Conclusions

This study proposes an integer programming model to deploy incident response units at optimal locations, while minimizing the total delay as the objective function.

Successful freeway incident management programs noticeably contribute to alleviating the non-recurrent congestions not only by promptly removing incidents but also by efficient incident clearance and traffic management.

The Maryland incident data clearly show that the average clearance time of incidents operated by Maryland incident management program (CHART) is shorter than the one without CHART.

The incidents first responded by CHART present a shorter average clearance time than those responded by CHART but arriving at the scene later than other agencies.

This study found that the freeway incident management program plays an important role in expediting the incident clearance and consequently reducing the incident delay.

The empirical study for various fleet sizes from 2 to 7 and sensitivity study on traffic volume and incident frequency using CHART II Database show that the total incident delays with the proposed model are smaller than those with the traditional deployment model and the current practice by CHART.

The reduced delays along with the byproducts of reduced fuel consumptions and emissions due to efficient incident management program could produce significant socio-economic and environmental benefits.

DESIGN OF AN EFFICIENT EMERGENCY RESPONSE SYSTEM TO MINIMIZE THE INCIDENT IMPACTS ON HIGHWAY NETWORKS: A CASE STUDY FOR MARYLAND DISTRICT 7 NETWORK

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Abstract

This study presents a model for optimizing the deployment locations of emergency response units.

Unlike most existing studies, the proposed model is designed to assign the available units to minimize the total delay caused by incidents, rather than just to minimize their average response times.

The proposed model with the Maryland incident data outperforms both the popular p-median model and the current practice.

Extensive sensitivity analyses with respect to various traffic volumes and incident frequencies have also confirmed the superior performance of the proposed model with respect to minimizing the total delay caused by incidents.

EFFECTS OF AN INCIDENT MANAGEMENT PROGRAM ON INCIDENT DURATION

MDSHA has operated an incident traffic management program, named Coordinated Highway Action Response Team (CHART), to minimize the impacts of incidents on highway networks by prompt response, efficient clearance, and effective traffic management.

The efficient response of an incident management team can indeed contribute to the reduction in not only the response time but also the clearance time.

The clearance time can be reduced significantly if the incident management team arrives at the scene faster than other agencies.

The Maryland incident data clearly show that the average clearance time of incidents operated by Maryland incident management program (CHART) is shorter than the one without CHART.

The incidents first responded by CHART present a shorter average clearance time than those responded by CHART but arriving at the scene later than other agencies.

This study found that the freeway incident management program plays an important role in expediting the incident clearance and consequently reducing the incident delay.

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Research Background

The study site: I-270, I-70, and US-15,

63-mile long with 30 exits

Operated by 3 units from TOC-7

During AM peak hours (7:00 – 9:30) on weekdays

Input data and data source

CHART II Database (Data from Year 2010 to Year 2012)

Incident on freeway

Average response times for each type (RTs and RCTs)

Average and variance of clearance times for each type (CTs) and Var(CTs)

RITIS (Regional Integrated Transportation Information System)

Traffic volume (q)

Reference models for the comparative study

(1) The dispatch strategy to minimize the average response times

(2) The experience-based patrolling strategy operated by CHART

Methodology

Objective Function

Minimize the total delay caused by incidents, but also the clearance time.

Minimize response times.

Subject to

The dispatch minimizing total delays caused by incidents, but also the clearance time.

The current practice.

The Maryland incident data clearly show that the average clearance time of incidents operated by Maryland incident management program (CHART) is shorter than the one without CHART.

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