Adaptive estimation of optimal color transformations for deep convolutional network based homography estimation

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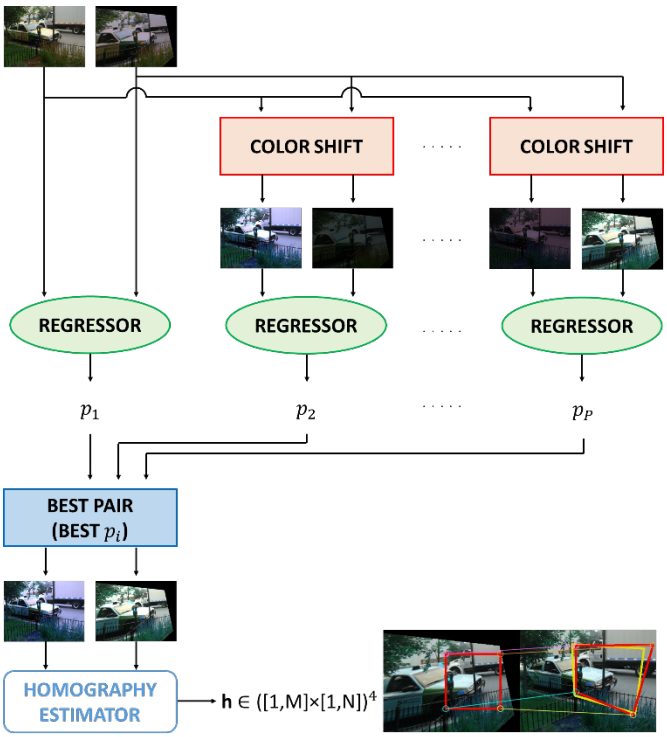
Methodology



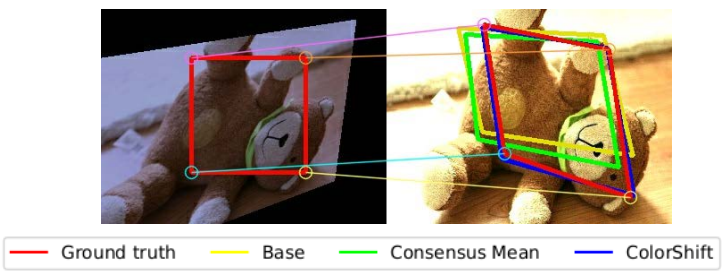
- Starting point: The observation that the output of deep convolutional neural networks for homography estimation substantially varies when each element of the input image pair is changed by a color transformation (shift). Thus, the output of the deep convolutional network is suboptimal for some color transformations.

- Proposed procedure:
  - Several pairs of random color transformations are generated.
  - The quality of the homography estimations obtained by using the pairs of color transformations is estimated by a trained regressor.
  - The pair of color transformations which is estimated to yield the best homography estimation performance is chosen.
  - The estimated homography is computed by supplying the homography estimation network the pair of images obtained by applying the chosen pair of color transformations to the original image pair.

Experimental Results

1) To study which characteristics may have the input pair of images that are supplied to the homography estimation method so that they perform better. This way, which characteristics perform better can be predicted by training a regressor.

2) To analyze how the proposal performs by applying the best regressor obtained in (1). Comparison with other homography estimation methods.



Conclusions

- A new framework for the homography estimation issue is proposed, which integrates a convolutional deep learning network, and whose main novelty is the application of a preprocessing module to estimate the best possible variation of the input images pair.
- The regressor model requires the following feature set as input, namely: brightness features of the input images, parameters of the applied color transformation, and brightness features of the transformed images.
- The influence of these characteristics on the goodness of the regressor has been studied. On the other hand, different performance measures and different regression methods have been tested.
- The proposal has been compared with the base method and different strategies for a consensus-based model in order to check its viability.