

# Short Term Traffic Flow Prediction Of The Cross Bronx Expressway by Monte Carlo Method

Mathematics

Anushka Patel

#### Rationale:

In major urban cities such as New York City traffic congestion is a major problem. Due to the rise in the population, an increasing number of vehicles with the combination of limited availability of land for roads, traffic management develops into an important concern. Traffic congestion causes detrimental effects to the environment as well as wastes fuel, money, and time. This problem is becoming more severe over time, especially in urban areas, thus it is important to create strategies that will optimize the traffic flow.

#### Research Goal:

The goal of this study is to resolve traffic-related problems dealing with analysis, design, planning, and management pertaining to the Cross Bronx Expressway by predicting the short term traffic flow. Since the predicted short term traffic flow is an extremely important parameter utilized by traffic engineers to prescribe methods to improve traffic flow (Mishra, 2015).f The Cross Bronx Expressway is chosen because it is ranked number one for the most congested U.S Roads for the year 2016. The predicted traffic flow volumes once found can be used by traffic engineers to prescribe solution to optimise the flow of the roadway. I expect to see predicted hourly traffic volume counts that have a low mean absolute percentage error.

## Procedure:

In order to predict the traffic flow of the Cross Bronx Express the Monte Carlo Method will be used. The I-95 westbound from Exit 6A (I-278) to Exit 2 (Trans-Manhattan Expressway) is rated the most congested roadway in the United States thus this was the segment that will be used as my parameter of study. The traffic volumes will be obtained from the New York State Department of Transportation. Once the hourly traffic volumes are received each hour will be fitted to a normal distributions and the parameters will be used for the monte carlo simulation in order to predict the hourly traffic volumes. To see if the predicted volumes are accurate the mean absolute percentage error formula will be used.

## Bibliography:

Alpert, S. "Heartbreak Highway": The Cross Bronx Expressway: Massachusetts Institute of Technology. (2003).

Cookson, Graham, and Bob Pishue. INRIX Global Traffic Scorecard. INRIX Global Traffic Scorecard, 2017.

Du Y, Geng Y, Sun L. Simulation model based on Monte Carlo method for traffic assignment in local area road network. *Frontiers of Architecture and Civil Engineering in China*, (2009)

Ghorani-Azam, Adel, Bamdad Riahi-Zanjani, and Mahdi Balali-Mood. "Effects of air pollution on human health and practical measures for prevention in Iran." *Journal of research in medical sciences: The official journal of Isfahan University of Medical Sciences*. 1 Sept. 2016.

Lampthey, Geoffery, et al. "Life cycle cost analysis for INDOT pavement design procedures." (2005).

Li S, Li Y, Metcalf JB Enhancement of asphalt pavement evaluation using Monte Carlo simulation and accelerated pavement testing. *Journal of testing and evaluation*, (2002)

Lovett, Gary M, et al. "Effects of Air Pollution on Ecosystems and Biological Diversity in the Eastern United States." *Annals of the New York Academy of Sciences*, U.S. National Library of Medicine, Apr. 2009

"Mayor De Blasio Announces Initiatives To Help Ease Congestion." *The Official Website of the City of New York*, 22 Oct. 2017

Mishra, Raunak & Singh, Ajit Pratap & Sharma, Antriksh & Kumar Sarkar, Ashoke. *SHORT TERM TRAFFIC PREDICTION USING MONTE CARLO SIMULATION*. (2015).

Ploschnitzki, Patrick. "Robert Moses, the construction of the Cross-Bronx Expressway and its impact on the Bronx"

Prozzi JA, Gossain V, Manuel L. Reliability of pavement structures using empirical-mechanistic models. In *CD-ROM Proceedings of the 84th Annual Meeting of the Transportation Research Board*, Washington, DC. January. 2005

Schneider, Stephen H. "The Greenhouse Effect: Science and Policy." *Science*, American Association for the Advancement of Science, 10 Feb. 1989

Taplin, John. "Simulation Models of Traffic Flow, Department of Information Management and Marketing", University of Western Australia, 1999.

University of Surrey. "Sitting in traffic jams is officially bad for you." ScienceDaily. ScienceDaily, 25 August 2016.

Visintini, Andrea Lecchini, et al. "Monte Carlo optimization for conflict resolution in air traffic control." IEEE Transactions on Intelligent Transportation Systems 7.4 (2006)

Vlahogianni, Eleni & Karlaftis, Matthew & Golias, John. Short-term traffic forecasting: Where we are and where we're going. Transportation Research Part C: Emerging Technologies. (2014).

Wach, W. and Unarski, J., "Determination of Vehicle Velocities and Collision Location by Means of Monte Carlo Simulation Method," SAE Technical Paper 2006-01-0907, 2006,

**NO ADDENDUM REQUIRED**