## UTC Project Information

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| Project Title | **Develop in-vehicle information dissemination mechanisms to reduce cognitive burden in the information-rich driving environment** |
| University | Purdue University |
| Principal Investigator | Srinivas Peeta |
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| Funding Source(s) and Amounts Provided (by each agency or organization) | CCAT $119,595<br>Cost share partner (Chongqing University of Posts and Telecommunications, China): $120,650 |
| Total Project Cost | $240,245 |
| Agency ID or Contract Number | 69A3551747105 |
| Start and End Dates | 8/15/2017-12/31/2020 |
| Brief Abstract of Research Project | The diversity and complexity of real-time travel information provided en route to drivers has steadily increased over the years. While it generally has positive impacts by enabling drivers to make more informed travel choices with confidence, several studies have reported the possible negative implications of poorly-designed information delivery systems. The key reason for this underlying ineffectiveness is the lack of adequate consideration of human and psychological factors in real-time information design and its delivery. This study measures drivers' brain electrical activity patterns to evaluate driver cognition under real-time information provision using insights on the localization of brain functions from the neuroscience domain. The brain electrical activity patterns of 84 participants are collected using an electroencephalogram (EEG) in an interactive driving simulator environment. The impacts of real-time auditory travel information characteristics (amount and content) and different time stages of interaction with information provision (before, during and after) on the frequency band powers of EEG signals in different brain regions are analyzed using linear mixed models. Study results illustrate that drivers exert more cognitive effort to perceive and process real-time information on complex routes in terms of the road environment and traffic interactions. Further, insufficient real-time travel information may evoke increased attention to internal processing and memory retrieval on routes characterized by higher travel time uncertainty. Also, driver anxiety may increase due to information recommending switch to routes with higher travel time uncertainty and complex driving environment. The study findings can aid information providers, both private and public, as well as auto manufacturers to incorporate driver cognition and psychology in designing real-time information and their delivery systems. |

| Most Relevant CCAT Research Thrusts | ____ Enabling Technology<br>____ Planning and Policy<br>____ Human Factors<br>_____ Infrastructure Design and Management<br>___X__ Control and Operations<br>___X__ Models and Implementation |
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| Describe Implementation of Research Outcomes (or why not implemented)<br><br>Place Any Photos Here | Research results were based on pilot designs that were implemented in a virtual driving simulation environment. Any real-life implementation of such research outcomes would be relevant insofar as such systems were indeed deployed or deployable. Given the evaluation and findings of the pilot experiment, potential implementations of the research outcomes would be hybrid driver behavior models with driver physiological data under real-time information provision and integrated real-time information system and driver monitoring system to provide information based on the driver's psychophysiological state. |
| Impacts/Benefits of Implementation (actual, not anticipated) | No research outcomes implemented so far. |
| Web Links<br>• Reports<br>• Project website | ccat.umtri.umich.edu |