

Improving Workplace Safety by Utilizing the Machine to Machine Support Intelligent Decision-Making in Preventing Slip and Fall Occurrences during Elevated Work Activities

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Abstract: In developing countries like India, the number of fall-related incidents in workplaces is rapidly increasing—not just in the industrial sector, but also in construction and private sectors. Falls are currently the leading cause of fatalities and serious injuries. The severity of injuries resulting from working at heights depends on various factors such as the type of job, the height involved, and the condition of the working surface, whether it is uneven or cluttered. Generally, the greater the height, the more severe the injury; however, under certain unavoidable circumstances, even a fall from a lower height can prove fatal. Several factors contribute to the outcome of a fall injury, including individual characteristics, workplace behavior, alertness, fatigue, haste, and frustration, lack of focus, mental distraction, and complacency. In many cases, contract workers fail to properly secure their safety harness to an anchorage point. This research paper explores an innovative solution aimed at transforming personal protective equipment (PPE) used for working at heights. While numerous technologies exist—such as in the chemical industry, where equipment automatically shuts down and safety protocols are triggered upon parameter deviation—traditional PPE still lacks such automation. This highlights a critical area where further technological advancements are needed to develop a more robust safety system. A useful comparison is with airbags in vehicles: in the event of a collision, the airbag system activates within milliseconds, potentially saving the lives of the driver and passengers. Similarly, Smart PPE incorporates a feature where, if a compliance breach occurs in the workplace, the deviation is instantly detected and a warning alert is sent to the user as a reminder to adhere to safety protocols. This system enhances workplace safety by eliminating the need for manual surveillance or manual recording of violations, making it error-proof. In this study, Machine to Machine Like IoT-based smart safety harness has been analyzed. The research compares workplace deviations detected by this smart system with historical data obtained through manual monitoring, aiming to assess human error in PPE compliance.

Keywords: Occupational Safety, Machine to machine M2M, Internet of Things, Smart Personal Protective Equipment (PPE), Fall Protection Systems, Fall Prevention, Working at Heights, Fall-Related Injuries, Workplace Safety, Industrial Safety Measures, Health etc

