

Analysis of Alternative Scenarios for Managing Traffic Incidents Through Micro Simulation

Eleni Charoniti¹, Foteini Orfanou², Dimitris Sermpis³, George Yannis²

¹ Eindhoven University of Technology ² National Technical University of Athens ³ Athens Traffic Management Center

Summary

The objective of this work is the investigation of the impacts of a traffic incident occurrence on a central urban road network in Athens and its management, through the implementation of alternative traffic control scenarios, using the microscopic traffic simulation software package, PTV VISSIM (www.ptv.de). In order to evaluate the results, travel time, delays, number of stops per vehicle and queue length were defined as measures of operational performance. The first scenario is related to the intervention in traffic signal programs of the road axis where the incident occurred, while the guidance of drivers to an alternative route by information provided through a Variable Message Sign constitutes the second scenario. The application of these models, indicates that the traffic conditions are significantly improved during the first scenario, whereas during the second scenario the deterioration in the traffic conditions of the road segments of the alternative route is more serious than the improvement succeeded.

Theoretical Background

- Incident: any event causing capacity reduction or abnormal increase of traffic demand on a road segment.
 - e.g. accidents, road works, maintenance works, emergency situations.
- The Incident Occurrence:
 - influences the level of service (LOS) of the road segment and prevailing traffic conditions,
 - deteriorates safety levels of the road axis around the incident location
 - causes **delays** and **queues**,
 - increases gas emissions and fuel consumption.
- Risk of **secondary incident occurrence**: incidents (e.g. accidents) occurring within the spatiotemporal limits of the influence area of a primary one (which has already occurred).
- Incident Management Strategies: Actions aiming at incident detection, drivers information, incident management, implementation of traffic management measures

Study Area and Dataset

- Length of analyzed network: 25 km (includes 33 signalized intersections)
- It includes Alexandras Avenue Kifisias Avenue Mesogeion Avenue Katechaki Avenue, the greater area of the intersection Vasilissis Sofias Avenue - Zacharof - Mesogeion Avenue, Fidippidou Street and Panormou Street
- Traffic data during the morning peak hour (08:00 09:00) (Source: Traffic Management Centre)
- Incident duration: 20 minutes
- Consequences due to the incident occurrence: one lane blockage on Kifisias Avenue

- The Variable Message Signs inform drivers about issues related to:
 - Traffic conditions of the road network
 - Environmental conditions
 - Variable speed limits
 - Incident Occurrence
 - Delays
 - Alternative Routes
- The Software VISSIM (Verkehr In Städten SIMulationsmodell) is a microscopic simulation software of the temporal evolution of the traffic conditions and it analyzes passenger cars, public transportation and pedestrians flows under various constraints (related to infrastructure or traffic).

Result Analysis and Comparison		
Measures of Operational Performance		Scenarios
travel times,delays,	 average number of stops per vehicle and queue length. 	 <u>"Basic" Scenario</u>: normal network operation without any intervention <u>"Zero" Scenario</u>: incident occurrence without the implementation of any incident management strategy <u>1º Scenario</u>: intervention in the traffic signal plan of the road axis where the incident occurred <u>2º Scenario</u>: driver guidance through an alternative route via Variable Message Signs upstream of the incident location
Comparison of travel times	Comparison of delays	Comparison of average number of stops per vehicle Comparison of average and maximum queue length
Basic and Zero Scenario	Basic and Zero Scenario	Basic and Zero Scenario (average queue length) Basic and 1 st Scenario (average queue length)



Travel Routes

2700-3600

3600-4500

700,0%

<mark>ප</mark> 600,0%

500,0%

400,0%

a 300,0%

ප200,0%

ď-100,0%

-200,0%

100,0%

0,0%





3 4 5 6 7 8

Travel Routes

-500.0%





Conclusion

- The values of travel times, delays and queue lengths are **significantly increased**, especially in the case of "**Zero**" **Scenario**.
- Meaningful improvement of all the measures of operational performance for all the critical segments when the 1st Scenario is implemented.
- The **use of VMS** improves the values of the measures of operational performance of some segments but its **negative impact** on other road segments causes additional traffic issues.
- The **intervention in the signal plans** of the road axis where the incident occurred was revealed to be **more efficient and effective** when compared with the use of VMS.

Further Research

- Simulation of **different incident characteristics**, such as duration, location and consequences.
- Analysis, evaluation and comparison, through microscopic simulation, of other incident management strategies (e.g. actuated traffic signal).



Contact Details

Eleni Charoniti Department of Built Environment, Urban Planning Group Eindhoven University of Technology P.O. Box 513, 5600 MB Eindhoven The Netherlands

E mail: <u>e.charoniti@tue.nl</u>



HELLENIC INSTITUTE HELLENIC INSTITUTE OF OF TRANSPORT TRANSPORTATION ENGINEERS 8th International Congress on Transportation Research www.ictr.gr