Real Time Safety Measurement Protocol System for Construction Sites Using Machine Learning in Bangladesh

Tanjila Islam
1811017042
Department of Electrical and Computer Engineering
North South University
tanjila.ritu@northsouth.edu

Tanzila Islam
1811027042
Department of Electrical and Computer Engineering
North South University
tanzila.islam@northsouth.edu

Sourav Biswas
1721288642
Department of Electrical and Computer Engineering
North South University
sourav.biswas@northsouth.edu

Shuvo Bhowmick
1632409042
Deptartment of Electrical Computer and Engineering
North South University
shuvo.bhowmick@northsouth.edu

Md. Abir Ahmed
1722322042
Department of Electrical and Computer Engineering
North South University
abir.rafi@northsouth.edu

Shahnewaz Siddique
Assistant Professor
Department of Electrical and Computer Engineering
North South University
shahnewaz.siddique@northsouth.edu

***Abstract*—Safety in the construction industry is one of the main concerns in Bangladesh. It is one of the most unpredictable and danger-filled industry sectors. Most developed countries endeavor to reduce the tragic damages and losses resulting from construction accidents by preventing, eliminating, and bypassing the probable occurrences. Unfortunately, Bangladesh is one of the countries most at risk of construction accidents because they lack a robust safety system. Both authorities and employees do not have a clear understanding of construction safety. Safety negligence tends to cause most accidents. Thousands of Bangladeshi workers are injured or die from accidents on construction sites every year. Lack of training and knowledge about the equipment are the top five causes of these misfortunes, followed by lack of personal protective equipment, lack of safety eliminating/avoiding design, unfit equipment, and a lack of knowledge about the equipment. [1] The last decade has seen numerous studies conducted to introduce effective protection systems within the construction industry using machine learning and computer vision. To achieve this goal, in this study we proposed a model to actively monitoring the proper wearing of Safety Equipment (hard-hat, gloves, face masks, vests, harnesses and boots) of the construction workers in real-time. Based on the results of experimental tests, the model proved to have 86.93% mean average precision, which was effective for identifying safety equipment correctly. In combination with YOLOv4 and Darknet, these pieces of equipment can be registered and classified simultaneously. In future, we want to develop a system that monitors the wear of safety equipment to determine if workers are wearing it properly based on our model. Workers will not be able to access certain construction areas if one of these pieces of equipment is missing.**

***Index Terms*—Construction, Safety, YOLOv4, Darknet, Machine Learning, Image processing, Object detection, Real-time video.**

I. Introduction

Construction sites should always maintain a high level of safety. Many hazardous locations and working conditions in the construction industry, such as houses, roads, and other infrastructure. Working in these environments also requires dealing with heights, noise, heat, and electricity. In the absence of proper safety protocols, workers face an array of issues in the long run. Safety equipment includes a wide variety of items, such as Head Protection, Eye Protection, Face Mask, Vest, Hand Protection, Safety Boots, and so on.

The use of a hard-hat and vest coat are the most important components of workplace safety.Safety helmets resist and divert blows to the head hit by falling objects. A construction safety vest plays a significant role in keeping workers safe by promoting visibility. On the other hand, eye and face protection such as safety goggles and full-face shields are equally important since they protect eyes and faces. Additionally, this assists in protecting from dust, smoke, metallic debris, chemicals, and other harmful materials that could cause permanent damage to the body. Another necessary piece of equipment is hand protection like hand gloves as all kinds of work are maintained by hands and over 1 Lakh hand injuries are reported each year. Wearing gloves can also prevent potential risks associated