Worker safety and injury severity analysis of earthmoving equipment accidents

* Abstract:
  + A majority of the earthmoving equipment accidents resulted in fatality. Backhoes were the most common equipment involved in accidents and fatalities. Struck-by accidents were the most prevalent and most fatal. Non-OSHA compliant safety training, missing seatbelt, operator not using seatbelt, malfunctioning back-up alarms, and poorly maintained equipment were factors contributing to accidents and fatalities. On-foot workers experienced a higher number of accidents than operators, while fatality odds were higher for the operators. Practical applications: Safety professionals should benefit from our findings in planning and delivering training and providing oversight to workers in earthmoving equipment operations.
* Kazan, Emrah, and Mumtaz A. Usmen. “Worker Safety and Injury Severity Analysis of Earthmoving Equipment Accidents.” Journal of Safety Research, vol. 65, June 2018, pp. 73–81.

Head-mounted display-based intuitive virtual reality training system for the mining industry

* Abstract:
  + Virtual reality (VR) training technology in the mining industry is a new field of research and utilization. The successful application of VR training system is critical to mine safety and production. Through the statistics of the current research and applications of VR training systems in mining industry, all the input/output devices are classified. Based on the classifications of the input/output devices that are used in the VR system, the current VR training systems for the mining industry could be divided into three types: screen-based general type, projector-based customized type, and head-mounted display (HMD)-based intuitive type. By employing a VR headset, a smartphone and a leap motion device, an HMD-based intuitive type VR training system prototype for drilling in underground mines has been developed. Ten trainees tried both the HMD-based intuitive system and the screen-based general control system to compare the experiences and training effects. The results show that the HMD-based system can give a much better user experience and is easy to use. Three of the five components of a VR training system, namely, the user, the tasks, and software and database should be given more attention in future research. With more available technologies of input and output devices, VR engines, and system software, the VR training system will eventually yield much better training results, and will play a more important role in as a training tool for mine safety.
* Zhang, Hui. “Head-Mounted Display-Based Intuitive Virtual Reality Training System for the Mining Industry.” International Journal of Mining Science and Technology, vol. 27, no. 4, July 2017, pp. 717–722.

Better Retention of Skill Operating a Simulated Hydraulic Excavator After Part-Task Than After Whole-Task Training.

* Abstract:
  + The article examines whether part-task or whole-task training produces better learning and retention when training to use a hydraulic excavator through a virtual reality simulator. Participants in the study performed a trench and load task on the simulator using either training method. It was found that part-task training on the simulator resulted in better skill retention than the whole-task method.
* So, Joey C. Y., et al. “Better Retention of Skill Operating a Simulated Hydraulic Excavator After Part-Task Than After Whole-Task Training.” Human Factors, vol. 55, no. 2, Apr. 2013, pp. 449–460.

Virtual excavator simulator featuring HILS and haptic joysticks

* Abstract:
  + This paper presents a virtual excavator simulator featuring hardware-in-the loop-simulation (HILS) technology and haptic joysticks. First, the technical concept of the virtual excavator simulator is proposed. Then, the mathematical relations describing the behavior of the excavator are derived for the software environment. Next, for reflecting the nonlinear and dynamic characteristics of the hydraulic system in the excavator, the simulation software is integrated with the hydraulic system hardware. In addition, for improving the interaction performance between the operator and the simulator, MR fluid actuator based haptic joysticks are employed. The experimental performance evaluation verified that the proposed concept of the virtual excavator simulator is effective and practical from the viewpoint of the reality improvement.
* Nam, Yun-Joo, and Myeong-Kwan Park. “Virtual Excavator Simulator Featuring HILS and Haptic Joysticks.” Journal of Mechanical Science and Technology, no. 1, 2015, p. 397- 407.

An overview of self-adaptive technologies within virtual reality training

* Abstract:
  + This overview presents the current state-of-the-art of self-adaptive technologies within virtual reality (VR) training. Virtual reality training and assessment is increasingly used for five key areas: medical, industrial \& commercial training, serious games, rehabilitation and remote training such as Massive Open Online Courses (MOOCs). Adaptation can be applied to five core technologies of VR including haptic devices, stereo graphics, adaptive content, assessment and autonomous agents. Automation of VR training can contribute to automation of actual procedures including remote and robotic assisted surgery which reduces injury and improves accuracy of the procedure. Automated haptic interaction can enable tele-presence and virtual artefact tactile interaction from either remote or simulated environments. Automation, machine learning and data driven features play an important role in providing trainee-specific individual adaptive training content. Data from trainee assessment can form an input to autonomous systems for customised training and automated difficulty levels to match individual requirements. Self-adaptive technology has been developed previously within individual technologies of VR training. One of the conclusions of this research is that while it does not exist, an enhanced portable framework is needed and it would be beneficial to combine automation of core technologies, producing a reusable automation framework for VR training.
* Vaughan, Neil, et al. “An Overview of Self-Adaptive Technologies within Virtual Reality Training.” Computer Science Review, vol. 22, Jan. 2016, p. 65 - 87.