Motion Detection System Documentation

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Week 9 & 10 Challenges

1. **Introduction**

The Motion Detection System is a Python-based application designed to detect motion in a video feed captured by a camera. This system utilizes computer vision techniques and the OpenCV library to analyse consecutive frames, identify changes, and determine the presence of motion within the camera's field of view.

2. **Dependencies**

The Motion Detection System relies on the following external libraries:

- OpenCV: Open Source Computer Vision Library for image and video processing.
- imutils: A collection of convenience functions to make basic image processing operations more straightforward.

Ensure that these libraries are installed before running the application.

3. **Usage**

1. **Camera Setup**: Connect the camera to the system and ensure it is properly recognized.
2. **System Initialization**: Run the **motion detection** script to start the motion detection system.

3. **Background Calibration**: The system captures the first frame as the reference background for subsequent motion detection. Allow a brief period for the system to calibrate.
4. **Motion Detection**: The system continuously analyses incoming video frames, detects changes, and highlights regions with significant motion.
5. **Display**: The processed video feed is displayed in a window titled "Security Feed," with additional windows showing the thresholded foreground mask and frame differences.
6. **User Interaction**: Press 'q' to exit the application.

4. Parameters and Adjustments

- **Threshold**: The **thresh** variable in the code determines the pixel intensity threshold for identifying motion. Adjust this value based on the lighting conditions of the environment.
- **Contour Area**: The minimum contour area (**cv2.contourArea(c)**) is set to 800 pixels. Modify this value to control the sensitivity of motion detection.

5. Output

- **Security Feed**: The main window displays the processed video feed with motion-highlighted regions.
- **Threshold (Foreground Mask)**: Shows the binary image indicating areas with detected motion.
- **Frame Delta**: Displays the absolute difference between consecutive frames.
- **Status Text**: The system indicates the room status (occupied/unoccupied) and includes a timestamp for each frame.

6. Conclusion

The Motion Detection System provides a simple yet effective tool for monitoring motion in a given environment. It can be customized and extended based on specific use cases and requirements.