

ANNEX A – Master Thesis Proposal

1. Student Information

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Date and Signature

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2. Master Thesis Information

Title:

Dense 3D Reconstruction using Photometric Stereo

Description:

The aim of the project is to obtain an accurate dense 3D Reconstruction of a scene by changing the illumination settings (e.g., by changing the position of the light sources), a problem that is called photometric stereo. The main advantages of photometric stereo are that: 1) unlike conventional stereo methods, there is no correspondence problem and 2) the technique is effective and is known to yield accurate reconstructions.

In photometric stereo, the surface normals are computed at every pixel and integration of surface normals gives the 3D model of the surface. The main contribution in this project is to devise a novel regularization technique that preserves discontinuities in the reconstruction of the normals. We consider Lambertian objects, i.e., objects that appear the same from any vantage point and study the case with known light sources (calibrated) as well as when light sources are not known (uncalibrated).

Aims:

- To study active and passive stereo methods.
- To study Photometric stereo with known (calibrated case) and unknown (calibrated case) light sources.
- To implement Photometric stereo in combination with a novel regularization method to achieve an accurate dense 3D Reconstruction of objects in which the discontinuities are better preserved.

Tasks:

The project can be split up into following tasks:

- Literature Review
- Capturing photometric images for different objects
- Implementation of Photometric stereo technique to achieve accurate dense 3D Reconstruction of objects
- Testing and Result analysis
- Writing of Thesis
- Making of poster and writing of paper

Planning:

Below is given the timeline of the project.

Time Period	Tasks
19 th January to 19 th February	Literature Review
20 th February to 30 th April	Implementation
1 st May to 31 st May	Writing of thesis and paper Making of poster
1 st June to 18 th June	Preparation for defence Working on final presentation

3. Supervisor Information

Name: Dr. Paolo Favaro

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Processing

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