ASSESSING DECISION MAKERS’ COGNITIVE LOAD FOR A FIRST RESPONDER HEALTH MONITORING SYSTEM

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ABSTRACT
Assessing cognitive (CL) load is one technique used in HCI research to assess user interface (UI) usability. Individual CL often varies depending on the UI design, data complexity, and type of decision making. CL refers to the mental effort needed to process information simultaneously in order to make a decision (Leppink & van den Heuvel, 2015). Acquired CL during a task can be measured using the NASA-Task Load Index. This study aims to measure the user’s cognitive load when using three different visualizations monitoring first responders’ heart rate and heat index data using IoT technologies. Our goal is to identify an optimal visualization.

Keywords
Human-Computer Interaction, visualizations, cognitive load, NASA-TLX, uncertainty information

EXTENDED ABSTRACT
Assessing cognitive load (CL) is a technique used in HCI research to assess user interface (UI) usability. Individual CL often varies depending on the UI design, data complexity, and type of decision making. CL refers to the mental effort needed to process information simultaneously in order to make a decision (Leppink & van den Heuvel, 2015). Acquired CL during a task can be measured using the NASA-Task Load Index (NLI) (Hart & Staveland, 1988). NLI consists of six subsections: mental, physical, temporal, performance, effort and frustration measuring the demands the participant experienced and the interaction between the participant and the task. Being a first responder (FR) requires strenuous physical exertion and coping with environmental hazards. This occupation is physically, mentally, and emotionally demanding. FRs experience high injury rates from accidents, musculoskeletal health complications, and sudden premature deaths. Among these occupational health events, coronary heart disease (CHD) is the leading cause of death for FRs, and nearly half of the CHD events occur during FR activity. This study aims to measure the user’s CL when using three different visualizations monitoring first responders’ heart rate and heat index data using IoT technologies. Our goal is to identify an optimal visualization that reduces the workload of completing the task (Rensink, 2014).

The study dashboard allows incident commanders to monitor FR health data to decide if an intervention is necessary. This data may be viewed as uncertainty information. Uncertainty information in UI designs are typically presented in graph form in order to better aid the decision-making process (Allen et al., 2014). This is important for the users to view trends in the data and aid in making probabilistic decisions with varying consequences. In order to minimize risk of an incorrect decision, graphical UI designs of the heart rate and heat index uncertainty information will be studied based on user experience and CL. Reducing CL helps ensure an optimal decision is made while also providing a positive user experience. Our study design will present users with three different UI prototypes displaying heart rate and heat index data. Each user will be provided a use case scenario to follow requiring a decision in a short period of time. After the decision-making process, cognitive load measures from making the decision will be assessed. Our goal is to identify an optimal visualization from the cognitive load results.

REFERENCES