ESTIMATION OF EMERGENCY TRANSPORTATION TIME USING AMBULANCE PROBE DATA AND PAVEMENT SURVEY DATA

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ABSTRACT

In Hokkaido, there are many areas where ambulance transport takes more than 60 minutes, and road surface damage requiring attention to vehicle vibration is widely distributed. In the case of urgent diseases, the ambulance travel time greatly affects the survival rate, and hence, rapid driving is required. Meanwhile, considering the patient's condition during ambulance running, it is necessary to drive safely, decelerating at places where vehicle vibration may occur.

In this study, we conducted an ambulance probe survey and a road surface condition survey on five ambulance transport routes in Hokkaido, and analyzed the effects of road surface damage on ambulance travel speed using a statistical model. In addition, the model was used to estimate ambulance travel times for several pavement repair scenarios. First, the data were summarized, and it was found that on each route, long-distance transports of 55 to 70 minutes were carried out about once every three days, and that ambulance travel time increased by about 2 to 3 minutes during the snowy season compared to the non-snowy season. Next, we analyzed the relationship between pavement condition and transport time using a logistic regression model. The results showed that road surface conditions such as crack ratio, IRI, and number of low-temperature cracks, as well as road structures such as signal intersections, also affect speed reduction. Finally, using the above model, the transport times were estimated for several pavement repair scenarios. The results indicate that even a simple repair of a section with one or more low-temperature cracks can reduce the transport time by about 2 minutes. In addition, it was shown that the worst-case scenario, with more pavement damaged areas, would result in an arrival delay of approximately 4 minutes or more compared to the best-case scenario with good pavement maintenance.

Keywords: smartphone, car-mounted camera, IRI, crack, deep learning