3D COMPUTER VISION COURSE PROJECT
HIERARCHICAL MODEL-BASED MOTION ESTIMATION

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The paper "Hierarchical model-based model estimation" presents 4 different models through which we can estimate the motion. The 4 models are namely:

MODEL	TYPE OF INPUT
AFFINE	Distance between the scene point and camera should be high
PLANAR-FLOW	Planar scenes
RIGID-BODY	The rigid body containing scenes
GENERAL-FLOW	Multiple objects moving scenes

The hierarchical motion estimation framework is as follows:
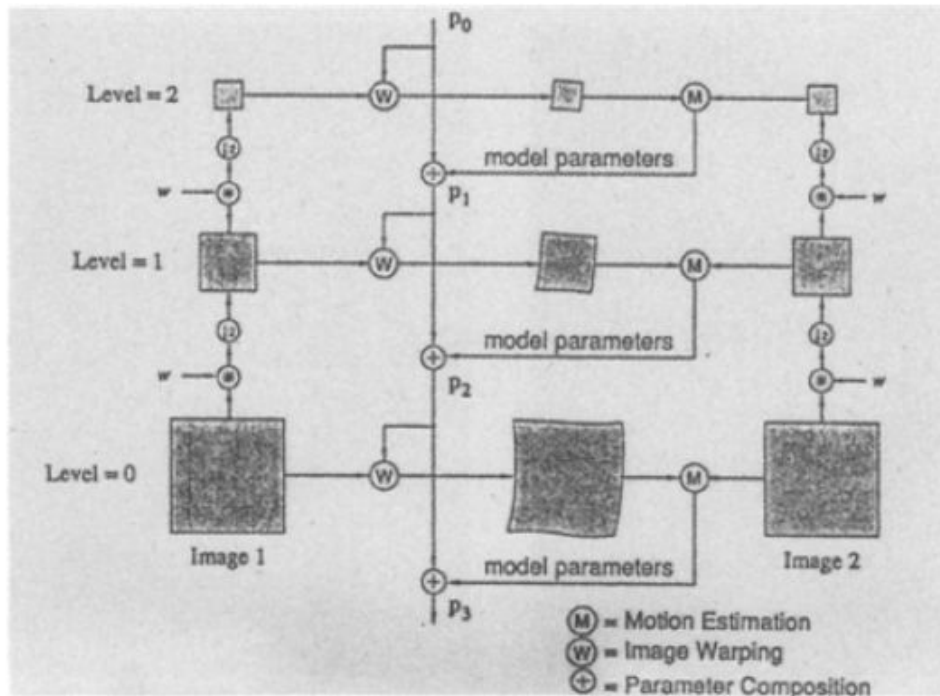
[1]

Laplacian pyramids have been used as input in the framework (in the paper)
We have also used Gaussian pyramids as input in order to compare the results with that of Laplacian pyramids.

The comparison for the affine model is shown on the next page.

One of the input images

Raw difference

The compensated difference using Gaussian Pyramids as input

The compensated difference using Laplacian Pyramids as input

The no. of iterations used for both the inputs is the same.
For the affine model, it was observed that the gaussian pyramid input brings out better output than that of the Laplacian Pyramid used as the input.

Similarly, it was observed that Laplacian pyramids give better output in the case of the General flow model.

Laplacian and Gaussian give a similar kind of output when the planar flow model is used.

Learnings from the project:
1. The difference between parametric and non-parametric models.
2. How easy it is to use parametric models in hierarchical estimation when compared to non-parametric models.
3. Newton method and when it is used.
4. Gauss-Newton method
5. Laplacian and Gaussian Pyramids

References:
[1] Bergen, James R., Patrick Anandan, Keith J. Hanna, and Rajesh Hingorani. "Hierarchical model-based motion estimation." In European conference on computer vision, pp. 237-252. Springer, Berlin, Heidelberg, 1992.
[2] Hanna, K. J. "Direct multi-resolution estimation of ego-motion and structure from motion." In Proceedings of the IEEE workshop on visual motion, pp. 156-157. IEEE Computer Society, 1991.