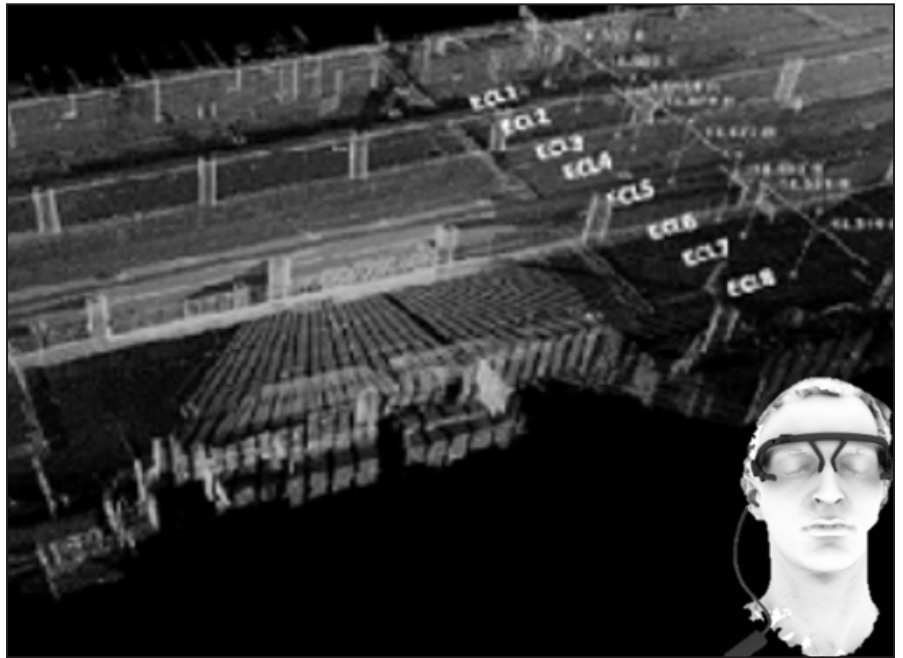# MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 22-472 (project 653) | July 2022

Optimize the Work Zone Safety with Spatial Information Technology and Eye Tracker

the ISSUE

Construction in the United States has consistently experienced high fatality and injury/illness rates. While many studies have highlighted the importance of attention in reducing the number of injuries in the construction industry, few have attempted to measure the actual effectiveness of vibrant markers, such as eye movement, on hazard identification.

the RESEARCH

Human error is the main contributing factor to accidents in the workplace, especially among construction workers. This study adopted systematic literature review methods to discuss current research on using eye-tracking technology to improve construction safety, as well as present the challenges and opportunities. Experiments were conducted with 60 participants, who were asked to recognize the potential hazard in three construction pictures before and after a 10-minute training. Then, workers' hazard identification rate (HIR) was defined. The MultiMatch method, a vector-based, multi-dimensional approach to compute scan path similarity, was adopted to calculate the similarity of scan path in five dimensions, vector, length, position, duration, and direction. Statistical methods, including T-test and one-way-ANOVA analysis, were performed to evaluate the effectiveness of the brief training.

MOUNTAIN-PLAINS CONSORTIUM REGION 8

Lead Investigator(s)

Chengyi Zhang, Ph.D., P.E.
chengyi.zhang@uwyo.edu

Research Assistant(s)

Peng Liu, GRA, PhD Student

Project Title

Optimize the Work Zone Safety with Spatial Information Technology and Eye Tracker

Sponsors | Partners

University of Wyoming

USDOT, Research and Innovative Technology Administration

the FINDINGS

1. The combination of virtual reality, wearable technology, and eye-tracking is a new trend in construction safety analysis.

2. The field experience will significantly influence workers' safety hazard recognition rate, while a certificate (such as 10 or 30 hours of OSHA training) has less effect on the recognition rate.

3. A 10-minute brief safety training has a minimum impact to improve workers' hazard recognition rate.

4. The scan path similarity of the high recognition rate group is higher than that of the low recognition rate group in five dimensions, including vector, length, direction, position, and duration. The visual search strategies of the high-rate group are more stable than that of the low-rate group.

the IMPACT

This research is a first step toward an entirely new way of improving construction jobsite safety by increasing the construction field's understanding of the variables that impact attentional allocation and providing a novel approach for improving construction site safety by using eye-tracking technologies and remote sensing.

For more information on this project, download the main report at https://www.ugpti.org/resources/reports/details.php?id=1093