Intelligent Cruise Control System Impact Analysis

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(ABSTRACT)

Intelligent cruise control (ICC) has the potential to impact both roadway throughput and safety by assisting drivers in maintaining safe headways. This thesis explores this potential through comparisons of ICC to conventional cruise control (CCC) and manual driving. Accordingly, descriptions are given of both CCC and ICC systems. Furthermore, descriptions of ICC evaluation studies and car-following models are presented.

The evaluation of ICC is conducted using data collected as part of the Field Operational Test (FOT) performed in Ann Arbor, Michigan. Two levels of analysis are presented in this thesis. The first level of analysis compares the usage of ICC to CCC from a macro level. This study demonstrated that ICC was used more along similar trips. In addition, it was shown that there was no difference in usage of the ON, SET, CANCEL and RESUME buttons. ICC resulted in a higher usage of the ACCEL button and a lower usage of the COAST button compared to CCC. Furthermore, the number of brake interventions while ICC was engaged was higher than CCC. Lastly, the macro-level analysis indicated that there was no difference in the number of near encounters for ICC and CCC. The second analysis makes comparisons at a micro level. The most probable speed, acceleration and headway for each driving mode as well as the probability of using cruise control (based on speed) were determined. The probability of ICC use exceeded CCC use for every freeway speed bin and all but two high-speed arterial speed bins. Finally, a car-following behavior comparison was performed. Manual driving resulted in larger headway values for speeds less than 80 km/h. The ICC speed-headway curve was similar to the CCC speed-headway curve created from high-speed arterial data. The mean headway-speed charts, however, indicated that ICC was more similar to manual driving. Exploration into the specific differences is needed in order to determine the impact of ICC on system safety.

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