Weekly Report

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Project: UAV-Based Traffic Safety & Video Analytics
Week: 21 Feb 2026 – 28 Feb 2026
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Detailed Summary of Work Done During Current Week

A. Image Registration Refinement

- Continued refinement of frame-to-reference homography estimation.
- Evaluated fixed-reference vs rolling-reference registration strategies.
- Analyzed cumulative drift in long UAV video sequences.
- Improved feature matching stability using ORB + RANSAC threshold tuning.
- Verified geometric consistency of registered frames through visual overlay validation.

B. Zone Mapping Stability Validation

- Revalidated predefined polygon zones after registration refinement.
- Ensured spatial consistency of zones across stabilized frames.
- Tested zone alignment over multi-minute video segments.
- Confirmed minimal geometric distortion under improved homography computation.

C. Semi-Automated Annotation Pipeline (In Progress)

Given the scale of the dataset (~9000 frames), full manual annotation is not feasible. Therefore, work this week focused on designing a semi-automated annotation workflow.

1. Inference-Based Pre-Annotation

- Running YOLO inference on video frames to generate bounding boxes.
- Extracting class labels, confidence scores, and coordinates.
- Producing structured detection outputs per frame.

2. Structured Data Export

- Developing a CSV-based storage format containing:
    - Frame number
    - Bounding box coordinates
    - Class label
    - Confidence score
- This structure enables traceability and systematic post-processing.

3. XML Conversion for CVAT

- Designing conversion logic from CSV detections to CVAT-compatible XML format.
- Aligning XML schema with video task structure (track-based format).
- Testing import compatibility within CVAT.

4. CVAT-Assisted Refinement Strategy

- Planning to import generated XML into CVAT for correction and validation.
- Goal:
    - Correct false detections
    - Adjust bounding boxes
    - Maintain frame-wise ID consistency
- This approach is expected to significantly reduce annotation time compared to full manual labeling.

2. Tasks Planned for Coming Week

A. Annotation Workflow Stabilization

- Finalize CSV → XML conversion pipeline.
- Validate CVAT import reliability for longer frame sequences.
- Establish structured annotation protocol for consistency.

B. Trajectory Continuity Improvement

- Improve vehicle ID consistency across frames.
- Reduce identity switching in dense traffic scenes.
- Extend trajectory generation to longer video segments.

C. Dataset Structuring & Documentation

- Standardize trajectory dataset schema (CSV/JSON).
- Prepare visual outputs demonstrating trajectory traces.