# Static Vehicle Detection and Analysis in Aerial Imagery using Depth

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## Abstract

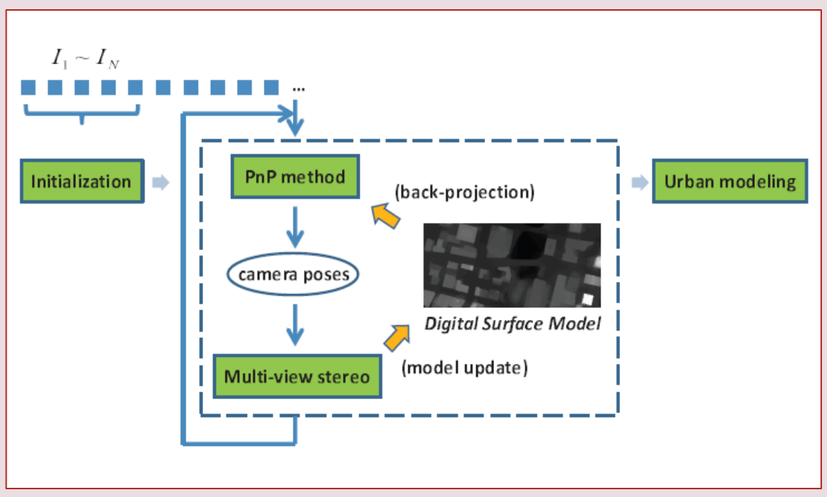
Goal :
- Robust detection of static vehicles, specific to outdoor parking places, using a sequence of aerial images
- Performance analysis based on parameterization of intermediate stages

Approach :
- Identification based on depth information obtained from existing methods for urban landscape modeling
- Validation using local 2D features from images to eliminate false positives and improving accuracy

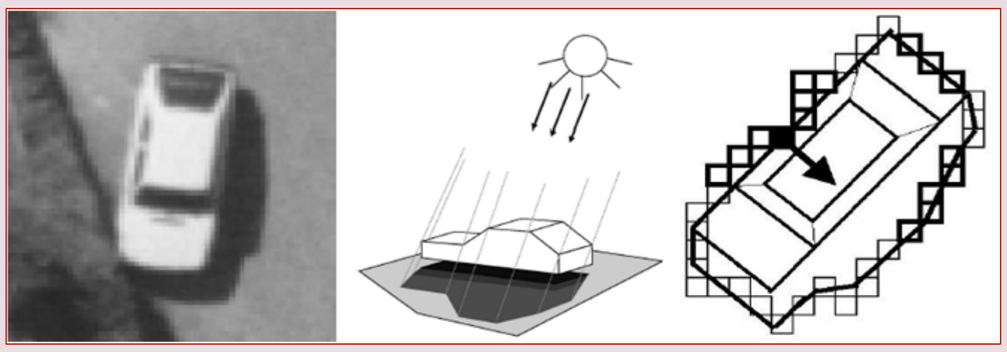
Contribution :
- Fusion of 3D-2D information to detect vehicles
- Relationship between system performance and parameters of most crucial step in the pipeline – evaluation of optical flow in depth estimation

## Related Work

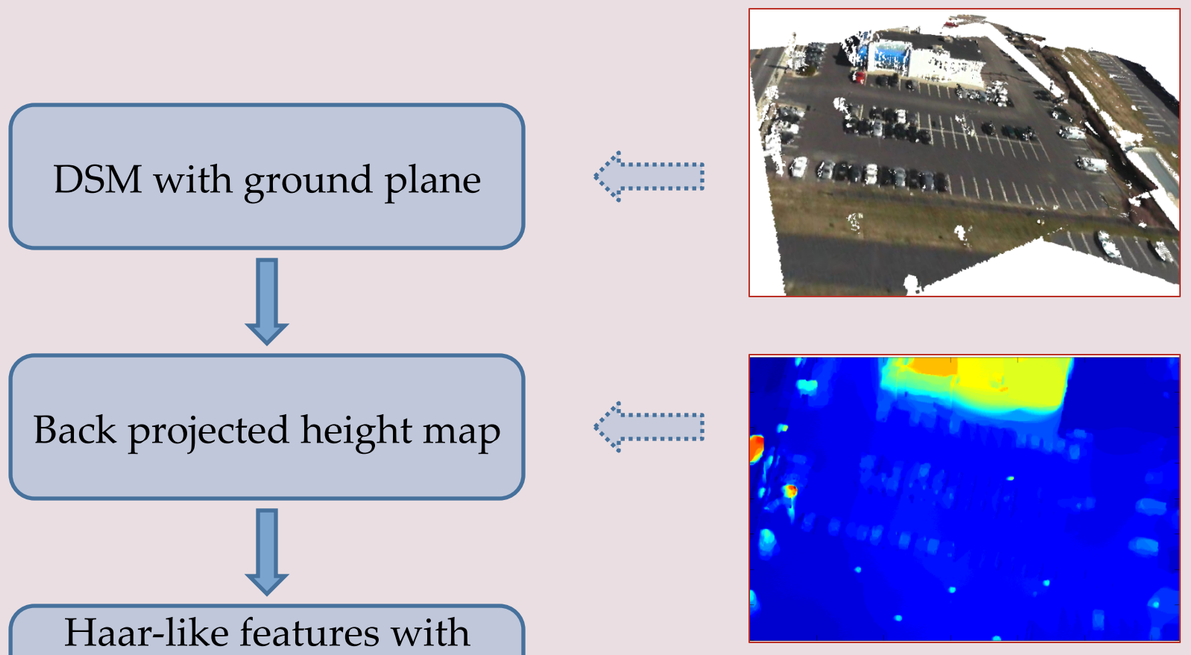
Dense Reconstruction for Urban Modeling :
- Simultaneous camera pose estimation and multi-view stereo using a DSM
- Updating the model and solving PnP using RANSAC by back-projecting from the model, for every incoming frame




Vehicle Detection in Monocular Areal Image :
- Projected 3D Wire frame of vehicle used to identify vehicle using local 2D illumination

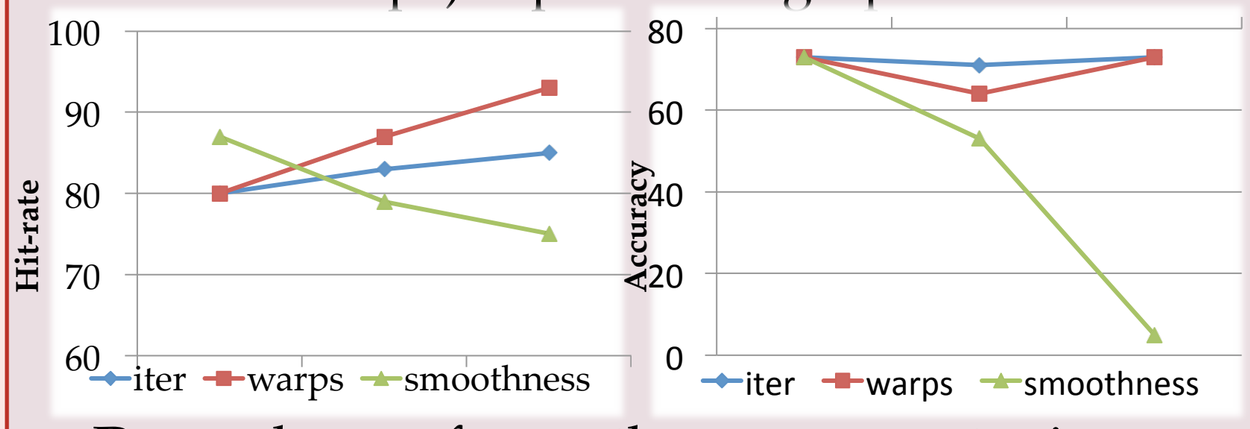


## System Overview




## Results and Discussion

Variation in system performance (hit rate, accuracy) due to optical flow parameterization (number of iterations, smoothness parameter, number of warps) is plotted in graphs below:




- Dependence of smoothness parameter is more pronounced than other two
- Drastic reduction in accuracy in excessive smoothening case

## References

- Work on urban modeling by Zhuoliang Kang, Dr. Gerard Medioni, USC
- Integrating Local and Global Features for Vehicle Detection by Dr. Stefan Hinz, TUM