AI-Powered Workplace Safety: Helmet and Face Detection using YOLO for Access Control

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Abstract: *The influence a hazardous workplace has on worker well-being and efficiency has led numerous companies to put extreme focus on workplace safety. Workers are continuously subjected to numerous hazards at all times and locations when labouring in today's large construction/manufacturing plants and other hazardous industrial sites. The accident occurrence is thus higher compared to other sectors because the number of variables of risk is higher, and it is also a requirement for employees to don personal protective devices (PPE) in order to protect their bodies against unsafe causes. The accidents that have occurred because employees failed to put on personal protection equipment, such as hard hats, are the most common types of safety occurrences at the worksites. In reality, most existing safety inspection processes rely on the manual observation and reporting of inspectors. Hand observation of construction sites can be time-consuming, error-prone, costly, and inappropriate for large projects with several simultaneous operations. There have been numerous publications of studies on automatic detection of helmet wearing and human identity recognition, which have been aimed at helping safety inspectors on construction sites in monitoring workers' safety. Another study asserts that the computer vision-based person identification could be combined with helmet wear. In other words, in helmet testing, we usually do not have the capability to recognize individual people, and vice versa. We propose a computer vision approach to automatically recognize workers' identity and helmet wear to resolve the issues discussed above. First, our method involves two applications: identification and detection of helmet wear. Second, we tested the accuracy and recall rate of the algorithm under different visual environments to establish its use in the real construction site conditions. This was carried out as per the differing visual conditions at the construction site*

Keywords: Accident Occurrence, Computer Vision, Helmet Detection, Personal Protective Equipment, Safety Inspection, Worker Identification