HARVEST4D

HARVESTING DYNAMIC 3D WORLDS FROM COMMODITY SENSOR CLOUDS

Publications for Task 6.2

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Statement of originality

This deliverable contains original unpublished work except where clearly indicated otherwise. Acknowledgement of previously published material and of the work of others has been made through appropriate citation, quotation or both.

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1 EXECUTIVE SUMMARY

1.1 INTRODUCTION

This deliverable describes the publications that resulted from Task 6.2, and how they fit into the work plan of the project.

The objective of Task 6.2 is to analyze the distribution of noise from various sensors. Insights gained from this analysis are believed to be beneficial for other upstream applications that make use of the sensed data.

There is so far one publication that is mainly attributable to Task 6.2. As it contains still unpublished material, at the time of delivery it can be found in the restricted section of the website only.

1.2 PUBLICATIONS

The following publication can be found on the webpage only:

- T. Plötz, F. Saeedan and S. Roth.
  Towards Datasets of Noise from Image Sensors.
  Working paper, TU Darmstadt, 2015

2 DESCRIPTION OF PUBLICATIONS

2.1 OVERVIEW

Harvest4D makes use of various input modalities. Especially images are of great importance since they constitute the input to 3D reconstruction techniques like Structure-from-Motion (see WP5), image registration (see WP4) or material acquisition (see WP7). However, when capturing images, these are inherently degraded by image noise and algorithms that process images are affected by this noise. For this reason, the working paper [Plötz, Saeedan, Roth 2015] aims at quantifying image noise.

2.2 TOWARDS DATASETS OF NOISE FROM IMAGE SENSORS

Many algorithms that handle images as input can benefit from a good model of image noise as it allows to incorporate a notion of confidence into an algorithmic framework. Ideally, we would like to have a database of measured image noise in order to model the statistical properties of the

noise distribution. However, measuring noise is a hard problem since it is difficult to separate noise from signal from just a single image.

Therefore, this working paper presents an acquisition procedure that allows to capture pairs of images of the same scene where one of the images has little noise and one is affected by stronger noise. In the end, the difference between both images can be used to measure the amount of noise in the latter image, thus opening the possibility to faithfully model the underlying noise distribution. Moreover, the data could be used to benchmark denoising and noise estimation algorithms. An example of two images showing the same scene with different amounts of noise is shown in *Figure 1*.

The paper validates the acquisition procedure in a rigorous mathematical framework. In practice, the theoretical model does not apply to the captured images to full extent since, for example, small changes in the scene and illumination result in a residual measurement error. The paper presents and evaluates a post-processing procedure of the captured images to correct the effect of these errors.

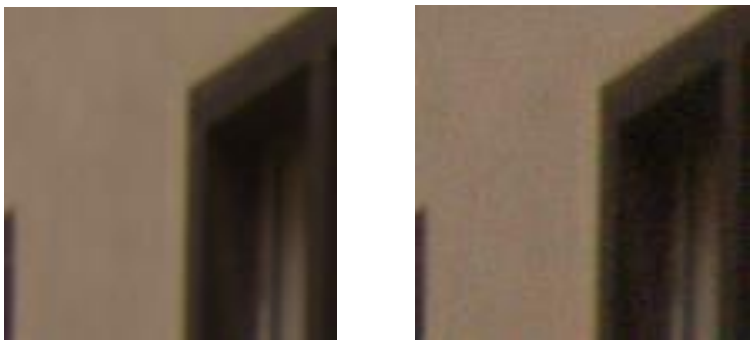

Figure 1: A crop from two images from one scene of the captured dataset. Left: Image taken with low analog gain. Right: Image taken with high analog gain.

3 REFERENCES

- T. Plötz, F. Saeedan and S. Roth. Towards Datasets of Noise from Image Sensors. Working paper, TU Darmstadt, 2015