

Vehicle Parsing Using Synthetic Data

September Update

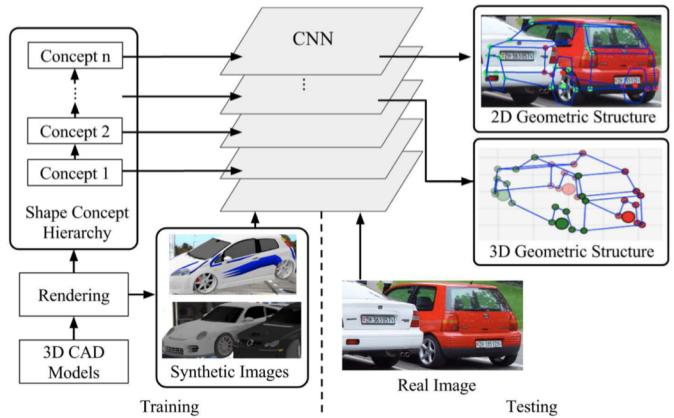
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Motivation for predicting car key points using synthetic data

- Car- human activities: provide relative geometry between vehicles and humans for complex interactions for car-human activities.
- Car tracking: provide tools for similarity metric and trajectory prediction for car tracking.

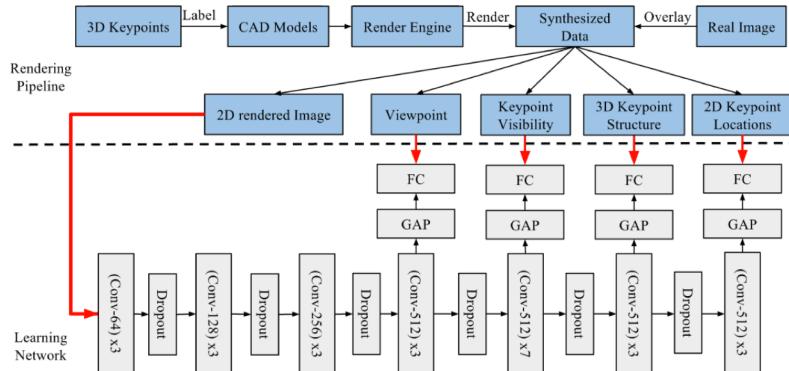
Previous Model: Overview and Failure Cases



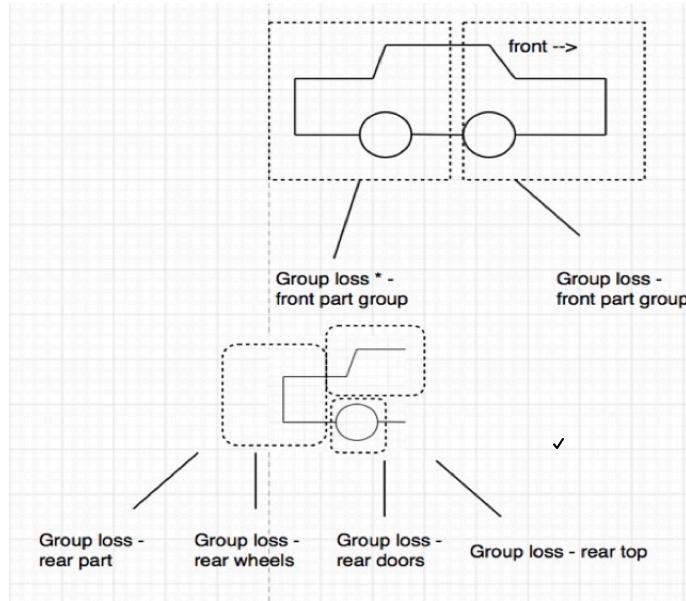
Failure case 1: occlusion/truncation



Failure case 2: deformable parts



Improvement 1



Insights:

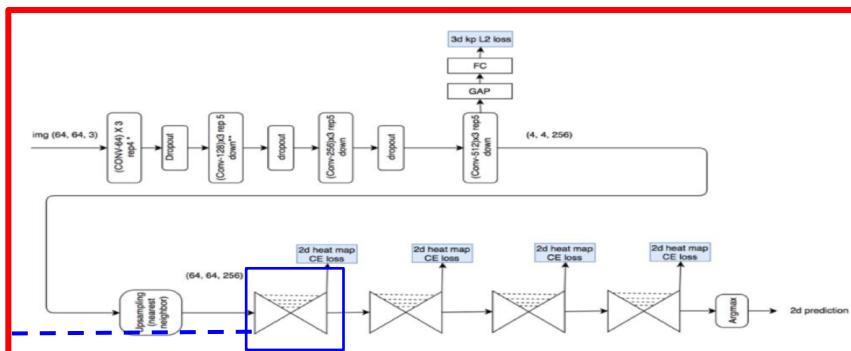
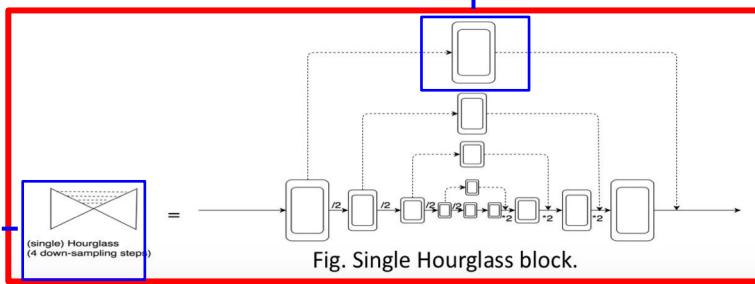
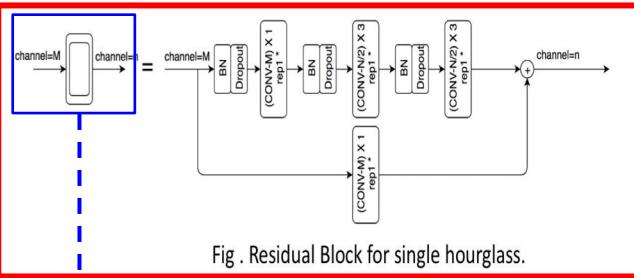
1. local context info for key point inference (especially in heavily-occluded situation).
2. robust deformable parts (doors, trunks) key point inference.

Hierarchical structure-aware loss function:

$$L_{hs} = \frac{1}{N} \sum_{i=1}^N \|P_i - G_i\|_2 + \sum_{k=1}^L \lambda_k \sum_{i=1}^{N_G^k} \|P_{S_i^k} - G_{S_i^k}\|_2$$

P_i, G_i : prediction heat map and ground truth heat map of i^{th} key point ($i = 1, 2, \dots, N$)
 $P_{S_i^k}, G_{S_i^k}$: group prediction heat map, ground ground truth heat map of group S_i^k
where S_i^k is i^{th} group within k^{th} hierarchical level.
 N_G^k is number of groups in k^{th} hierarchical level

Improvement 2: Improved Model for occlusion case.



Improved performance on occlusion

Before



After

