A Proposed Driver Assistance System in Adverse Weather Conditions

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The impact of different weather conditions could be severe and lead to erroneous decision making by the driver. This paper addresses the decision making guidance for drivers at signalized intersections in rural areas under different weather conditions for reducing delay and crashes. This paper proposes a new framework for **D**river **A**ssistance at intersections using collected field data for different **W**eather conditions: "**DA-W**". The dataset was collected from a signalized intersection in Christiansburg, Virginia. The intersection was equipped by four video cameras and in-site weather station for collecting the gap acceptance/rejection observations (with total number 9,058 observations). Each observation consists of driver decision, gap size, weather condition (dry, rain or snow), illumination (day or night), gap size and gap offered location (lane number). The observed decision making (accept or reject the offered gap) and the corresponding variables were aggregating together to build the database of the DA-W system. The DA-W device would be able to fuse the information gathered from road side sensors (input data) in order to estimate the decision guidance (output data), i.e. accepting or rejecting the offered gap, using the stored dataset. In order to connect between the input, the output and the stored data base, it is anticipated to use Case-based Reasoning (CBR) as a problem solving algorithm. The CBR cycle starts with entering a new case (input) which is the combination of the gap size and the corresponding independent variables, and ends with the proposed solution, i.e. the decision output: accept or reject the gap (i.e. safe or not safe gap). For framework validation, it was recorded the waiting time for different scenarios and it was concluded that the total waiting time is reduced by approximately 25% after applying the DA-W system. It is anticipated that these findings will be used for the future of V2I (vehicle to infrastructure) communications in order to reduce delay and improve intersection safety.