1. Introduction

- More than 60% of rail accidents were reported due to derailments. The most significant causes of derailment accidents are related to defects of track/wayside elements and impacts of environmental factors.
- Mobile LiDAR (Light Detection and Ranging) System (MLS) is an emerging technology enabling rapid engineering grade mapping and virtual surveying over railway infrastructure.
- Despite its large potential, MLS has been only used for rail track condition assessment. Its potential for railway asset management has not been exploited yet.

2. Workflow

ADE (Automated Data Extraction) System Workflow

- Input MLS data
- Track model-based Kalman filter
- Track window localization
- Classification (track head/web/head)
- Multi-track recognition (single/multi-track)
- Multi-track labeling (spread/parallel, overlapping, parallel)
- Set top point detection
- Track model prediction
- Multi-track recognition (single/multi-track)
- Multi-track labeling (spread/parallel, overlapping, parallel)
- Set top point detection

3. Methodology

- Frontend Perception
  - Track Detection
  - Single/Multi-track Recognition
  - Model Selection
  - Track Points
  - Model Selection

- Backend Extended Kalman Filter
  - ADE (Automated Data Extraction) System Workflow

4. Experimental Results

- Rail Track Modeling Accuracy
  - ADE system achieved 0.025m (RMSE ±0.023m) and -0.003m (RMSE ±0.008m).
  - ADE system achieved 99.46% recall (object detection rate).
  - Our experiments proved that context-based template matching increased 28% success rate of track type recognition.

5. Conclusions

- ADE system achieved 0.025m (RMSE ±0.023m) and -0.003m (RMSE ±0.008m).
- ADE system achieved 99.46% recall (object detection rate).
- Our experiments proved that context-based template matching increased 28% success rate of track type recognition.

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