

Applicable category: Use of road weather systems to enhance resilience under severe weather

Development of Variable Speed Limits System Reflecting Pavement and Rainfall Conditions for Real-Time Urban Road in Seoul

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ABSTRACT

The rainfall intensity partly determines the road conditions and the driver's behavior. It is very helpful for safe driving if the rainfall information is provided precisely in real-time.

This study aims to develop the methodology to provide the variable speed limits in real time by rainfall intensity. For this study, algorithm about variable speed limits was developed, which reflects the methodologies of Stopping Sight Distance (SSD) and Visibility Distance (VD) by using rainfall data. This algorithm provides variable speeds according to rainfall intensity and warn it to road users when SSD value is greater than VD value.

Weather data from 190 weather stations in Seoul were used for analysis. The 33 of 190 weather stations were used for validation purpose, which sites are based on 20 meter away from roads in Seoul. The data of remaining 157 weather stations were used for model fitting. Seoul road data from Urban Transit Information System operated by Korean National Police Agency were used. Seoul Road data consist of 22,183 nod links (lines of roads) which are connected to 177,599 points. Finally spatial pattern analysis for rainfall information of Seoul city were expressed based on results of interpolation by using representative 22,184 points of each nod links which are reproduced by 177,599 points. This rain information on nod links is generated every 10 minutes time by using 190 weather observations based 250m space resolution in Seoul.

For the statistical verification, the Root Mean Squared Error (RMSE) and correlation coefficient were considered by using IDW (Inverse Distance Weight) method which estimates values of cells by weighting of values (point) of geometric data in the neighborhood of each processed cell. This results showed significant statistically and prediction performance of rainfall in Seoul indicated good performance.

Further study will be needed to consider SSD value which can be determined by types of road alignment like difference in grades and horizontal factor, however tangent factor is only considered in this study.

This study will be expected to make driving safer and more convenient by providing the rain information required for road drivers, when heavy precipitation events occur on the roads.

Keywords: Road weather, Road safety, Rainfall information, IDW, Urban Transit Information System.