Research Log

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March 30, 2016	Established research log after 3 hours of learning new LaTeX
April 2, 2016	Added some additional comments to the **Process**
April 3, 2016	Have been reading [**?**]. **Have Question for Kamangar** regarding [**?**] about difference between: • **Camera Plane** : Cooridinates u,v • **Focal Plane** : Cooridinates s,t
April 11, 2016	Reviewing blog articles located at: • `https://erget.wordpress.com/2014/02/01/calibrating-a-stereo-camera-with-opencv/` • `https://erget.wordpress.com/2014/02/28/calibrating-a-stereo-pair-with-python/` • `https://erget.wordpress.com/2014/03/13/building-an-interactive-gui-with-opencv/` • `https://erget.wordpress.com/2014/04/27/producing-3d-point-clouds-with-a-stereo-camera-in-opencv/` for process to get webcam up and running. Previous issues related to fine-tuning *block matching* parameters. Need to review sources at list at bottom of `http://docs.opencv.org/2.4/modules/calib3d/doc/camera_calibration_and_3d_reconstruction.html` to understand.
April 19, 2016	Made adjustments to python for image acquisition scripts (from blogs mentioned on April 11, 2016.) **NOTE:** Consider creating rig with glue to keep stereo camera placement / direction constant.
April 19, 2016	**UPDATE:** Error with `calibrate_cameras` python code causing linux machine to crash. If can't be resolved switch over to MacBook. **NOTE:** Package should be setup by calling `$ python setup.py install`
April 19, 2016	**UPDATE:** Crash due to recursive shell call and was fixed. OpenCV not detecting all chessboard corners. Will try a new board.
April 20, 2016	Did small amount of work on **Change of Reference** section in the paper. Added a section to the intro containing a map of commonly used symbols and notation

April 29, 2016	Read following sections of [Chen93] [**?**]:

- Abstract

- Introduction

- Visibility Morphing

Summary: Explicit Geometry is ignored (i.e. surface mesh and 3d-points). Geometry is kept in 2-d. Whereas Image Morphing interpolates between *pixel intensity values in fixed locations* the method in this article interpolates between *pixel locations with (relatively) fixed intensity values.* **Question:** Sections read mention that pixel positions are stored in 3d (3-tuple) data structure. I'm not sure I understand this correctly, since

1. This would effectively make this structure a point cloud (but no mention of it in the paper).

2. There is no mention of special "depth-based" hardware or cameras (Far as I know this is upposed to be a regular image).

April 30, 2016	Checked understanding of *epipolar constraint* through reading of [Hartley2004] [**?**] and its derivation of

$$'\mathbf{x}^T \cdot \mathbf{E} \cdot \mathbf{x} = '\mathbf{x}^T \cdot [\mathbf{t}]_\times \cdot \mathbf{R} \cdot \mathbf{x}$$
$$= '\mathbf{x}^T \cdot 'l$$

and creation of MatLab code verifying this.

I may have been mistaken about relation of **Fundamental Matrix** and **Essential Matrix**.

My current understanding is the *Fundamental Matrix* describes point/epipolar line correspondance for images under **scale invariant** conditions (i.e. point correspondance and Fundamental matrix does not change when one image (or both images) are scaled (uniformly or omni-directionally).

Essential Matrix describes point/epipolar line correspondance for images under **normalized** conditions (i.e. unit-length is set equal to focal-length, and projection center is set at $(0, 0, 1)$.

May 2, 2016	Additional wording to Stereo-vision section. I am unsure of best order to present ideas related to *multi-view* geometry.