SCENE-DETECT

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This project used real-time pose estimation to create a human posture monitoring system that protects privacy. By analyzing live or recorded video streams, the system determines if a person is standing, lying down, or not present. After pose extraction, it only uses anonymized skeletons for analysis, discarding all visual input. The system allows real-time scene classification and supports both single-person and multi-person scenarios. It can be extended to include voice alerts and integration into smart home environments.

Introduction

1 Background

Smart homes offer automation and assistance, but often lack support for visually impaired individuals. By identifying crucial physical conditions, like a person lying down or being motionless, our project, SCENE-DETECT, aims to fill this gap while maintaining total visual privacy through pose abstraction.

2 Applications

- Monitoring of elderly or visually impaired residents
- Real-time alerts in case of falls or unconsciousness
- Privacy-compliant home automation and health monitoring

Methods

1 Modular System Design

- YOLOv8-based multi-person detection, real-time webcam, and static image pipelines were all independently designed.
- intended to operate using a rule engine based on shared voting.

2 Privacy-First Processing

- Visual input deleted immediately after extracting 2D/3D pose keypoints.
- All further processing conducted on anonymized skeletons.

3 Rule-Based Scene Classification

- Computed torso angle, bounding box dimensions, and depth variance.
- Classified status as Person OK, Person NOT OK, or No Person Detected.

4 Voice Feedback System

- Pyttsx3 engine is used for real-time text-to-speech alerts in critical cases.

Results

Key outcomes from real-time implementation and model behavior

- Privacy-first design ensured no RGB frames were saved, shared, or displayed
- Pose-based scene voting logic consistently identified "OK", "NOT OK", and "No Person" states
- YOLOv8-Pose successfully handled multiple individuals and separated outputs clearly
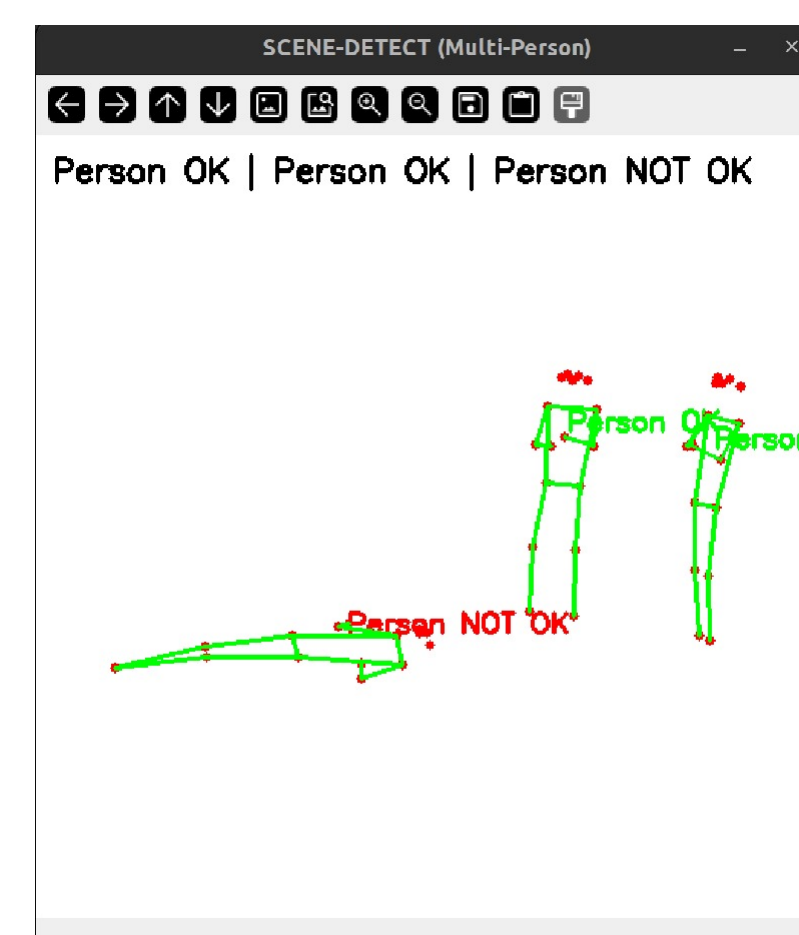
Outlook

Future extensions for enhanced posture coverage and practical deployment in real-world smart home settings.

- Expand detection to include additional postures such as sitting, crouching, or leaning.
- Improve handling of edge cases including low-light conditions, body occlusion, and partial visibility.
- Integrate system with mobile notifications or emergency response services for real-time alerts.

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Project Setting

Made by students in the bridge semester for the Master of Artificial Intelligence for Industry 4.0 Project.