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Prevention of Labours Accident in Construction Site

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Abstract: Construction industry has facing an extensive growth across the world for the past few decades. In a construction project, safety of the structures and that of the personnel is given much importance for the project to be successful. Construction site accidents are continuing, even though labour safety laws are available. This paper provides the solution for reducing the construction site accidents. It uses the sensors to detect the distance of the personnel from the safer limit. The PIR sensor detects the human, so that the worker crossing the safer limit will be detected and the buzzer produces the alarm to alert the worker. MEMS and parachute are used. Unfortunately when the worker falls from height, the MEMS get activated by angle variation of the worker and parachute expands.

Keywords: Sensor, MEMS, Construction site, accident, Buzzer

I. INTRODUCTION

Construction site is a work place where lot of risky activities and accidents would occur. In India, when compared to agriculture the construction industry has the second largest employer. It is important to pay sufficient attention to the safety issues in construction site because of the frequent development of high rise building. The construction site has an alarming rate of fatal accidents and is mainly caused by falling of person from height [1]. India has 7.5% labour force of the total world labour force and it extends to 16.4% of fatal global occupational accidents [6]. The fatality rate in the construction industry is 5 times more than the manufacturing industry. Over the past few years, accident's based on work at height is increasing. The Labour Department (LD) reminds the workers working at height to be aware of safety at work and to be alert. According to the study by the International Labour Organization ILO [3], India has the world's highest accident rate among construction workers. In a survey it is found that 165 out of 1000 workers injured on the job.

In the past few decades, the need for the prevention of labour's accidents in the construction industry is realized. The major reasons for construction site accidents are lack of communication among various departments, lack of proper inspection, poor protective device and lack of skilled labours.

According to the National Fire Incident Reporting System (NFIRS), high rise building can be categorized into four ranges which are 7-12 stories 13-24 stories, 25-49 stories, and 50 stories or more. In general, 75feet (23 meter) or seven stories will be the cut-off point for the most purpose. In year 2011, 4,937cases of accidents were reported in the construction industry and it was the second highest record of accidents reported among all the industries. In the same year, there are total 9,057 cases of people falling from height accidents [5] and 4,689 cases of struck by falling object accidents occurred.

This paper provides a new preventive measure which makes use of the microcontroller, passive infrared PIR, infrared IR and, MEMS (gyroscope). The PIR and IR detect the human and obstacles crossing it and send the signal to buzzer. The MEMS works by the smaller angular displacement of the falling person and send the signal to the relays for the parachute operation.

II. OBJECTIVE

The main objective of this paper is to reduce the fatality rate and to improve the safety of the workers in the construction site by providing the proper safety measures and protective devices for the workers.

III. LITERATURE SURVEY

There are four types of tall structure accidents which are caused by scaffolding, falling of people from height, struck by falling object and machinery. The workers are subjected to the crumple of the platform. Major of the framework mischances happened were because of the utilization of deficient materials for platform and combined with the untalented and indiscreet workmanship in erection of frameworks.

In construction industry, falls isn't just the most lethal mishaps however it likewise is the most continuous happened mishaps. Everyone in the construction site has the hazard to open to fall in anyplace and whenever particularly at the larger amount. By and

large, absences of the security measure at construction destinations is one of the causes the event of fall mishances. Struck by falling article mishaps [8] can be characterized as individuals who work at construction site is struck by the hardware, private vehicles, falling materials, vertically raised materials [1] and on a level plane transported materials. The ill-advised apparatus technique had caused the mishance happen. Over-burdening is one of the components that will cause the cranes fall in the elevated structure development. Amid the activity, the measure of reasonable dealing with stack by the crane is dependably not appropriate control by the supervisor.

Mishap is an occasion of erratic and it might happen because of the accompanying causes, absence of preparing, ill-advised hardware and working stage, wrong security disposition, deficient housekeeping, and inability to utilize individual defensive hardware (PPE), and issue acquisition technique [3] and subcontracting technique. The absence of preparing can caused mishances at development site. Due to the absence of preparing in security and innovation learning, specialists are haven't capacity and adequate learning to predicts the potential hazard and the best approach to maintain a strategic distance from the mishances [5].

The utilization of hazardous working stages likewise may put specialists in danger when the gear isn't legitimately utilized, kept up or then again put away. Development specialist's security demeanour is impact by their comprehension and figuring it out of hazard, administration, wellbeing rules and the working strategies. The perilous activities are incorporate do not take after the standard wellbeing strategies, developing brutally [9] and choosing to continue work in a dangerous conditions. The poor housekeeping in the working environment can be considered as a hazard factor for word related wounds. Working without wearing any PPE may profoundly build the likelihood for event of any undesired mishap.

The statistics showing the construction site accidents with their percentage is given below in fig 1. According to this statistics the higher rate of fatality 50% is caused by falling of worker from the heights such as roof, scaffold, ladder etc [7,10]. The minimum of 5% accident is caused by excavation works.

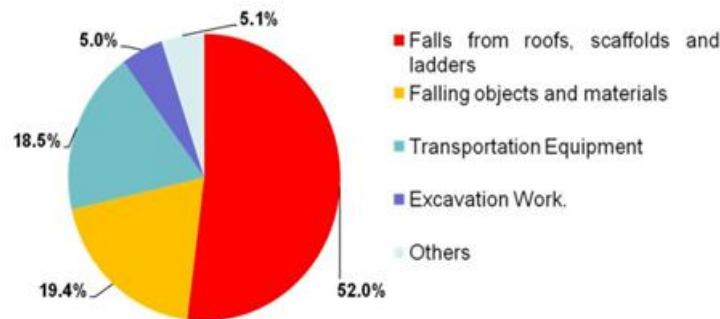


Fig .1. Accidents statistics during construction

The different reason of labours decline to wear PPE amid working are, for example, feel awkward with the riggings while playing out their activity at site and consider it as an aggravating thing to their work yield. As indicated by Ali, et al., the International Labour Association has uncovered that a portion of the labours felt awkward while wearing any kinds of PPE and it in a roundabout way diminishes their work execution. Sub-contractual workers more often than not have poor security mindfulness at construction site. Poor coordination, absence of legitimate directions and misconstruing between working exchanges all can prompt development mishaps. As indicated by Occupational Safety and Health Act 1994, segment 24[2,4], the workers are capable to wear or use at all the seasons of any defensive gear or apparel which gave by the business. Great housekeeping is the best safeguards against mishaps amid development. Accordingly, great housekeeping is an essential part in any construction site which helps to decrease event of mishances and enhance the general security execution. Assessment is one of the basic types of investigation to keep any mishaps. . Investigations are a piece of a preventive or proactive to mishap avoidance. Preparing is a vital and essential piece of mishap counteractive action strategy. Preparing is a fundamental and essential piece of mishap anticipation approach. Each of the organization ought to guarantee that the preparation program is a vital piece of the direction given to all men in development work and ensure them specific consideration towards to the security issues. The nature of the construction business' quickly evolving conditions [10], related work risks, and the qualities of development associations additionally exasperate the circumstance. Accordingly, there are important to execute the proper aversion activity to keep the event mishaps.

IV. METHODOLOGY

The methodology is designed in order to prevent the labour from accidents.

As the first step, the PIR and IR sensors are fitted at the sides, ceilings and walls where construction work is done on the floor. The buzzer is connected with the PIR sensor and the number of LED's is provided for the IR sensor. They are provided with 5v DC. The PIR sensor detects the human by using the infrared radiation emitted from the human body in the nearby surrounding. The PIR detection extends up to 10 meters at an angle variation of $\pm 15^\circ$. The IR sensor measures heat of an object and also detects the motion. These sensors are connected to the AT89S52 Atmel microcontroller which is coded by the dumper circuit. The various other devices connected to the AT89S52 are LCD, relay, MEMS (gyroscope). When the person comes closer to the free end of the construction site where the sensors has been placed, the IR detects the motion of the person. Therefore the LED gets glowed. This stimulates the buzzer to produce the sound to alert the worker. The buzzer works using the piezoelectric effect. When the person is detected the LCD coupled to the microcontroller will display "PERSON DETECTED". If only an obstacle is detected the LED glows. When both the human and obstacle is detected by the sensors then the buzzer will alert the worker by producing an alarming sound. This is one type of preventive measure to alert the workers working inside the tall structures.

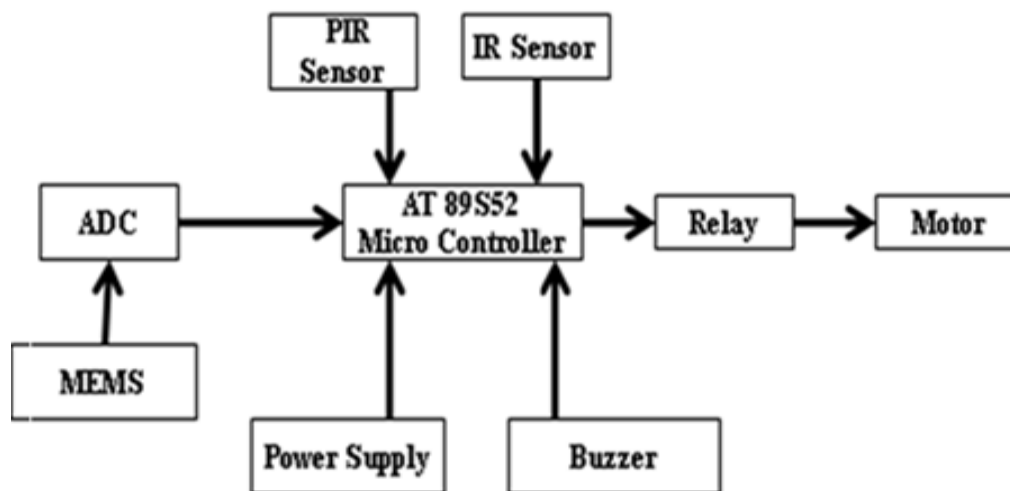


Fig 2. Block diagram

The second step in the preventive measures makes use of the MEMS (gyroscope). This establishes the protective solution to the workers working at scaffold, outer of superstructure and also the painter. They are provided with the MEMS (gyroscope) and parachute. The MEMS is placed at the wrist of worker and parachute as a bag. The MEMS work's by the angular velocity. When the workers fall unfortunately, the MEMS get activated by the angular velocity of the falling person. It is designed at the angle variation of 130° . It is connected to the analog to digital converter, to provide the signal to the microcontroller. Then the microcontroller sends the relay which aids in the expansion of the parachute for the safe landing of the falling person. In this instead of using parachute a dc motor has been used for demonstrating the concept of parachute.

V. HARDWARE DESCRIPTION

The hardware showing the various components is given below in fig 3. It consist of AT89S52 (microcontroller), relay, PIR and IR sensors, gyroscope, LCD, ADC, timer, LED, buzzer and the motor. The power supply for the operation of the sensors is provided using the step-down transformer. The operation performed by the microcontroller is displayed in the LCD. The hardware shows the detection of object and human by the sensors, as a result the LED glows and buzzer get activated.

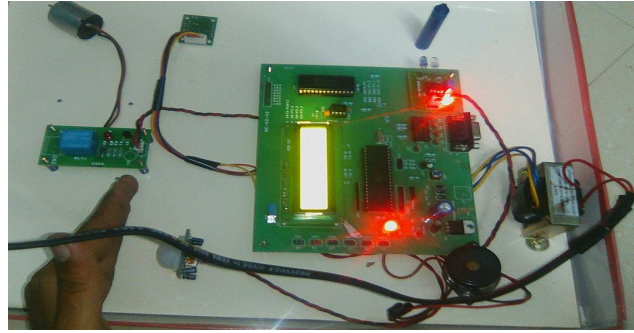


Fig3. Hardware

VI. CONCLUSION

This paper has provided preventive measures for reducing the fatality rate in the construction site by making use of the sensors. Since the construction industry is the second largest sector employing more workers, proper preventive measures has to be used. This provides the safer working environment for the workers.

This system encourages the courage of the workers to work at height and helps in saving the life of superstructure workers.

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