Report
Frame Differencing and Background Subtraction Techniques:

Frame differencing and background subtraction are fundamental techniques used in computer vision for extracting foreground objects from a video stream. Here's a brief description of these techniques:

1. **Frame Differencing:** Frame differencing is a simple yet effective method for detecting moving objects in a video sequence. It involves subtracting consecutive frames to highlight the pixels where motion occurs. The resulting 'difference image' typically shows the changes between frames, making it easier to identify moving objects.
2. **Background Subtraction:** Background subtraction is a more advanced technique that aims to separate foreground objects (moving objects) from the static background in a video stream. It involves creating a background model based on the initial frames and then updating the model over time to adapt to changes in the scene. The difference between the current frame and the background model reveals the foreground objects.

	Total number of cars	Cars per minute
Traffic_Laramie_1.mp4	6	2
Traffic_Laramie_2.mp4	4	2

Application Analysis:

The code is centered around object detection in a traffic scenario using background subtraction methods provided by OpenCV. The application aims to detect vehicles in a traffic scene, particularly focusing on cars moving towards the center of the city. Here is a breakdown of key components in the code:

- **Background Subtraction**:
  - The code initializes a background subtractor using MOG2 method based on user input. This step helps in isolating moving objects from the background.
- **Object Detection**:
  - It captures frames from a video source and processes them for object detection.
  - Region of interest (ROI) is extracted from each frame to focus on a specific area where vehicles are expected to appear.
  - Background subtraction is applied to the ROI to obtain a foreground mask highlighting potential moving objects.
  - Contours are extracted from the foreground mask to identify individual objects.
  - Any contour with an area greater than a specific threshold is considered a potential vehicle.

- **Vehicle Tracking**:
  - The code tracks the detected vehicles by drawing bounding boxes around them and calculating their centroids.
  - It maintains a list of centroids to keep track of the moving vehicles.
  - Vehicles are counted based on their centroids' positions, and the count is updated in real-time on the video frame.

- **Results Display**:
  - The application displays the count of cars moving towards the city center and the average vehicles per minute.
  - These metrics are updated continuously on the video frame for user monitoring.

- **User Interaction**:
  - The application allows the user to exit the program by pressing 'q' or 'Esc' key.
  - It provides flexibility in specifying the input video source and the background subtraction method via command-line arguments.

Conclusion:

In conclusion, the provided application showcases the practical use of background subtraction techniques for object detection in a dynamic environment. By leveraging frame differencing and background modeling, the application can identify and track moving objects, such as cars in a traffic scenario and it can count the number of cars overall and per minute.