UTC PROJECT DESCRIPTION

PROJECT NUMBER: 99324

PROJECT TITLE: An Evaluation of the Safety, Utility, and Reliability of Three-Dimensional Alarm Systems for Automotive Use

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PROJECT OBJECTIVE: The proposed research will provide information about driver reactions to marginally reliable alarms, and will compare trust levels for alarms generated spatially and centrally. Such information will aid automobile manufacturers as they design and implement collision alarm systems, and will lead to greater understanding of alarm mistrust in complex task situations.

PROJECT ABSTRACT: Advanced sensor-based collision avoidance warning systems have shown promise for informing drivers about impending collisions. Prototype systems rely on spatial alarms to deliver traffic proximity information. While such systems may hold promise for reducing collisions, researchers have not considered the impact of false alarms on driver behavior. The objective of this research is to determine the impact of spatial alarm presentation on alarm mistrust and subsequent driving behavior. Based on existing research, we expect that drivers will perceive spatial alarms as more reliable but more distracting that center console alarms. Our research will rely on the research expertise of the principal investigator and graduate student, and the programming and equipment expertise of Boeing personnel. During the project period, we will create a driving simulation at Boeings Advance Computing Laboratory to measure driver behavior in reaction to alarm signals. While driving in the simulator, eighty research participants will react to true and false alarm signals from the center console or from various spatial areas. We will measure driver’s reactions to the alarm signals, and their ability to make quick, accurate driving decisions. Data analyses will include comparisons of alarm reaction and driver performance data to determine the impact of spatial presentation on alarm mistrust. We hope to determine the impact of spatially configured collision avoidance alarm systems on driver trust and performance, and to assess the feasibility of their implementation. To benefit the automotive industry, we plan to distribute our findings to
refereed journals, professional conferences, transportation organizations, and standards organizations.

PROJECT TASK DESCRIPTIONS:
1. Literature Review
2. Task Environment Modeling
3. Alarm System Creation
4. Pilot Data Collection
5. Data Collection
6. Interim Progress Report
7. Data Analysis
8. Final Report Preparation
9. Deliver Final Report

MILESTONES AND DATES:
Project Start Date: July 15, 1999
Task 1 completion: September 30, 1999
Task 2 completion: September 15, 1999
Task 3 completion: September 15, 1999
Task 4 completion: October 15, 1999
Task 5 completion: January 15, 2000
Task 6 completion: January 15, 2000
Task 7 completion: March 15, 2000
Task 8 completion: April 15, 2000
Task 9 completion: April 15, 2000
Project completion: April 15, 2000

TOTAL BUDGET:
One-year project: UTCA $42,943; total budget $85,443.

STUDENT INVOLVEMENT:
The project will include at least one graduate student who is currently pursuing an MS in psychology with a concentration in human factors. The research will serve as a master’s thesis. Other undergraduate and graduate students may become involved in the project if needed.

RELATIONSHIP TO OTHER RESEARCH PROJECTS:
This project can be viewed as a stand-alone project as it does not tie into any other UTCA projects.

TECHNOLOGY TRANSFER ACTIVITIES:
We plan to publish our findings in three areas: peer-reviewed, academic journals targeted toward human factors and safety (i.e., Applied Ergonomics or Safety Science), scientific conferences related to human factors and safety (i.e., the annual meeting of the Human Factors and Ergonomics Society), and lesser trade journals related to human factors, to facilitate a timely dissemination of our results (i.e., Ergonomics in Design).
POTENTIAL BENEFITS OF THE PROJECT:
As automobile manufacturers consider implementing automotive collision avoidance systems, it is crucial that the false alarm issue be investigated in that context. We anticipate that the data from the experiment will help designers of automobile collision avoidance warning systems to create a usable, trustworthy product. Ultimately the safety of modern automobile cabs will be heightened as designers consider the proper design and placement of alarm systems. We also anticipate that the result so this research will supplement current alarm response theory.

TRB KEYWORDS:
Alarm systems, alertness, collision avoidance systems, consoles, display systems, false alarms-security, simulation.