PPE Kit Detection Solution

Improving Workplace Safety

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Abstract

Around **2 million** people worldwide have work-related incidents and it keeps increasing by **2-3%** every year.

An unsafe work environment can largely affect the daily functioning of a company and slows down productivity.

Any unforeseen incidents in the workplace can affect the morale of employees, which in turn affects the reputation of a business.

Even after conducting risk assessments and implementing adequate actions, workers are still subject to various safety hazards.

To avoid this, companies provide some safety guidelines to all the workers. If workers don't comply with following the guidelines, then the chances of injuries dramatically increase.

For instance, non-compliance with wearing a PPE kit can cause contamination of the products manufactured. The safety and security of employees can also be affected by any unwanted invasions or intrusions.

2 out of every 5 people are at life's risk as statistical data shows **40%** of workplace incidents happen due to vehicle accidents every year.

It is extremely important for companies to incorporate automated systems that effectively monitor the safety and security of workers.

Recent advancements in the field of computer vision and data analytics gave rise to a new technology called Video Analytics. It can perform automatic and real-time detection of the safety violation of workers.

Video Analytics has the potential to prevent injuries, save lives, money, and even time. This guide will help you understand how Video Analytics can improve workplace safety and efficiency.

Problem Statement

The non-compliance of workers in following the safety guidelines is slowly turning into a major issue. Many safety compliances installed in the workplace are usually faulty & outdated, which can lead to health & safety risks.

Let us first see what are the most common hazards that employees are at risk of:

Falling objects or debris - Workers can get hit or struck by falling objects, especially in construction environments. The debris or bricks can fall on a worker's head and can cause injury if the hard hat is not worn.

Breathing in contaminated air - If workers don't wear masks then they can accidentally breathe contaminated air at construction sites or even at chemical factories.

Chemical burns - Chemicals can spill on a worker's bare hands if he doesn't comply to wear gloves.

Intrusion - Any unknown person can enter the premises without notice and can cause havoc in the facility, which could jeopardize the safety & security of employees.

Entrance of unknown vehicles - Unidentified vehicles can enter the facility and could stand out as a safety hazard for the employees.

Over-speeding incidents - There are accidents related to forklifts getting out of control and bumping into workers, similarly, overspeeding trucks can become a major issue in factory areas.

Falling Objects

Breathing in contaminated air

Breathing in contaminated air

Problem Statement

Excessive Noise

Electric Shock

Vehicle Overspeed

Electric shocks - About 3-4% of workers lose their life due to electrical accidents every year. If a worker doesn't comply with wearing rubber gloves and shoes and works in an electric company, then it can result in him/her being electrocuted.

Exposure to excessive noise - Employees are advised to wear hearing protection to avoid excessive noise or vibration, especially in construction sites.

Projectiles can harm the eyes - Safety goggles are to be worn by the employees to protect their eyes from any projectiles coming directly or indirectly.

Due to the aforementioned problems faced by a business, they should get their hands on the latest technology and prevent any and all workplace hazards.

Video Analytics is an advanced all-in-one solution for businesses to adapt to their current system to provide employees with a much safer and more efficient work environment.

Solution Background

Video analytics is basically a technology that monitors video streams in real-time and identifies events, or patterns of specific behavior. Video Analytics enables its users to analyze and share any collected data to make better decisions.

How the Solution works?

Firstly, the data from the workplace is collected using CCTV cameras for model training. After a sufficient amount of data is collected from the cameras, algorithms and Computer Vision is applied to the data.

Once the model is trained, it is deployed into the monitoring system. The Video Analytics software then constantly monitors and analyzes the workplace for any safety violations. If the software finds any violations, real-time notifications will be sent on the provided dashboard, along with alerts on smartphones and Emails.

Depending on how you use the Video Analytics solution, it can help you improve protection for your workers against accident, injury, or even death. It can even guard against security breaches that take place in facilities.

How Solution is Made?

In this section, we will understand the working of the solution in more detail.

Data Collection & Annotation:

Data is initially taken from working sites in the form of images for reference. These images would be of workers who don't wear PPE kits and of trespassers or outsiders who enter the facility without a permit.

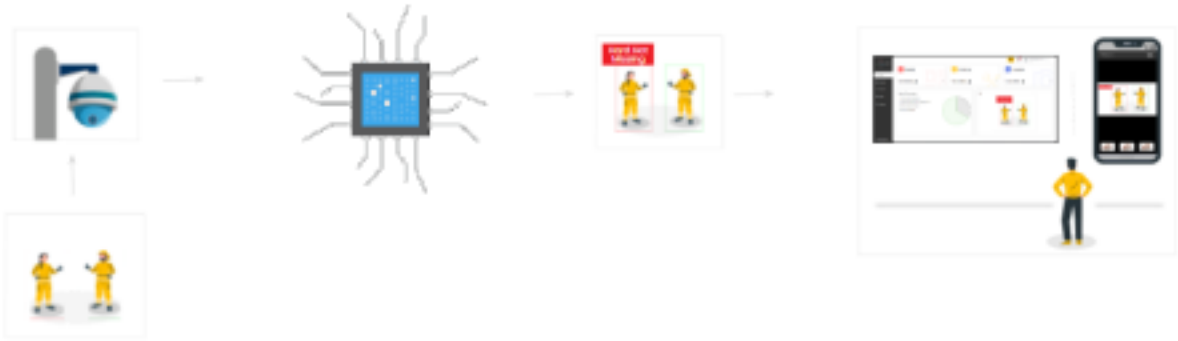
Similarly, number plates of incoming vehicles and their speeds are also taken in by the model for training purposes. This results in acquiring a model for intrusion detection, number plate recognition, and speed estimation.

High-quality annotated images are provided to the model for training it effectively. All these images are extracted from different sources such as cameras of different resolutions that are present in the facilities.

After extracting raw data, annotations are performed with correct label kinds. This information will help the model to recognize safety violations from incoming video streams & images.

Model Development & Training

Training a model requires a systematic process that maximizes the utilization of available data. Before training the model, you need to first determine the problem statement, access the dataset, and perform data cleaning of the whole dataset.



The process of object detection includes localizing the objects in images and classifying them. The model uses Computer Vision technology for detecting workers' safety measures, from the given data.

Worker's safety detection model follows two main stages:

The first stage involves the detection and identification of objects or person in images and videos. Then it differentiates between similar-looking objects and people, for better understanding. This data is then transferred to the second stage of object detection model architecture.

The second stage results are then decoded by the model. Finally, the result is stored of all the detected objects and people in the image and classified as any available target labels, such as PPE kit, Intruder, Number plate, and Speed.

Data on Dashboard:

After the complete development of the model, it is ready to work as a solution but it becomes hard to get insights without any dashboard. Hence after the completion of the model, a dashboard is created where you can get all the notifications and insights in real-time.

You can simply log in to the dashboard and initiate the monitoring process with ease. No algorithms or programs are required for accessing the dashboard since it has a very user-friendly interface.

The user can select the services that it wants to access and the video stream will be displayed on the dashboard, with information alongside. If any violation occurs relating to the safety or security of workers, the user will get instant alerts on the dashboard.

Deployment:

The working solution needs to be registered in the system to start the smart detection of workplace safety. Thus, it is necessary to deploy it into your system, there are two ways in which you can get them.

The first one is to simply integrate the solution directly into your servers, or the second one is to deploy it on a cloud-based platform. Regular updates and modifications will be sent to the solution.

Conclusion

Ensuring safety in the workplace is everyone's responsibility and Video Analytics fits just right into the picture. It uses advanced Computer Vision algorithms for detecting and analyzing any safety violations on-site. If the system finds any violations, instant alerts are sent to the dashboard, similarly, alerts are sent on Emails and smartphones.

Employees have the right to be safe even as they carry out different tasks in every organization. Hence, every employer must prioritize workplace safety and apply new technologies in place to secure the safety of employees and reduce the loss and productivity of the organization.

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www.datenwissen.com | contact.us@datenwissen.com

Mumbai | +91 9820080751
+91 7021980537