A VR Approach to Surface Mine Truck Safety Training

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ABSTRACT: In the surface mining industry, the cost of workplace accidents is high. One of the most important tools for on-the-job accident prevention is safety training. Two areas of safety training are the pre-operational vehicle inspections and driver training. Training operators to correctly inspect and operate vehicles is costly and time consuming in both equipment availability and man-hours. This paper outlines the motivation for and the development of alternative training methods using virtual reality (VR). Two training tools developed at the University of Nevada are the Mine Vehicle Inspection Simulator (MVIS) and the Mine Vehicle Driving Simulator (MVDS). This paper provides a description of these tools as well as future product enhancements.

1 INTRODUCTION

Workplace accidents in the mining industry reduce production, increase costs, and result in debilitating injuries or death to mine workers. Accidents are a major concern in day-to-day mining operations and are expensive in terms of cost and employee morale.

One of the most important tools for on-the-job accident prevention is worker training. However, the cost of accident prevention training is high, particularly when the training method attempts to provide a realistic representation of risks associated with mining vehicle operation and the proper techniques that avoid or manage those risks. Preparing video demonstrations, conducting safety training tours of work sites, and conducting on-site safety briefings are all effective training tools. But these methods can be expensive and disruptive to daily operations.

Virtual reality (VR) is a technology for developing training tools that offer an excellent approach to reducing both job accidents and the high cost of training. Two such tools developed at the University of Nevada are the Mine Vehicle Inspection Simulator (MVIS) and the Mine Vehicle Driving Simulator (MVDS). These tools address the training issues of pre-operational vehicle inspection and driver training.

These products have been developed using PC-based real-time 3D graphics and cutting edge VR input devices. These products, designed for the Microsoft Windows NT platform, offer mining companies a cost effective alternative to traditional training methods.

In Section 2 we discuss the pre-operational vehicle inspection and the development of the Mine Vehicle Inspection Simulator as well as its features and future improvements that we are planning. In Section 3 we present the Mine Vehicle Driving Simulator and discuss how it can assist in operator training. This is followed by conclusions in Section 4 and acknowledgments.

2 PRE-OPERATIONAL VEHICLE INSPECTION

Mining companies around the world agree that pre-operational vehicle inspections are effective in decreasing haulage-related accidents. Performed prior to taking a vehicle into the field, inspections by the vehicle operator identify hazardous damages that occur from normal use. The cost benefits of these inspections are twofold. First, they make the workplace safer by keeping faulty equipment out of the field and helping to reduce haulage related accidents. Second, pre-operational inspections extend vehicle longevity as an additional component to vehicle maintenance routines. However, training employees to correctly perform pre-operational inspections is expensive. Traditional training methods such as written material, videos, seminars, and live inspections suffer from one of two problems. Either the training method poorly conveys critical information (written and spoken) or is extremely expensive to conduct (live vehicle inspections). The need for a cost-effective training method appropriate for teaching pre-operational inspections has led to the development of the Mine Vehicle Inspection Simulator (MVIS). By using state of the art PC and VR technologies, MVIS combines the learning experience gained from live vehicle inspections with the cost effectiveness of written material and video training aids.

Figure 1: Screen Shot of MVIS.

MVIS is a VR simulation of the pre-operational vehicle inspection designed for mid to high-end PC-class computers running the Microsoft Windows NT operating system. A screen shot of MVIS is shown in Figure 1. As a feature-rich software package, MVIS brings together PC-based computing and VR technology to offer mining companies a cost-effective alternative to traditional training techniques in terms of time, initial investment, and training effectiveness.

The key to MVIS's effectiveness as a training tool is the virtual reality environment in which the trainee works. MVIS