A Smartphone-based Construction Fall Prevention Toolkit

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Construction is a hazardous and often physically demanding industry. Among all the category of construction injuries, fall injury was reported to be the most frequent and fatal. Fall injury prevention has received considerable attention from all over the world. Although there has been a significant improvement in workplace fatalities and injuries over the previous years with stricter OSHA regulations and enforcements, however 294 deaths out of 796 total deaths in construction due to fall in 2013 (OHSA) indicates that fall related fatalities and injuries are still unproportionately high. With the increasing use of technology in construction over the years it is proposed that the technology can be used to reduce construction related injuries and fatalities. With this overarching goal, the objective of this research is to create a smartphone-based fall prevention application using mobile embedded magnetic field sensor that triggers and communicates to the alarm receivers through mobile cellular network when a sudden change of magnetic field caused by a preinstalled magnetic triggering device is detected. The pre-alarm kit is designed to be deployed with multi-mobiles and multi-triggering devices on various construction jobsites where hazardous duties demanded by working on heights occur. Through this alert system, the device prevents construction workers from inappropriately or negligently performing hazardous duties. The basic theory of pre-alarm for fall accidents is to timely and appropriately sense the sudden augmented magnetic field. In order to achieve this goal, a worker needs to use the threshold settings of the mobile application along with the preinstalled magnetic triggering device to calibrate the alarm kit for its best performance. A preliminary smartphone app has been developed by the first author and is currently available on Android OS. It is composed of a main magnetic field sensing activity, a background monitoring service, a preference setting activity and a triggered alarm communicating activity. Preliminary tests including a mock field test with over ten participants have been conducted on the developed application and results indicate that the fall prevention toolkit sufficiently achieved the expected goal. More such field tests are scheduled in the future. The functionality and usability of the toolkit shall be refined upon the feedbacks received. Introduction of mobile sensing technology into construction safety arena to prevent fall accidents caused due to inappropriate or negligent performance of hazardous activities is a novel idea and is expected to bring about positive changes to the safety of the construction workers.

Key Words: Safety, Fall, Injuries, Sensing, Pre-alarm