

Video Surveillance System for Human Protective Equipment Detection

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Abstract – We have presented the idea to reduce the accidents by simple video analysis software as a web-application which performs a new self-organizing method for modeling to allow or disallow person with a missing equipment. This can help in lowering the labour work of verifying the absent equipment. Moreover, the approach is suitable to be adopted in any chemical industry, nuclear industry or in a small laboratory which can improve safety of the workers and labourers. This is a very desirable operative mode, considering that a very actual visual surveillance task is looking for suspect missing equipment. In this paper, a video-based surveillance system for detecting the absent equipment objects in unmanned environments has been proposed. The system is able to detect a permanent change in a scene in a reasonable time and to recognize if the change is due to an missing equipment.

Keywords – missing, equipment, surveillance, detect, human.

I. INTRODUCTION

Workers in a wide range of industries are required to wear personal protective equipment (PPE) to reduce or prevent exposures to hazardous chemicals, fire, particulates, or other health risks. Workers or employees tend to forget or misplace their safety equipment. This needs to be verified before entering the hazardous chemical laboratory/factory. The verification process for safety of employees is neglected in most of the factories of chemical industry.

II. SCOPE

The project solution is based on web-application which can analyse different types of videos taken by High Definition (HD) camera / Drone / Robotic tools, so that no human intervention is required to analyse data by watching continuous video. It has many applications like security / safety where video can analyse a person who has not with him safety equipment.

The main purpose of the scope definition is to clearly describe the boundaries of the project. In the project scope definition, the elements within the scope and out of scope are well defined in order to clearly understand what will be the area under the project control. Scope for any project can be local or global. For our Proposed System, the local and global scope can be described as

1. local scope:

- Creating a simple web-application
- connecting the CCTV/video camera
- selecting the equipments which need to be detected from multiple checkbox web form

- Detecting a human in the surveillance and corresponding equipments selected
- alert system to prevent the person with any of the absent equipments into the premises

2. global scope:

The global scope of our system will deal with newer modules and tasks to be integrated and implemented in nearby future of project development and maintenance cycles. The tasks viewed to be accomplished under global scope are:

- Creating a window to create users own model trained by his own dataset
- Automate the log storage of the person entered and exited with and without missing equipment's

III. LITERATURE REVIEW

1. Detection of personal protective equipment

In this study, they focused on the moving areas for personal protective equipment used by people. The helmet points marked on the images by the operator are used for training of interest areas automatically extracted from the moving areas. As a result of the study, it was possible to classify the helmets which are worn by the construction workers. It used Gaussian autolabeling algorithm for detecting personal protective equipment

2. Real-Time Video-Shot Detection for Scene Surveillance Applications

The proposed system aims at detecting the presence of abandoned objects in a guarded environment and at automatically performing online semantic video segmentation in order to facilitate the human operator's task of retrieving the cause of an alarm. This application detected objects with absence of any human.

3. Preventing Transmission of Pandemic Influenza and Other Viral Respiratory Diseases: Personal Protective Equipment for Healthcare Personnel 2010 Workers in a wide range of industries are required to wear personal protective equipment (PPE) to reduce or prevent exposures to hazardous chemicals, fire, particulates, or other health risks. Researchers, designers, and manufacturers continue to look for improvements to the equipment that can reduce the physiological burdens, improve communication, and be more comfortable and less of an encumbrance to wear. For healthcare personnel, the trade-offs of hazardous exposures with the challenges of donning, wearing, and doffing PPE often end up with healthcare personnel not fully adhering to PPE and infection control protocols. Each healthcare employer should assume responsibility for taking an active role in facilitating, promoting, and requiring safety actions. Health-care facilities need to foster and promote a strong culture of safety that includes a commitment to worker safety, adequate access to safety equipment, and extensive training efforts that utilize protocols requiring specific safety actions and detailing consequences for noncompliance.

IV. PROPOSED SOLUTION

The solution targets the major problem in chemical industries without the need for buying and installing additional hardware in the premises, instead it provides the solution by modification of the existing CCTV surveillance system. The project focusses the analysis of the previously recording surveillance system to create the safe environment for workers.

1. Project Requirements

Functional Requirements

- The system will be an web application with a two paged screen.
- Integration of different packages in python and real-time cctv video app will be done.
- There is only one input that is from the application controller for the category of objects to be detected. The outcome of the detected object will be visible by a mask of colour on the video.
- Non-Functional Requirements
- Performance of the application system will be low as the computation required is high.
- The system must be good Stress resistance for multiple detections
- Usability is moderate
- Security will be only handled by the application owner Flow of the project is show in 'Fig. 1'

2. flow of project

There are two actors for the project : the project administrator who selects the category for the equipments to be

detected in the project form window, the worker of the industry who needs to be verified for the protective equipments. In an Industry, when the worker or the labourer enters the premise of

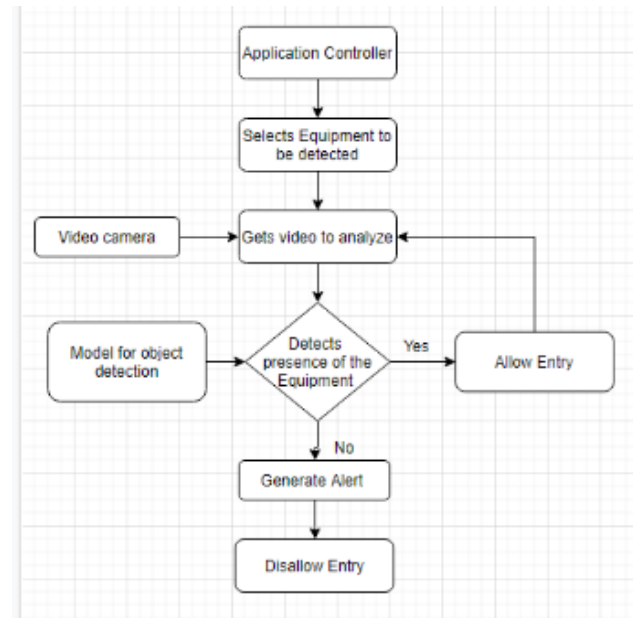


Fig. 1. flow diagram of the project.

The CCTV captures the video and analyze for the human. If a human is detected then the presence of various equipments are analysed. If any of the equipments are missing then the alert with the missing equipments is generated which can be viewed on the screen.

V. DESIGN

1. Selection of technology

Hardware : 8Gb ram with octacore processor, Video camera/CCTV with 7.5 and 15 frames per second.
Software : Python(3.6.1) , OpenCV package , Tensorflow Package(CNN, R-CNN, YOLO)

2. Selection of frameworks and distributions

The different frameworks and distributions required for the project are: anaconda which is an scientific Python distribution which provides a single download and an install program/script that installs all the packages in one go. Flask is a micro web framework written in Python. It is used in our project to create a web application Microsoft Visual Studio is an integrated development environment from Microsoft.

3. Creating the web application

The flask framework is used to create the web application for the equipment selection form and the resulting display screen of the analyzed video. The analysis of the video is done in python using the frameworks of tensorflow and opencv packages.

'Fig. 3' shows the use case diagram

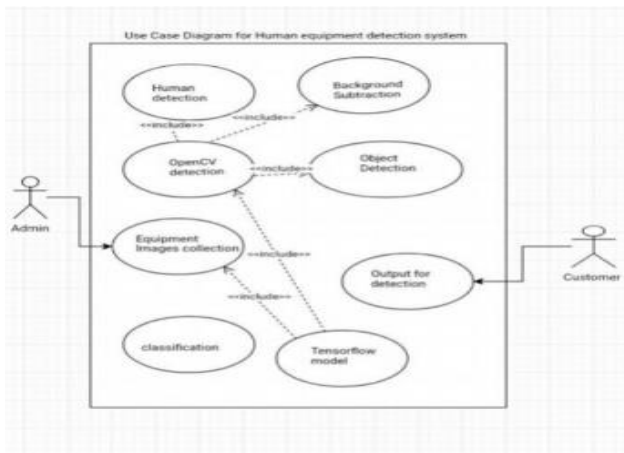


Fig. 2. Use case Diagram.

4. Constraints in project

The detection of equipment accuracy with more than 80 percentages will be a huge challenge as the video may be in different angle or any obstacle that blocks the view for object. The video quality may vary and the clarity, rpm image of the video along with the environment may degrade the output accuracy. The cost for the software is low but there is huge cost of running it in a high performance computation system. Detection of human carrying the equipment or wearing the equipment giving the same outcome for different cases may cause objective of system to get compromised. 'Fig. 3' shows the sequence diagram

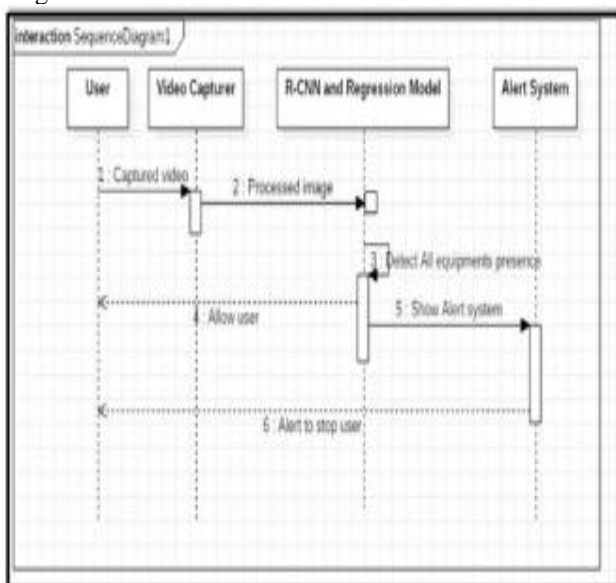


Fig. 3. Use case Diagram.

VI. CONCLUSION

With increase in technology and automation the need for the extraction of metadata from raw video requires to be

auto- mated. The automation ease the task of improving productivity and quality while reducing errors and waste, increasing safety, and adding flexibility to the industrial environment. The project solution of web application provides the generic solution for problems faced by various distinct industries of different areas. The analysis performed will be precisely accurate with clear control over the diverse equipment to be detected and permit the entry into the premises.

VII. FUTURE SCOPE

Application of video surveillance system can be used in chemical factories / laboratory to analyse the safety of work- ers. It can be applied in Hospitals as safety of patients and doctors during the breakouts of diseases. Video analysis contain generic modelling hence can be used to verify the person wearing the dress code or a particular uniform for any event. This application can be used using cloud where all the processing and storage of the video information can be done in order to increase the performance of the analysis in real-time videos. Various algorithms can be added to perform advance detection of people monitoring system to alert if a human falls sick I.e by heart stroke or any hazardous incidents. It can be used to find lost objects in huge stack of similar or dissimilar articles such as a ink pen in a stack of ball point pen, etc.

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