PROTECTO

PPE Detection using YOLO and DeepSORT

Overview

Introduction

- What is PPE?
- Personal Protective Equipment (PPE) like helmets, gloves, goggles, etc., are crucial in industries like construction and manufacturing for worker safety.
- Why is PPE Monitoring Important?
- Reduces workplace injuries.
- Ensures compliance with safety regulations.
- Problem Statement:
- Traditional monitoring is labor-intensive and prone to human error.

Project Overview

- Goal: To automate PPE detection and tracking using CCTV cameras.
- Technologies Used:
  - YOLOv3 for real-time object detection.
  - DeepSORT for multi-object tracking.
- Real-Time Alerts: Send alerts if a worker is not wearing the required PPE for more than 5 seconds.

Working of the System

- Input: CCTV camera footage.
- Detection:
- YOLOv3 detects workers and identifies if they are wearing helmets (or other PPE).
- Tracking:
- DeepSORT assigns unique IDs to each worker and tracks them through consecutive video frames.
- Alerting:
- If a worker is not wearing the required PPE, the system raises an alert.

System Architecture

Diagram of the system showing:

- Camera feeds as input.
- YOLO for PPE detection.
- DeepSORT for tracking.
- Alert mechanism sending notifications to supervisors.

Algorithm Overview

- YOLO (You Only Look Once):
- Real-time object detection.
- Fast and efficient.
- Used for detecting helmets and people.
- DeepSORT:
- Multi-object tracking.
- Uses Kalman filters and the Hungarian algorithm for association and tracking.

Model Training

- Real-Time PPE Monitoring: Detects if workers are wearing helmets or other safety gear.
- Tracking: Ensures that each person is tracked throughout the video.
- Alerts: Notifications are sent when a person is not wearing PPE.
- Support for Multiple Cameras: Currently supports up to 2 cameras.

01

- Collected from Google Images and Stanford 40 Action Dataset.
- Annotations done in Pascal VOC format.

02

- Configured the model using a JSON configuration file.
- Pretrained YOLOv3 weights used for the backend.

03

Mention the accuracy and detection time if applicable.

CHALLENGES FACED

- Limited Dataset: The dataset primarily focused on helmets; other PPE types need to be added.
- Real-Time Processing: Ensuring the system works efficiently on live video streams.
- Multiple Camera Setup: Synchronization and processing of multiple camera feeds.

Future Work

- Expand PPE Detection: Train the model to detect other types of PPE (e.g., safety harness, gloves, etc.).
- Mobile Integration: Integrate real-time notifications to supervisors via mobile app/SMS.
- Improved Tracking: Enhance DeepSORT tracking to handle occlusions and complex environments.

CONCLUSION

- Summary: Successfully implemented a real-time PPE detection and tracking system using YOLO and DeepSORT.
- Impact: Helps automate safety monitoring, reducing human error and improving workplace safety.
- Call to Action: Invite contributions and feedback from others to improve the system further.

THANK YOU!

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