**Research Paper Summary**

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**Title: Vision based inter-vehicle distance estimation with extended outlier correspondence**

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**Link to paper:**

Section 1 - Overall Idea

* vision-based robust vehicle distance estimation algorithm that supports motorists to rapidly perceive relative distance of oncoming and passing vehicles thereby minimizing the risk of hazardous circumstances
* Morphological Strip Matching Algorithm and Recursive Stencil Mapping Algorithm (MSM-RSMA)

Section 2 – Methodology

* Motion-based methods: the optical flow fields from a moving vehicle is calculated by matching pixels or feature points between two image frames of the video. Sparse optic flow methods track specific features in two frames like corners and colour blobs. Segmentation is then performed by clustering detected flows.
* Feature-based techniques: Use some specific features of the target object, in vehicle detection it is the rear view of passing or the front view of oncoming vehicle.
* Approach use the changes in contours to detect moving vehicles and another feature-based approach to estimate the relative distance form the host vehicle.
* By adding feature-based techniques, the geometric differences of silhouette in consecutive frames of the video can be used to find not only the relative distance of the vehicles but the ego motion in an efficient manner, which is computationally inexpensive.



* The vehicle detection method is:
  + get the contours of real and false objects,
  + make the stencils of two frames removing the objects detected (some erroneously detected stationary background objects are also removed), and
  + ego motion is estimated using new stencils with removed moving objects. The next frame is developed by masking it with stencil without moving objects.
* To detect the relative distance and remaining non stationary objects (vehicles getting closer the host vehicle), silhouettes are matched with respective templates as follows:
  + 1. Compare width-to-height ratios to identify the vehicle category (Car, Van, SUV, Bus etc.)
  + 2. Obtain Tmin (minimum template in the range) and Tmax (maximum template in the range) from lookup table
  + 3. Match with the silhouette iteratively by scaling to identify the vehicle
  + 4. Verify it by symmetric property-based vehicle identification. For each contour we apply symmetric based to separate vehicles from other objects. We identify vertical symmetry by overlaying two halves partitioned at scan line, in silhouettes of all detected images.
  + 5. Use scaling factor to determine the distance

Section 3 - Applications

* method is capable of providing a comparatively fast distance estimation while keeping

its robustness in different environments changes.

Section 4 - Future Development

* extend the method to detect the motion of moving occlude vehicles and the identification of turning vehicles where the symmetric feature is no longer hold.

Section 5 - Questions

* What is Ego motion calculation?

Section 6 - Anything Else

* NA