

Weekly Report

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Project : UAV-Based Traffic Safety & Video Analytics

Week: 14 Feb 2026 – 21 Feb 2026

Submission Date : 21 Feb 2026

1. Detailed Summary of Work Done During Current Week

A. Research & Conceptual Work

- Reviewed concepts of video stabilization and image registration for UAV footage.
- Studied feature-based homography estimation techniques (ORB + RANSAC).
- Analyzed how registration improves consistency of spatial zones in aerial traffic videos.
- Examined challenges due to UAV jitter and frame-to-frame drift.

B. Technical Implementation

1. Image Registration

- Implemented fixed-reference frame registration pipeline.
- Applied ORB feature detection and descriptor matching.
- Used RANSAC to compute homography matrix for each frame.
- Warped frames to align with reference frame to reduce jitter.
- Generated:
 - registered.mp4 (stabilized output)
 - homography_data.csv (frame-wise transformation matrix)
- Observed improved spatial stability in long-duration UAV videos.

2. Zone Drawing on Video

- Parsed predefined zone coordinates from configuration file.
- Applied homography transformation to map zones consistently across frames.
- Drew polygonal zones on:
 - Original video
 - Registered video
- Ensured consistent alignment of zones after stabilization.
- Validated that zone geometry remains structurally preserved after transformation.

C. Observations

- Registration significantly reduces zone drift caused by UAV vibration.
- Minor inaccuracies occur when feature matching is weak (e.g., low texture frames).
- Frame-to-frame homography consistency is critical for long-duration analysis.

2. Tasks Planned for Coming Week

A. Vehicle Trajectory Derivation

- Annotate each vehicle in every frame.
- Assign unique IDs to vehicles across frames.
- Derive vehicle path / trajectory using centroid-based tracking approach.
- Store trajectory data in structured format (CSV/JSON).

B. Annotation Exploration

- Explore different techniques for vehicle annotation.
- Compare manual annotation with semi-automated approaches.
- Evaluate annotation efficiency, consistency, and scalability for UAV footage.