only areas of the streets close to lights or close to the camera are counted. With the data collected it is already apparent that traffic flows maintain some stability over a certain amount of time. Vehicle types were not apart of the data collection. The numbers of vehicles on certain street sections were recorded. When a vehicle is changing direction, it is considered to be in all roads that it touches. The data is also categorized by time slots to get a low resolution picture of intraday traffic patterns. The time slots will include major lunch hours, rush hours, late night, and early morning.

The actual data collection will be done by human observation of the pictures collected by the webcam. An issue that arises comes from the camera angles and the luminance of the images. This makes it sometimes hard to effectively count all the cars

on a given road. However this is partially solved by choosing only sections of the street that have fairly consistent lighting and high contrast.

Figure 1.2

Hypothesis

With the type of data being recorded over time, some hypotheses are formulated. The traffic flow will depend on chunks of time as well with 6am – 9am and 4pm – 6pm being the most congested times of the day. Also traffic peak times may be low for some streets during the lunch hours because they may not be near food courts or other major activities during lunch breaks. Finally, given enough observation one street will get increasingly more congested than another street at an intersection causing more flow problems. See the footnotes before for more information and studies on traffic flow and problems with congestion.[1]

[1] http://www.amasci.com/amateur/traffic/traffic1.html
http://www.sciencenews.org/pages/sn_arc99/7_3_99/bob1.htm

Results

So far with the data recorded, it has shown that the highest congestion of cars occurring during the rush hours of businesses. However, lunch hours tend to depend on the area being recorded because of some areas tend not to be hot spots for lunch breaks. 135th street showed actually a dip in car traffic during the lunch break hours. The United Nations area had the most apparent peak during the lunch hour and the highest standard deviation. This might indicate there is a potential standing wave affect in the traffic and could be further investigated. The Murray Street area at the interval between the lunch hour and rush hour traffic had a higher than average car flow and a very high standard deviation which also could be looked into. Finally, Broadway was the only area that got very congested which was during the morning rush hour. This was the best example of a standing wave effect and was big enough to take up all of Times Square. Times Square did have strong flow peaks since Times Square normally has high traffic flow. This was the worst area for traffic flow. Detailed data collection on these two areas with the averages, peaks, and standard deviation of the number of cars is on the excel spreadsheet attached.

Figure 2.1

United Nations	AVG	MAX	STDV
6:00AM - 10:00AM			
Street 1	8	19	5
Street 2	8	17	3
11:00AM-1:00PM			
Street 1	10	23	6
Street 2	10	18	1
2:00PM-4:00PM			
Street 1	7	11	3
Street 2	13	15	2

Figure 2.2

135th Street	AVG	MAX	STDV
6:00AM - 10:00AM			
Street 1	1	1	1
Street 2	4	4	3
Street 3	4	6	3
Street 4	8	7	1
11:00AM-1:00PM			
Street 1	1	2	1
Street 2	3	4	2
Street 3	4	5	2
Street 4	8	8	2
2:00PM-4:00PM			
Street 1	1	1	1
Street 2	2	5	2
Street 3	4	10	5
Street 4	8	8	1
5:00PM - 9:00PM			
Street 1	N/A		
Street 2	N/A		
Street 3	17	19	3
Street 4	11	12	1
10:00PM - 2:00AM			
Street 1	1	1	1
Street 2	2	2	1
Street 3	2	4	2
Street 4	7	7	1

Figure 2.3

Murray	AVG	MAX	STDV
6:00AM - 10:00AM			
Street 1	8	16	4
Street 2	5	9	4
Street 3	3	10	4
11:00AM-1:00PM			
Street 1	9	16	4
Street 2	5	9	3
Street 3	5	11	4
2:00PM-4:00PM			
Street 1	7	8	2
Street 2	2	4	2
Street 3	8	17	8

Figure 2.4

Broadway	AVG	MAX	STDV
6:00AM - 10:00AM			
Street 1	6	16	4
Street 2	8	8	4
11:00AM-1:00PM			
Street 1	7	16	4
Street 2	7	17	4
2:00PM-4:00PM			
Street 1	5	12	4
Street 2	8	15	3
5:00PM - 9:00PM			
Street 1	N/A		
Street 2	N/A		
10:00PM - 2:00AM			
Street 1	5	9	3
Street 2	7	15	4

Discussion

Even though issues were fixed, more problems surfaced while making observation about the data. In order to determine approximate max flow, when a flow becomes to large then that data point is marked as congested and compared with the rest of the congested flows. 135th street camera orientation was changing multiple times during the next phase of the project. This didn't help maintain consistency of the data and also could have changed what max flow would be for a given street for the times the camera orientation changed. Also at night Murray area and United Nations area become almost unreadable since the lights from the cars take up most of the screen and make it hard to determine car counts. Also the Murray area camera was down for a week which cut down on data collection. All these factors didn't help getting a complete data set for all areas. More data collection for time segments would have helped to better compare time slots between areas and possibly finding patterns that lead to traffic congestion.