

# Operational traffic monitoring using very high resolution satellite imagery

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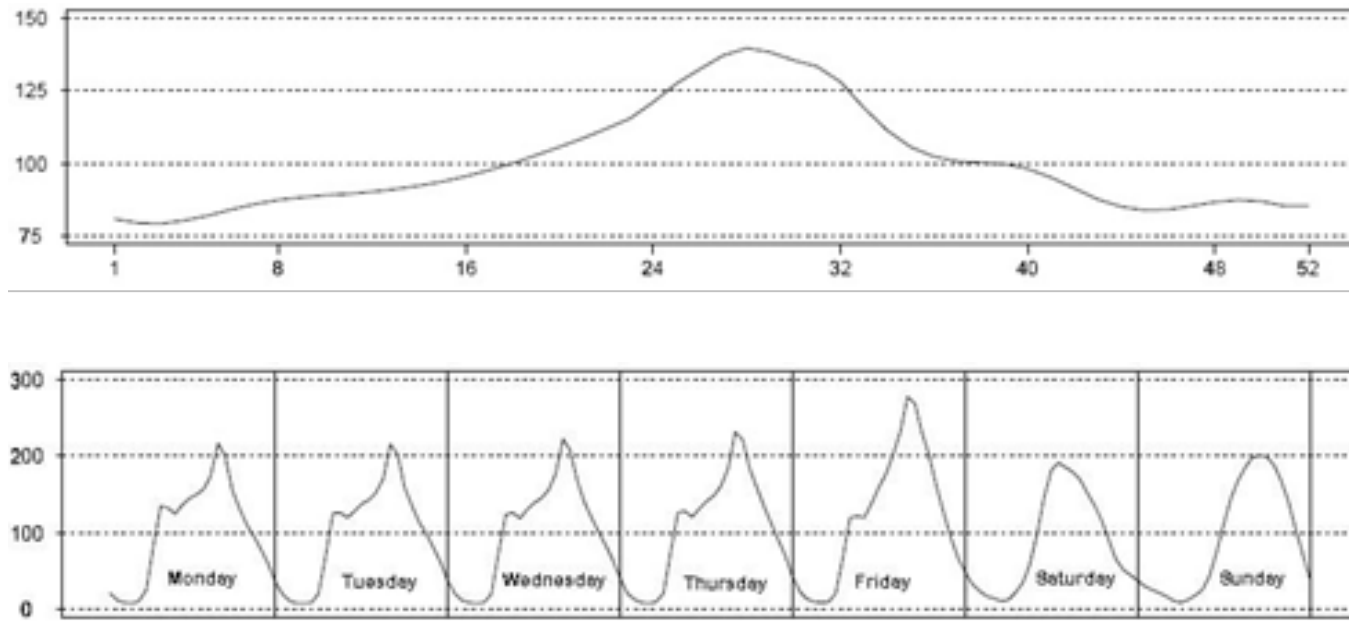


# Motivation

- ▶ Reliable traffic statistics are needed for effective maintenance of roads and planning of new roads.
- ▶ Satellite imagery can provide supplementary information to the traditional ground-based sensors.
- ▶ Satellite monitoring provides excellent spatial coverage and makes it easier to obtain data for smaller and/or rural area roads where few or no ground-based measurements are performed today.



# Basis curves



The above graphs show normal variation in traffic volume for small-town/countryside roads and totally for all vehicle size classes on weekly over a year (top) and hourly over a week (bottom) scale.

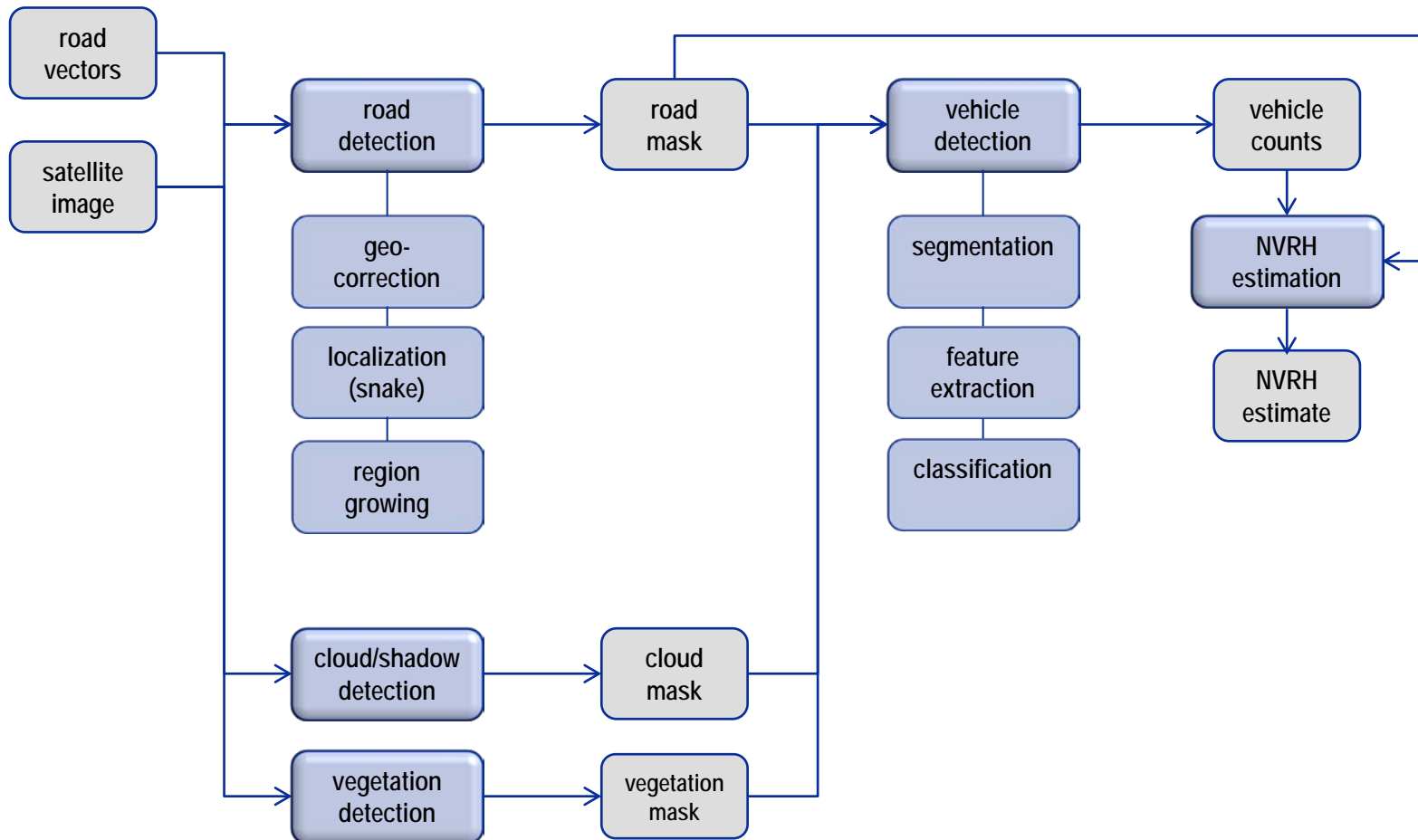


# Operational system

- ▶ Our focus has been to develop a fully automated operational system for the estimation of the number of vehicles on a given road segment per hour (NVRH).
- ▶ The system includes separate modules for
  - road detection,
  - cloud and cloud shadow detection, and
  - vehicle detection.



# SatTrafikk processing chain



# Road detection



Original road vector midline overlaid on multispectral image.

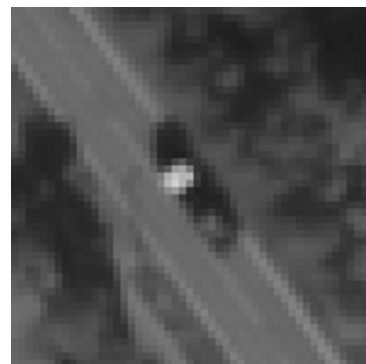
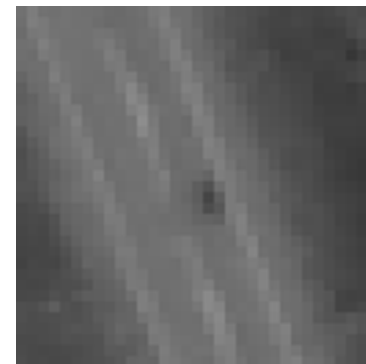
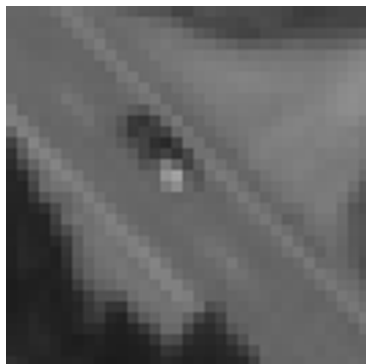
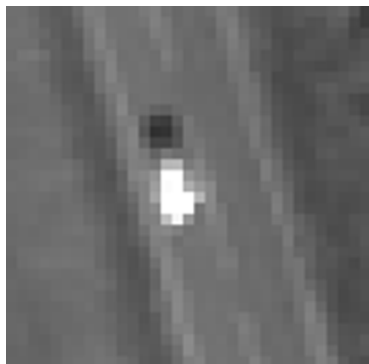


Final road mask overlaid on panchromatic image.

# Cloud and cloud shadow detection



# Vehicle detection



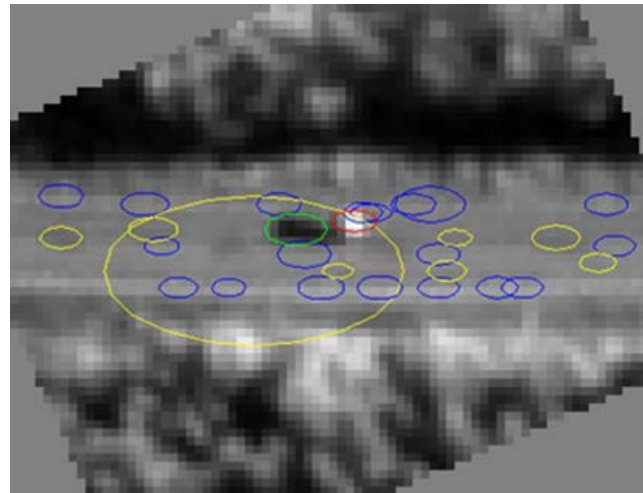
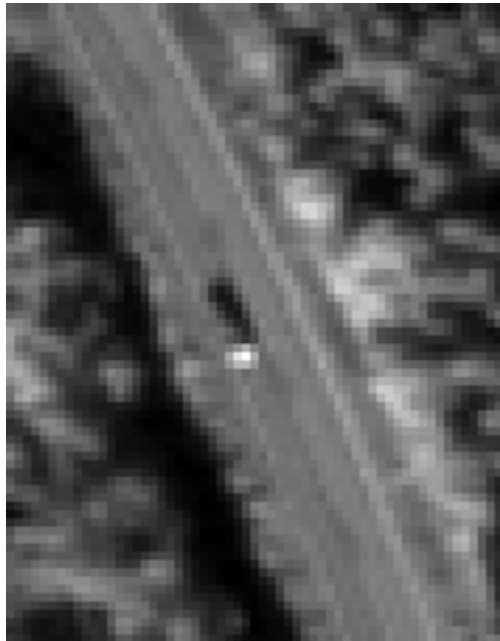
Vehicles in various sizes and shapes.



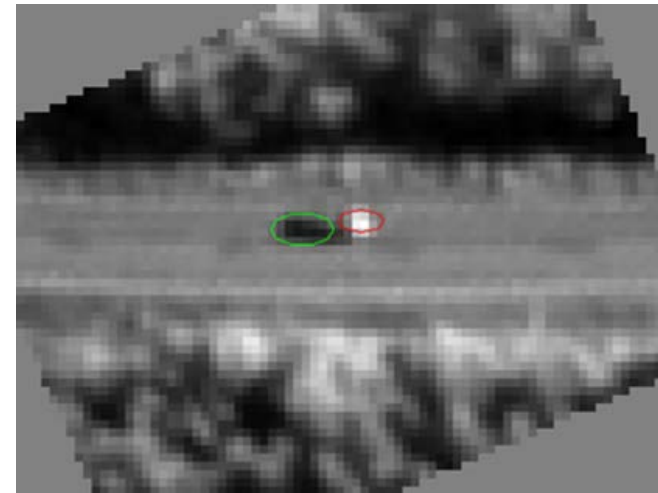


# Vehicle detection

1. Rotate
2. Convolve with Laplacian of Gaussian filters
3. Estimate features



4. Reject weak candidates



Elliptical blob detection using Laplacian of Gaussian filters.



# Vehicle detection results

