UMONS Université de Mons

POLYTECH MONS

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UMONS INSTITUTE FOR CREATIVE TECHNOLOGIES

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FREEDOM TO RESEARCH

ifip

Mons 2015

eNTERFACE 2015

The 11th International one-month Summer Workshop on Multimodal Interfaces
Aug 10th – Sept 4th 2015, Mons, Belgium

Adaptive projection on a mobile planar surface

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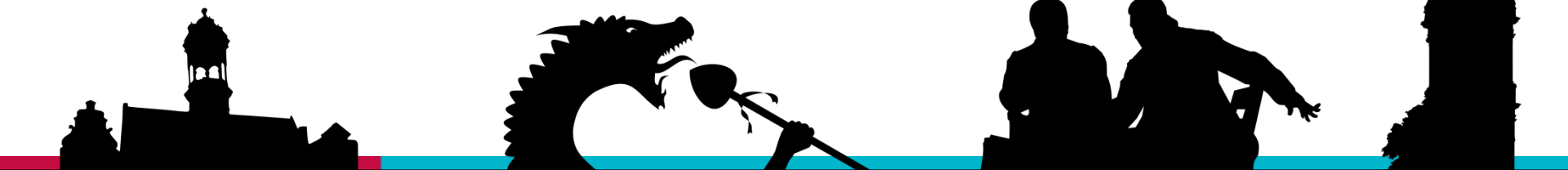

Overview

- Goals
- Concept
- Setup
- Algorithm & Results
- Future works

Overview

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The game (world premiere …)

Objectives

Simplify the process of mapping
on static or mobile planar surfaces

Goals

- Detect planar surfaces based on the uv map generated with the structured light
- Estimate the uv map using the projected content and not patterns
- Adapt in real time a projection on a mobile surface

Updated goals

- Detect planar surfaces based on the uv map generated with the structured light
- ~~Estimate the uv map using the projected content and not patterns~~
- ~~Adapt in real time a projection on a mobile surface~~

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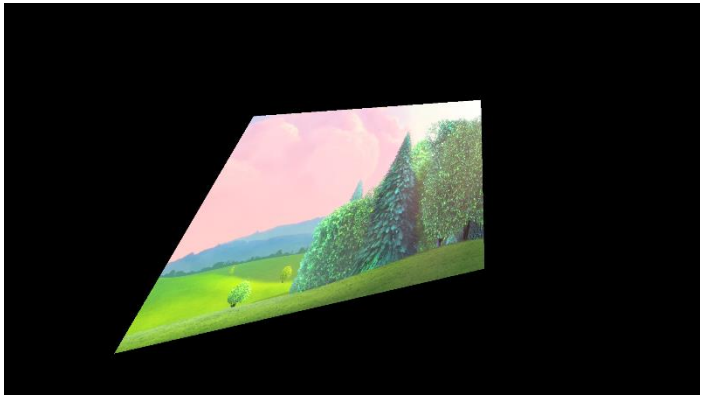
Context

Homography

One transformation for the image

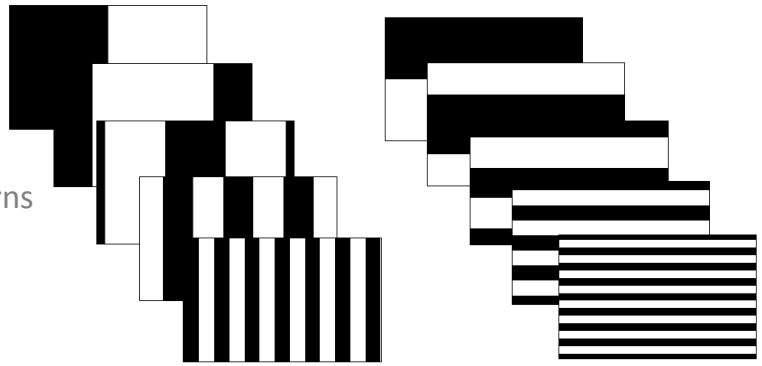


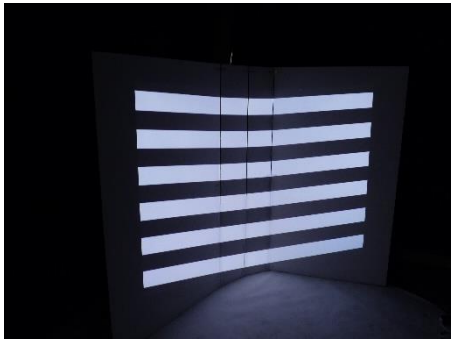
Context

Structured light / coded light

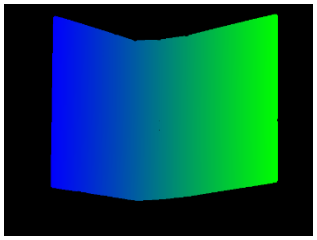
« One » transformation per pixel or a map

patterns





columns



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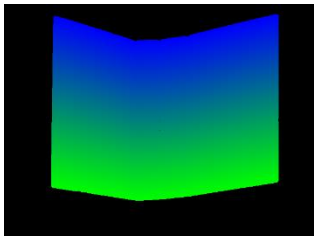
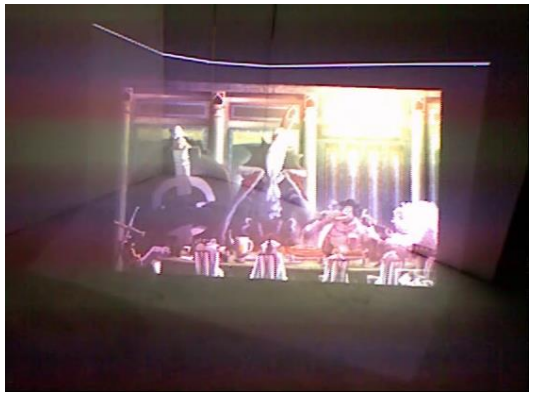
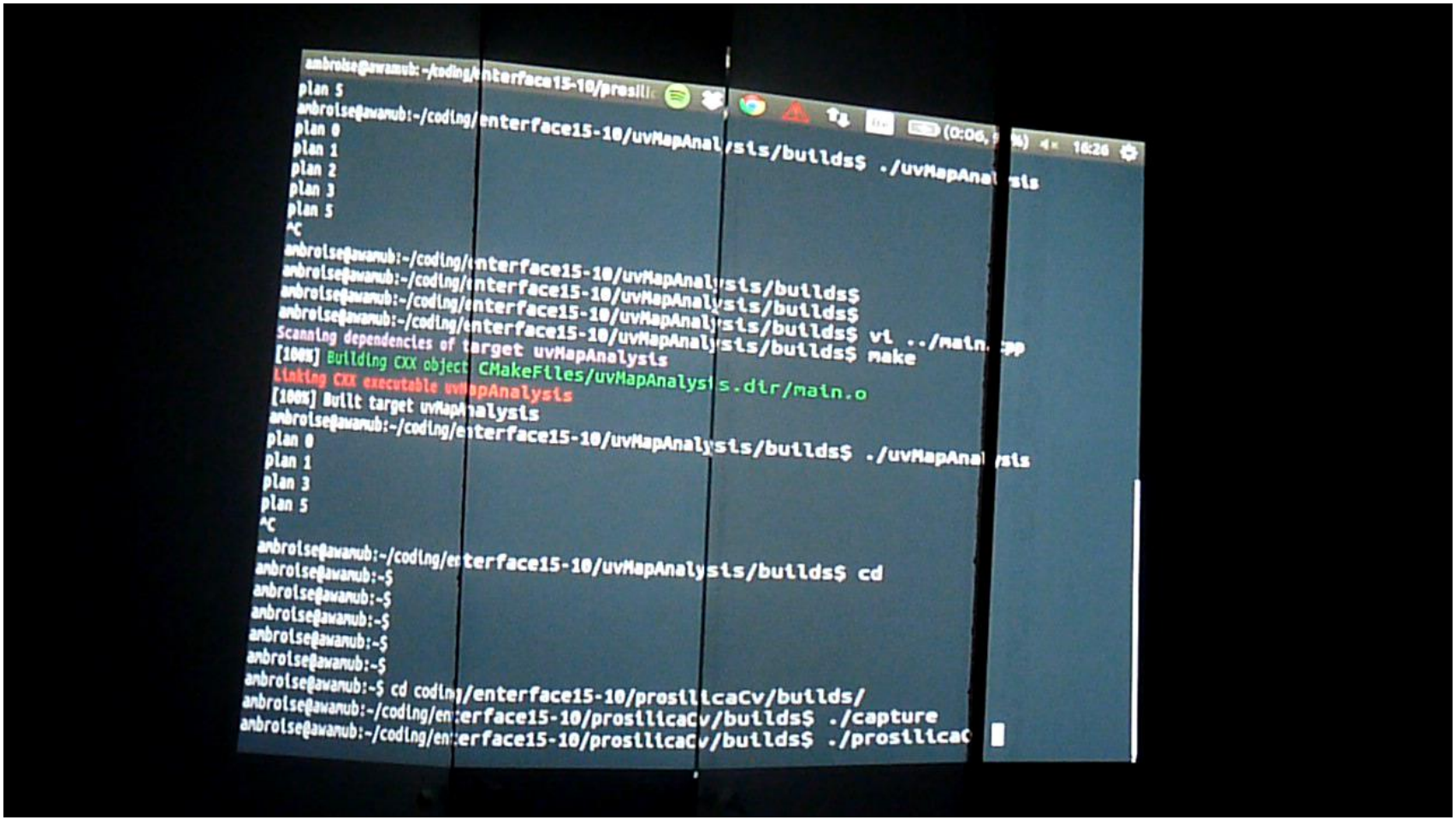


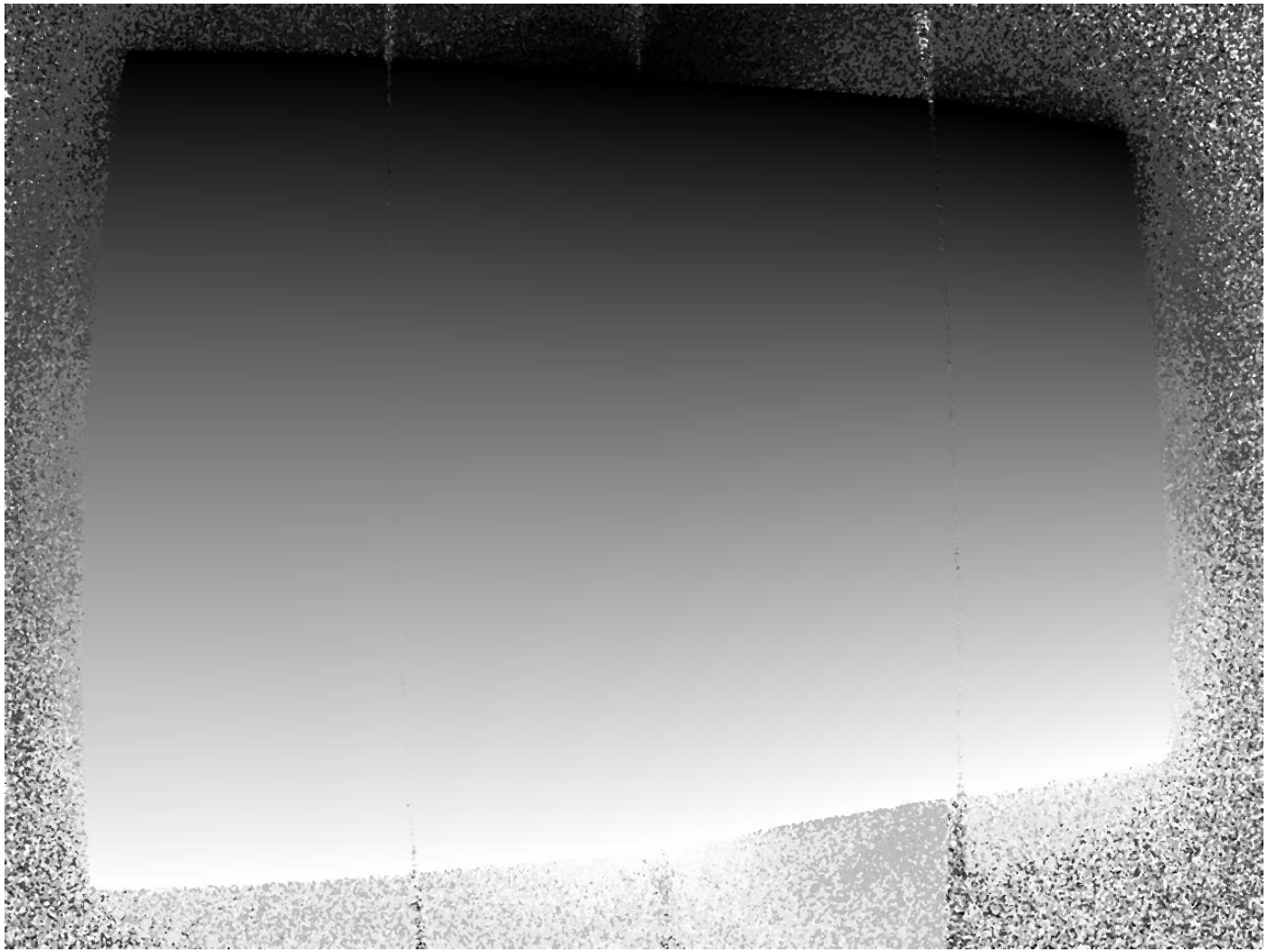


Context

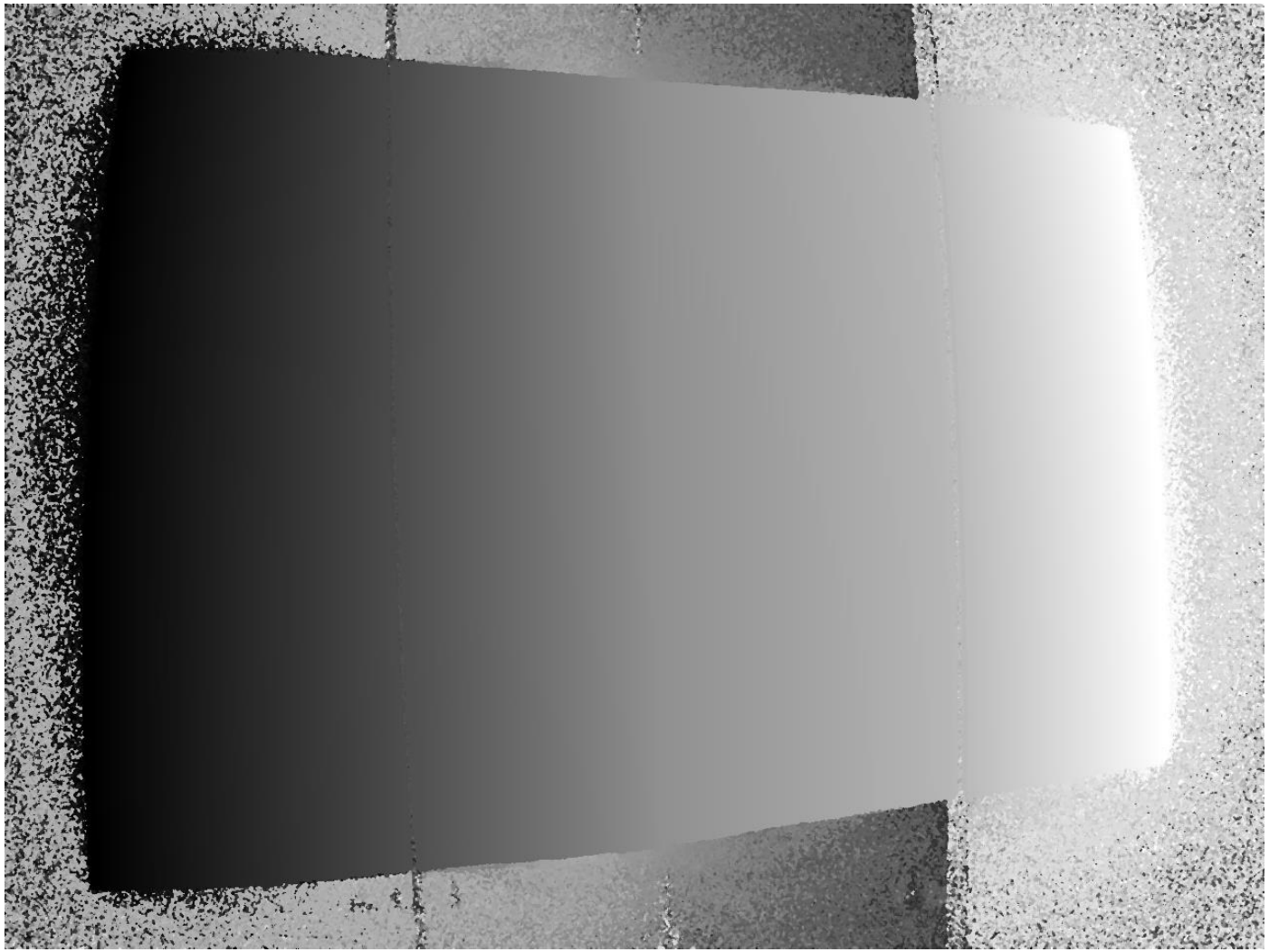

plan 5
plan 0
plan 1
plan 2
plan 3
plan 5
^C
Scanning dependencies of target uvMapAnalysis
[100%] Building CXX object CMakeFiles/uvMapAnalysis.dir/main.o
[100%] Built target uvMapAnalysis
plan 0
plan 1
plan 3
plan 5
^C
anbroise@awanub:~$ cd coding/enterface15-10/prosilicaCv/builds/
anbroise@awanub:~/coding/enterface15-10/prosilicaCv/builds$ ./capture
anbroise@awanub:~/coding/enterface15-10/prosilicaCv/builds$ ./prosilicaC

Context

Context



Context



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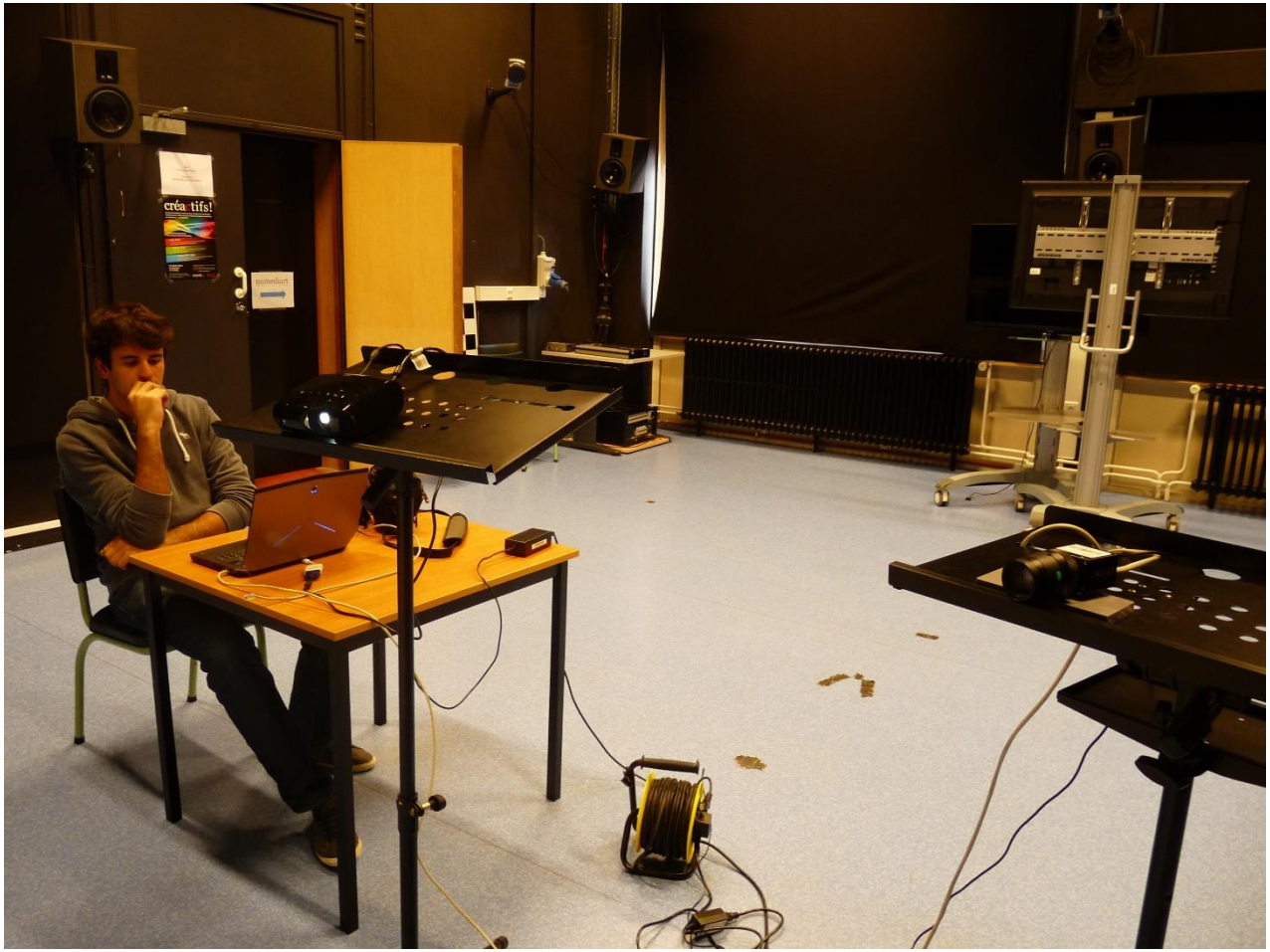
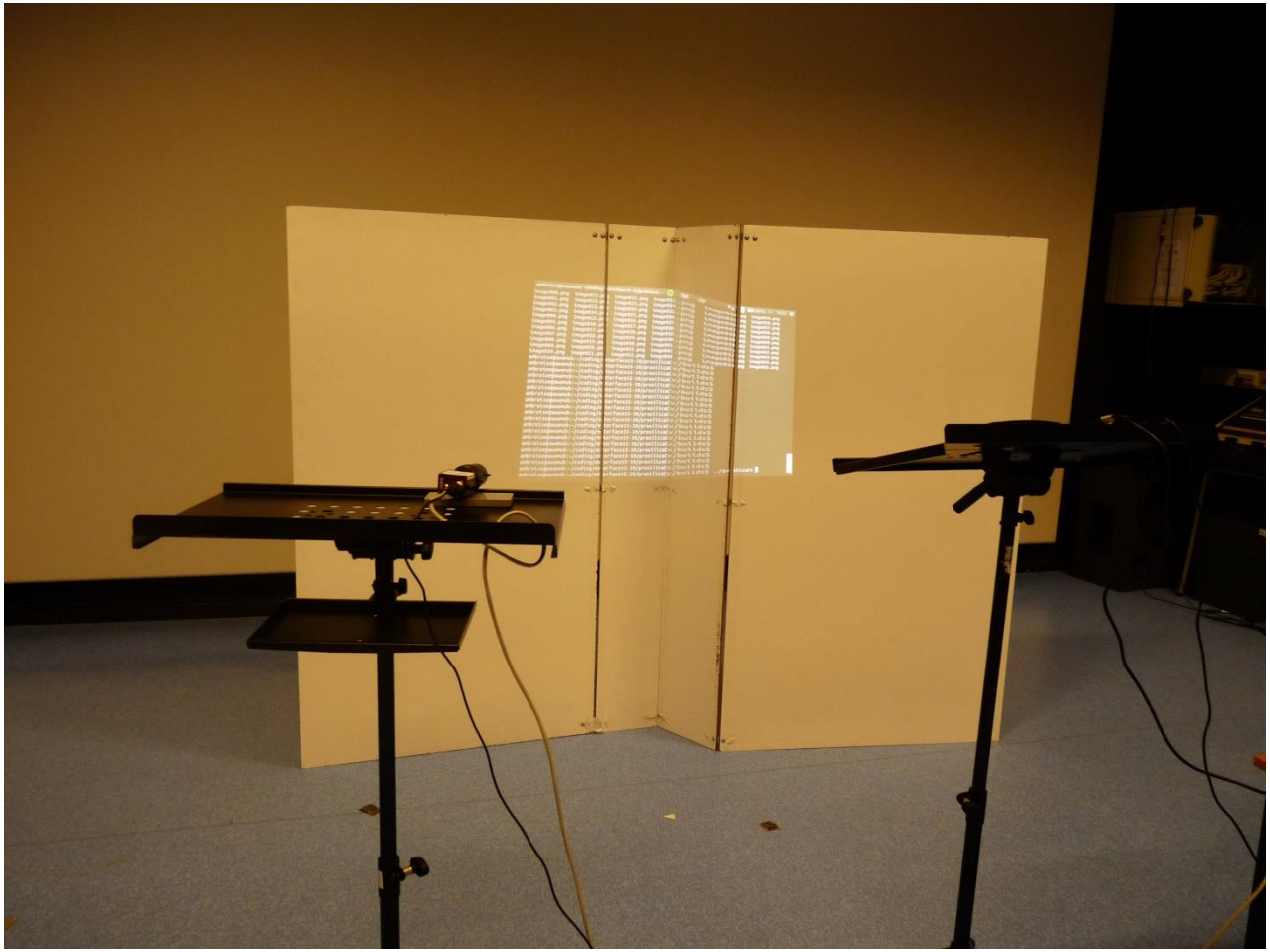
Setup

- Kinect 2
- Samsung projectors
- Gige Prosilica camera
- Homemade projection surface with multiple planes
- OpenCV, PCL and CodedLight c++ library

Setup



Setup



Setup

- Kinect 2  Structured light
  - Switched to Prosilica
  - Back to Linux
- Coded light library
  - Used only Phase Shift

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Algorithm

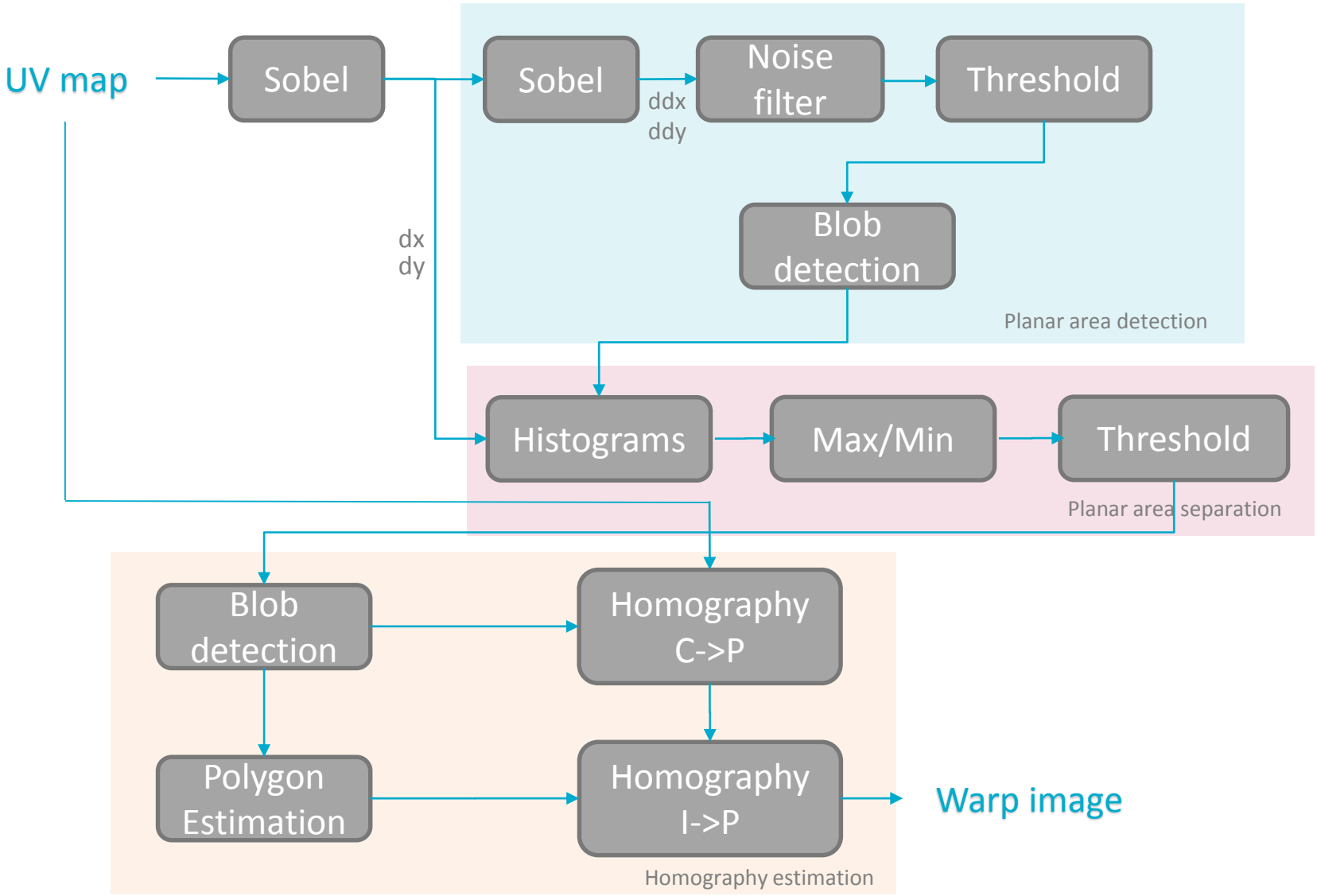
Evolution of the uv map is linear on a plane

Algorithm

First derivative is a constant

Second derivative is equal to zero

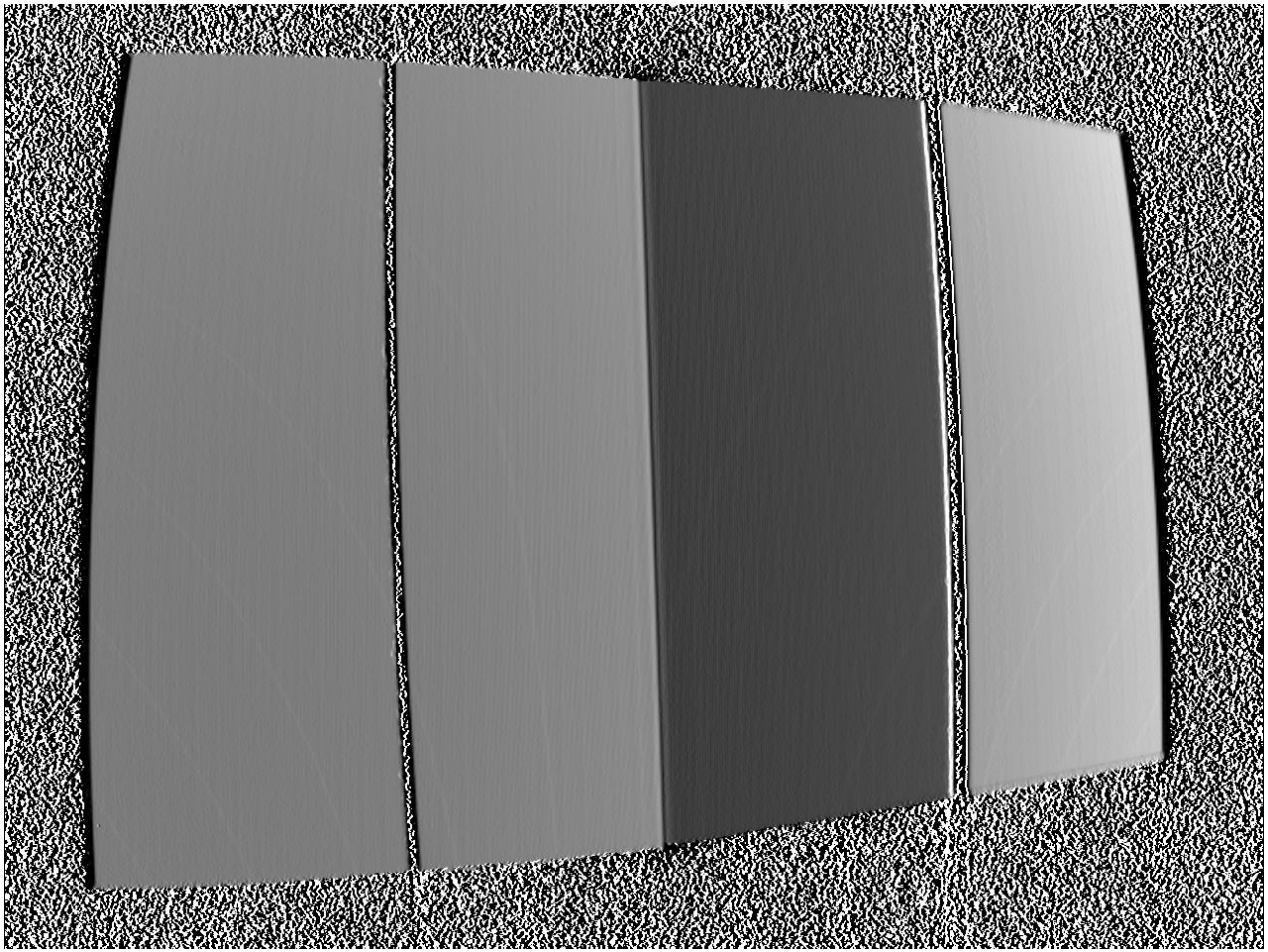
Algorithm


UV map
Sobel
Sobel
ddx
ddy
Noise filter
Threshold
Blob detection
dx
dy
Planar area detection
Histograms
Max/Min
Threshold
Planar area separation
Blob detection
Homography C->P
Polygon Estimation
Homography I->P
Warp image
Homography estimation

Results

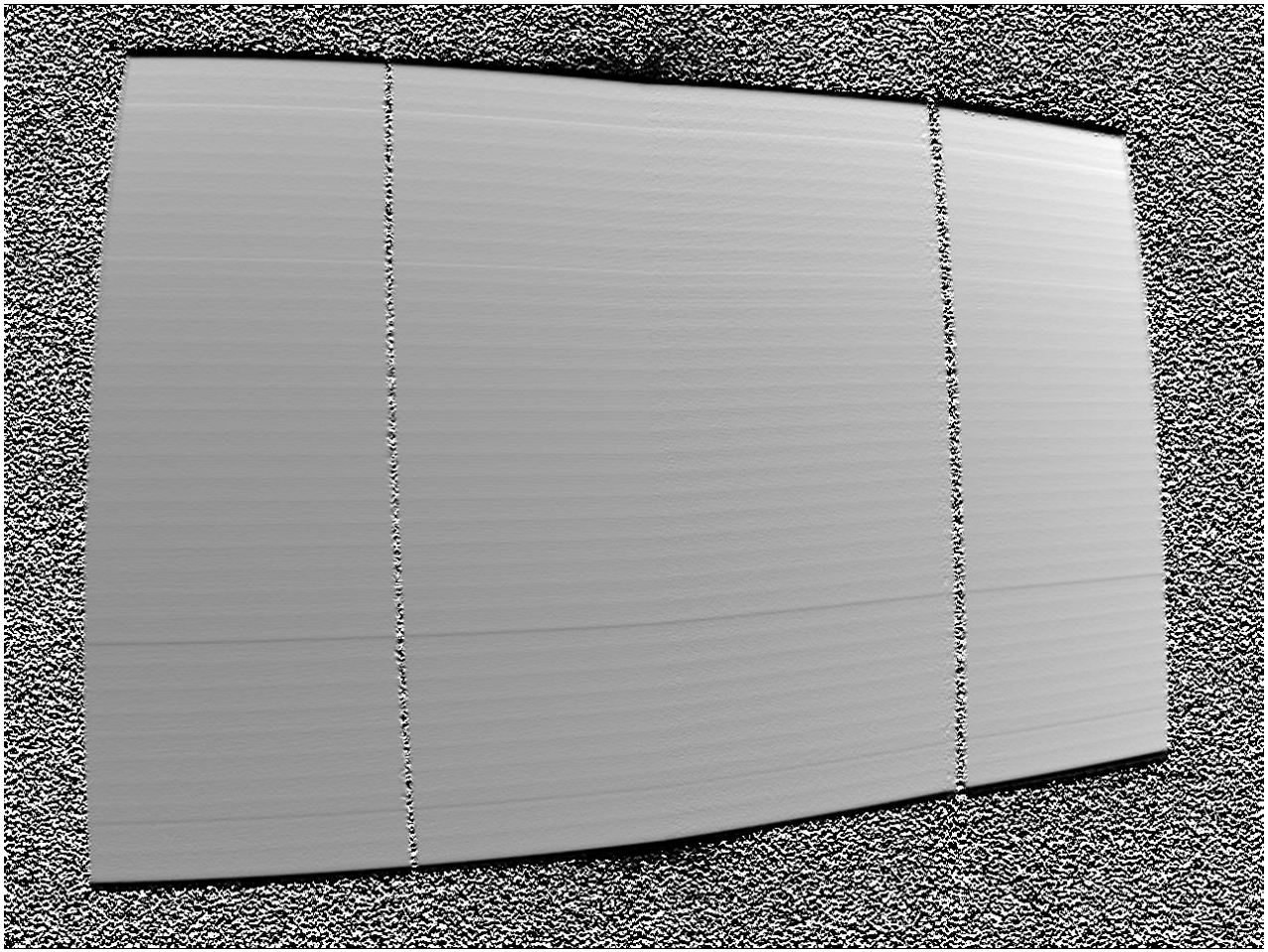
UV map

Results



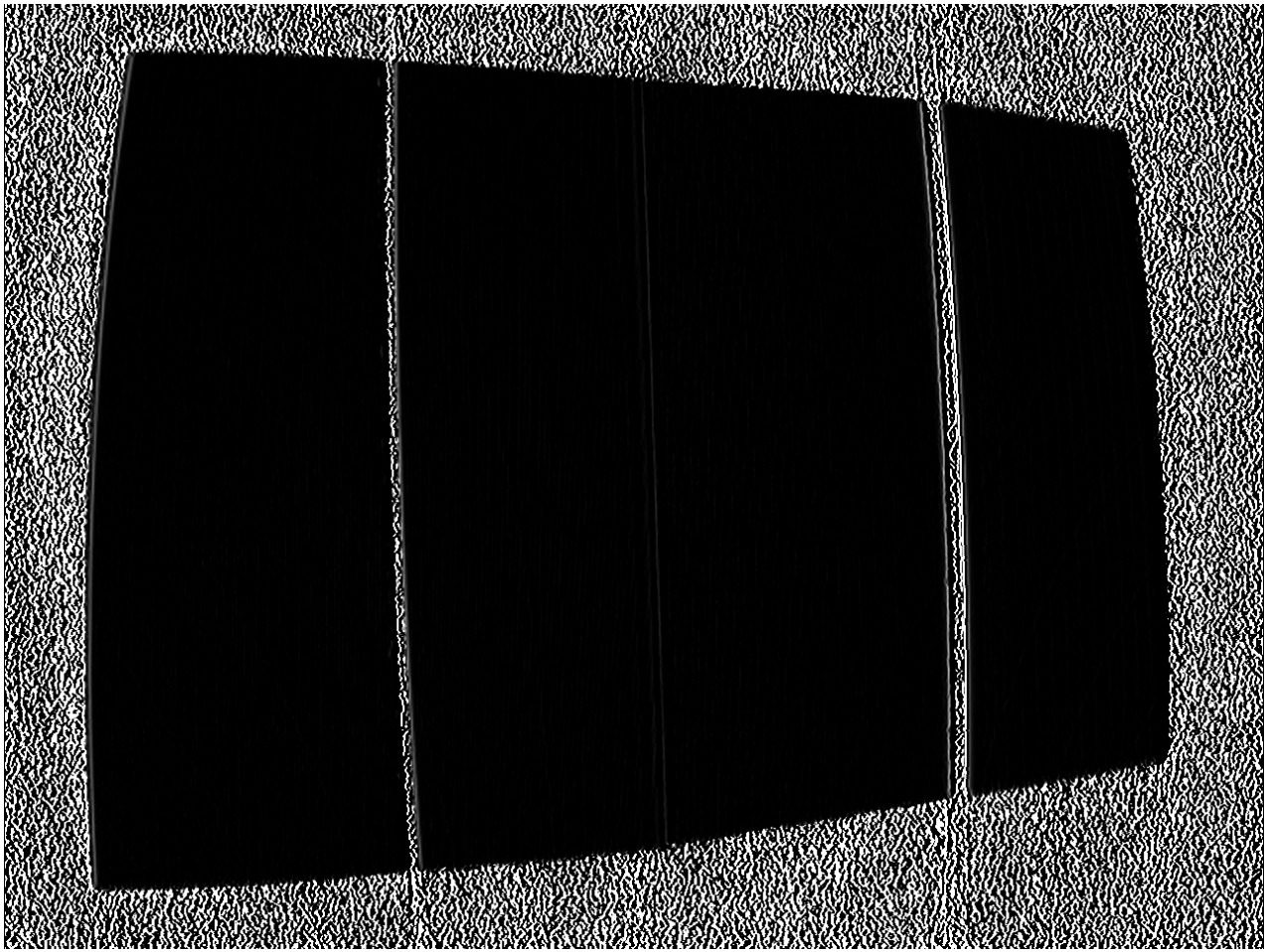
1st derivative (u)

Results



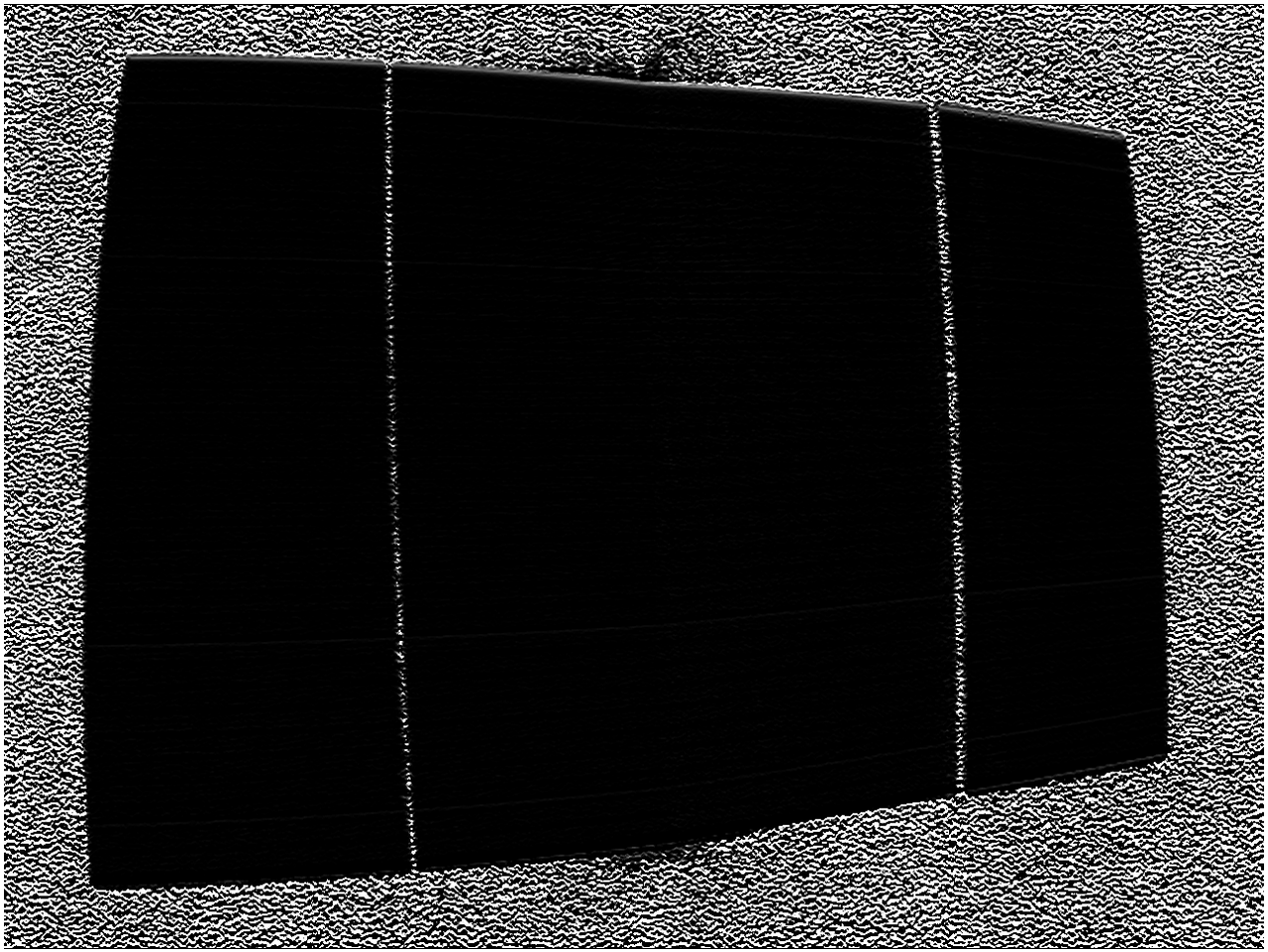
1st derivative (v)

Results



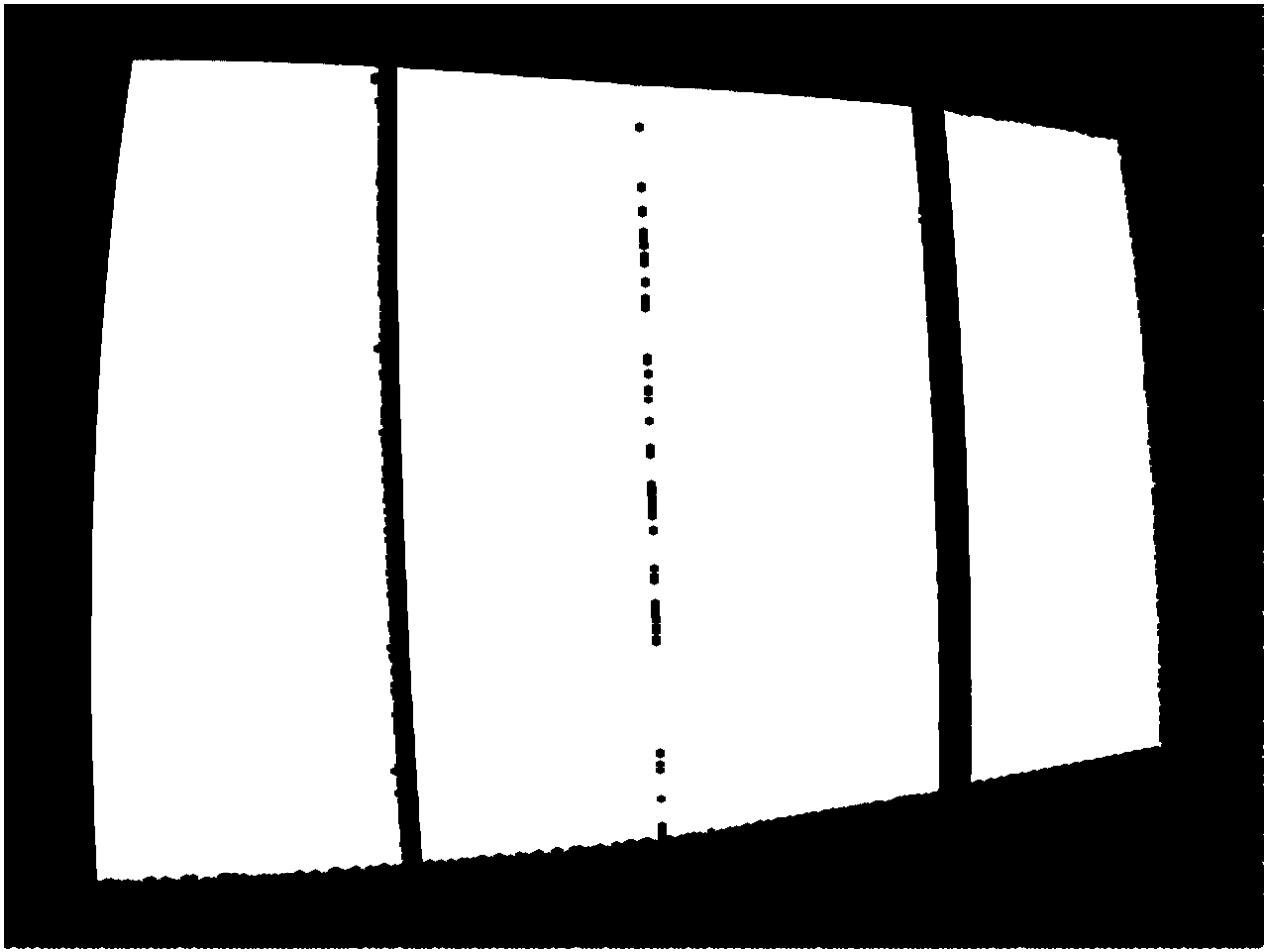
2nd derivative (u)

Results



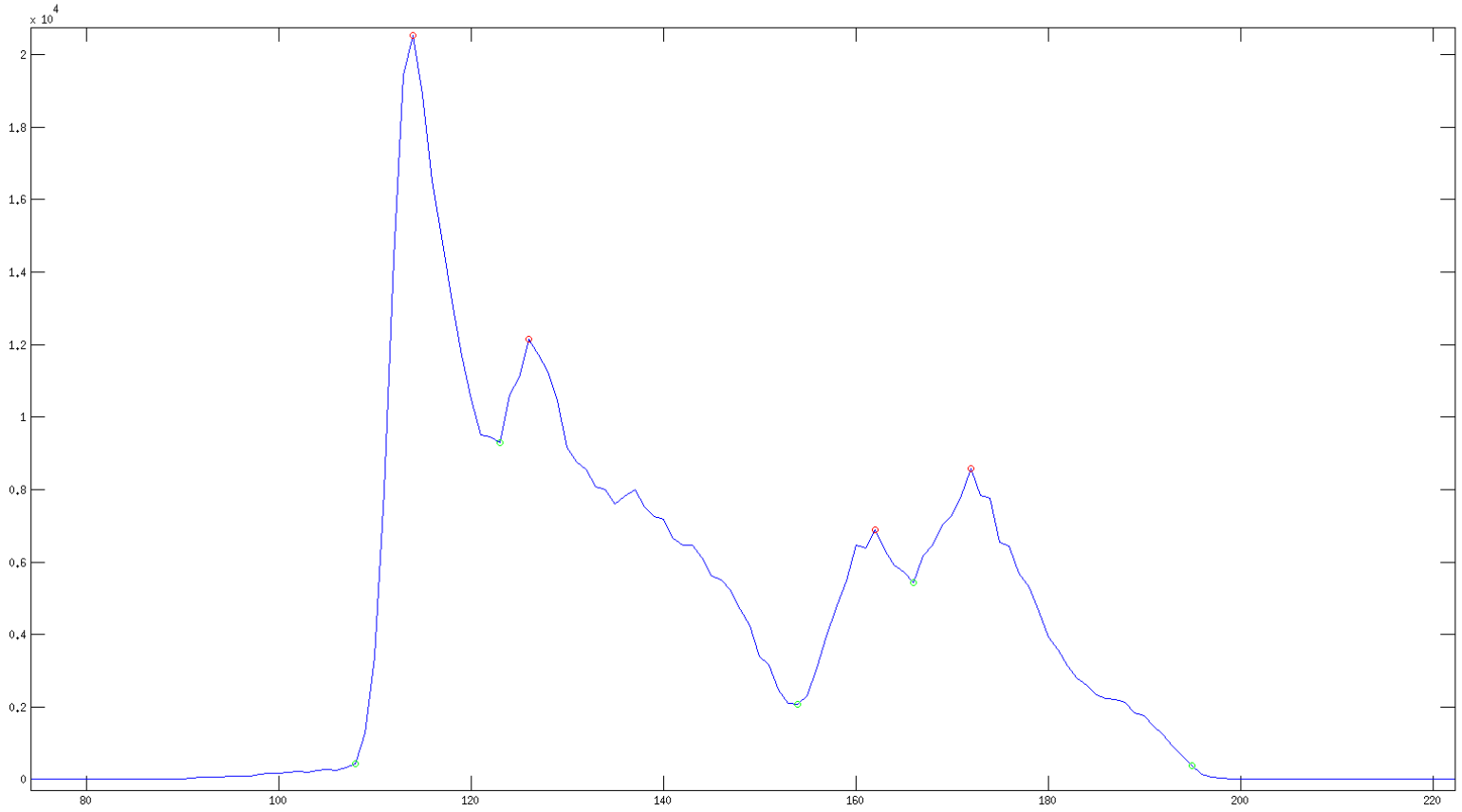
2nd derivative (v)

Results

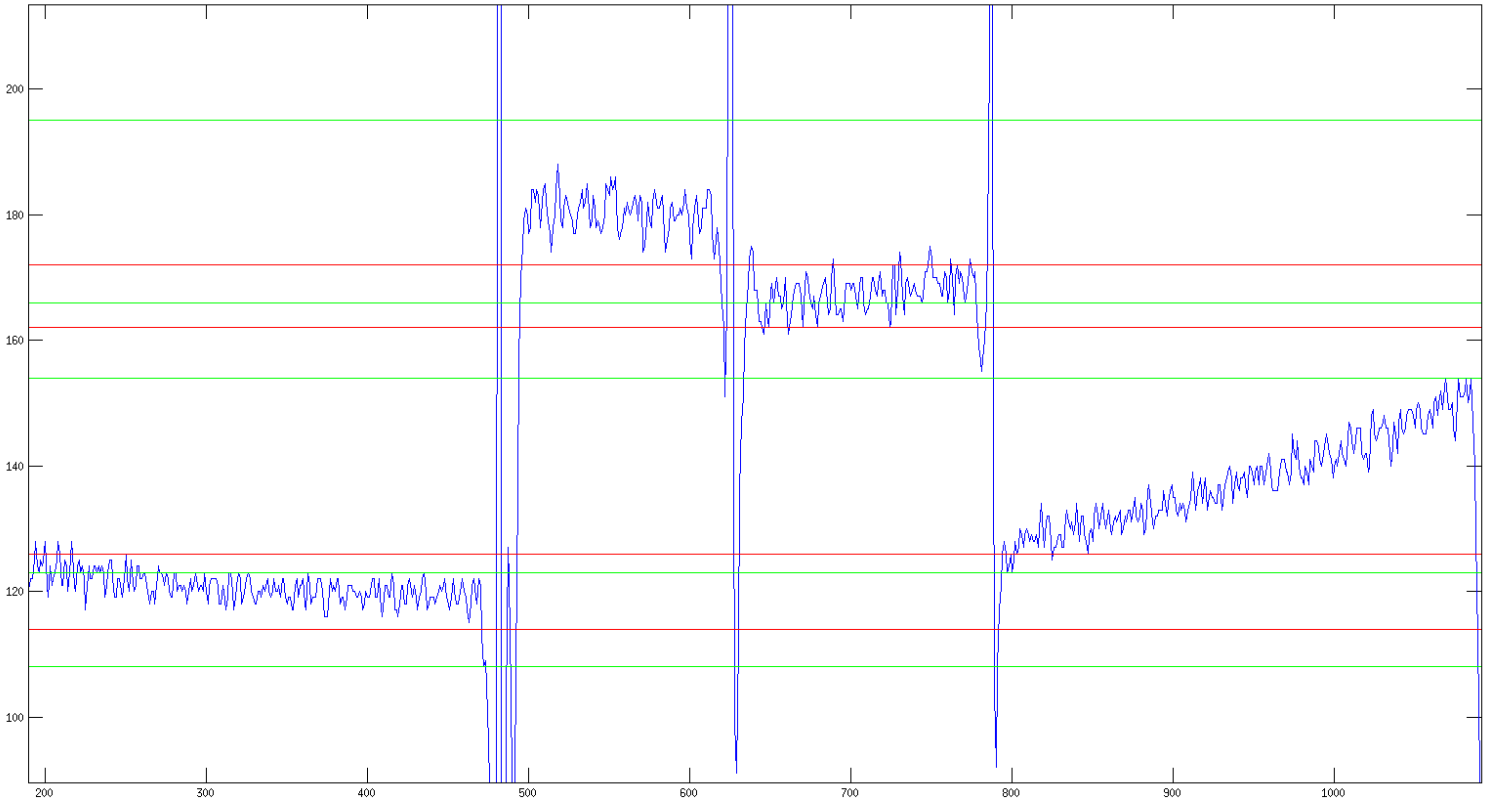


Thresholded 2nd derivative

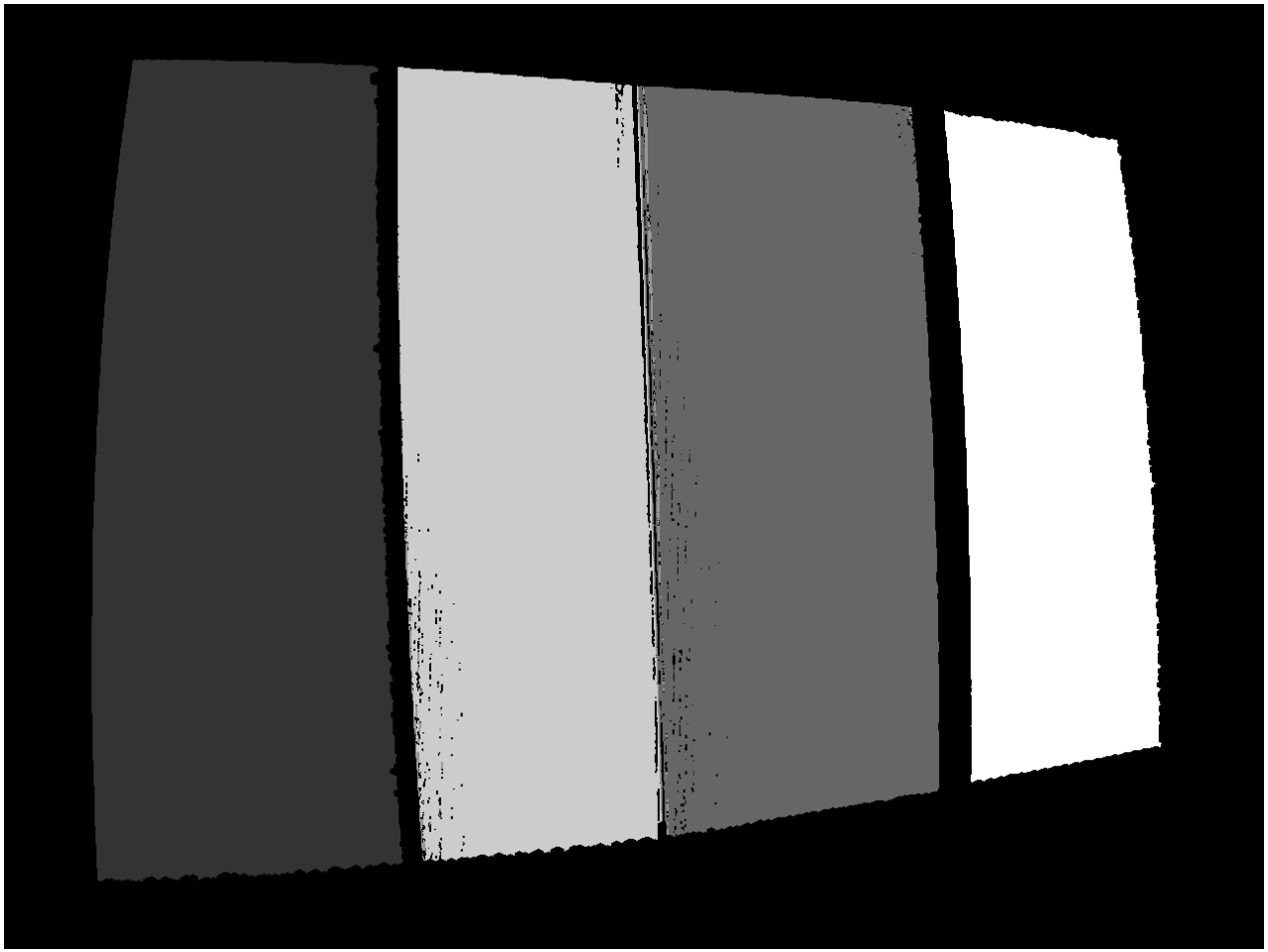
Results



Results

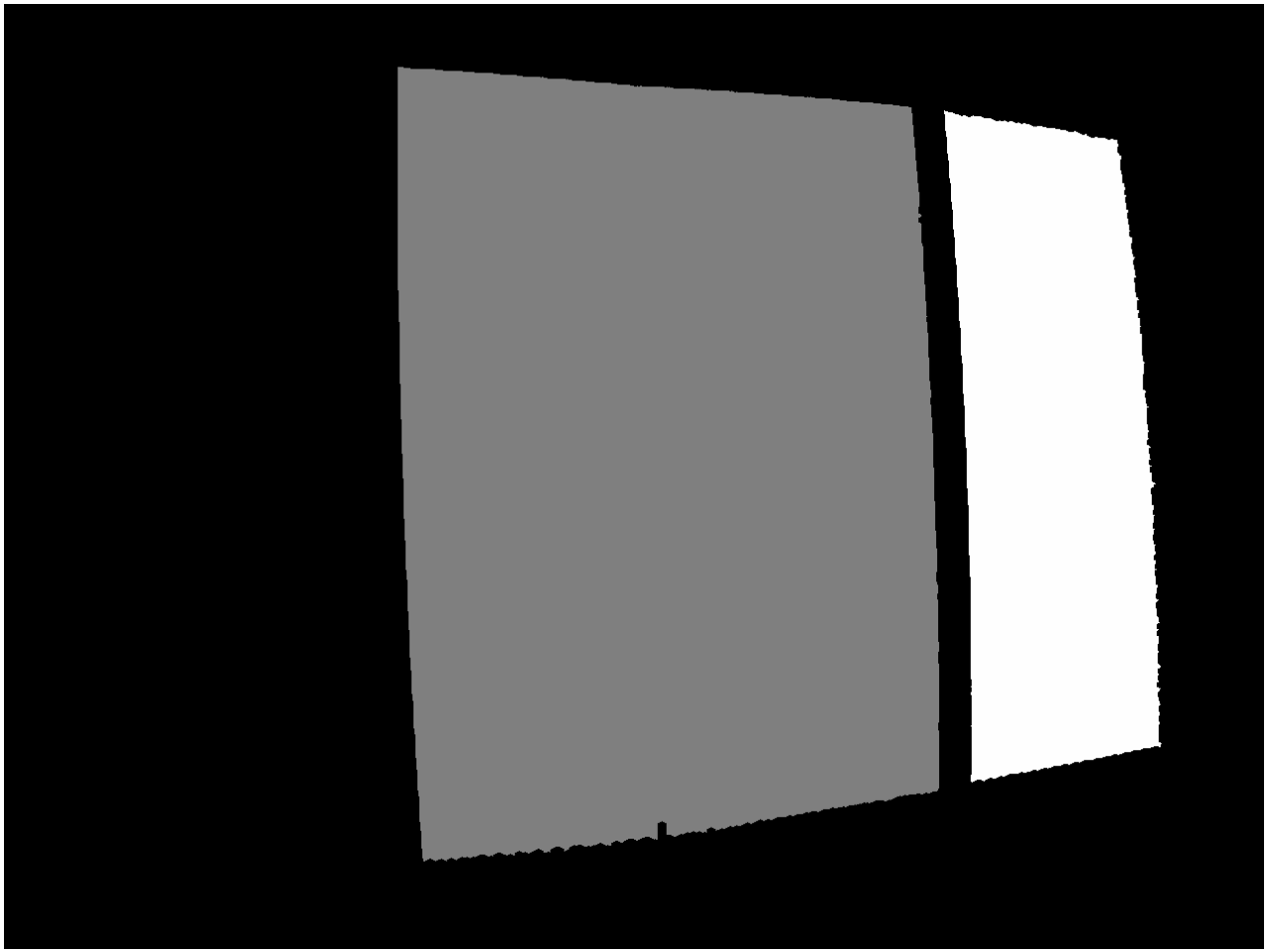


Results



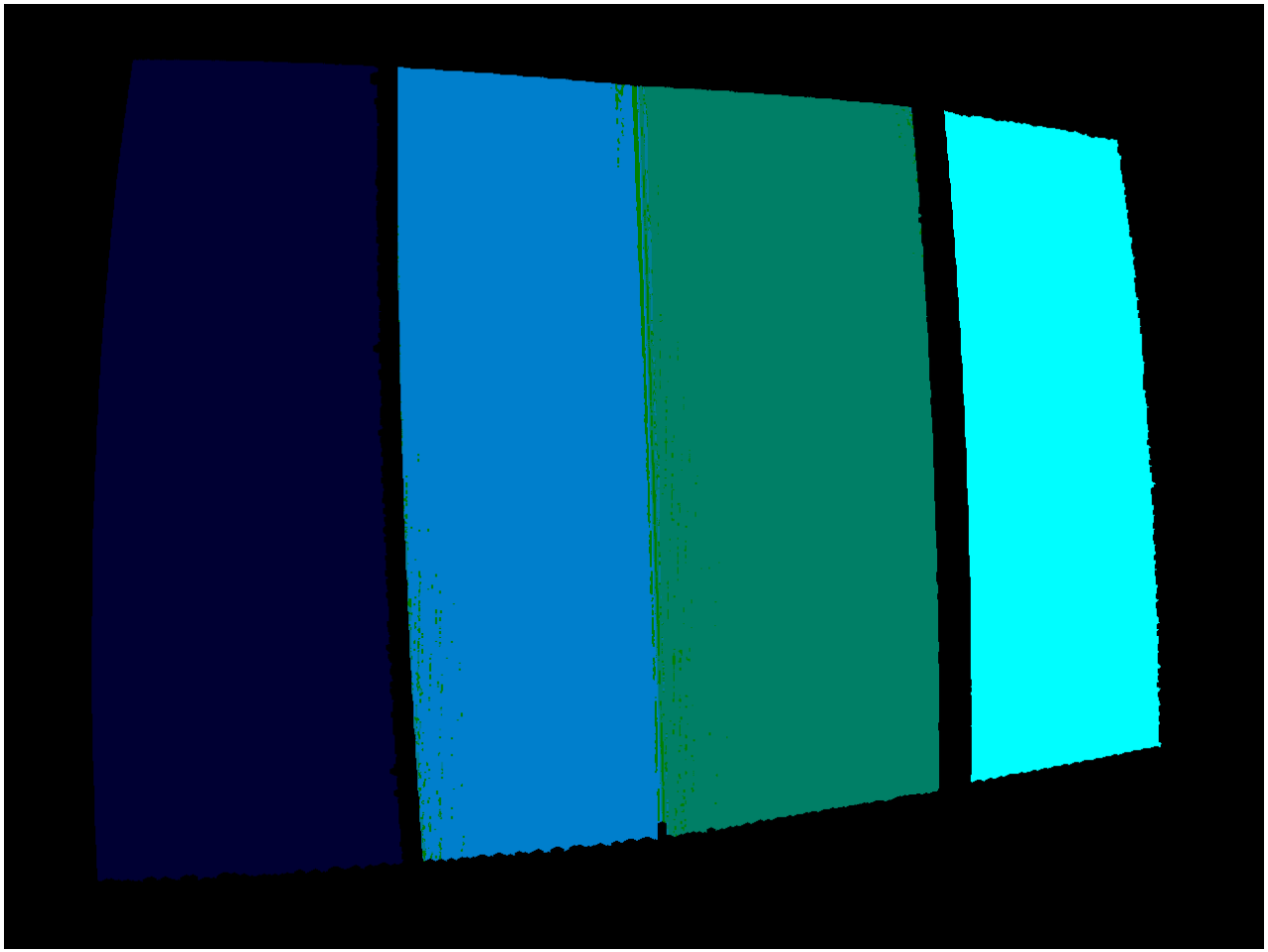
Planar area segmentation (u)

Results



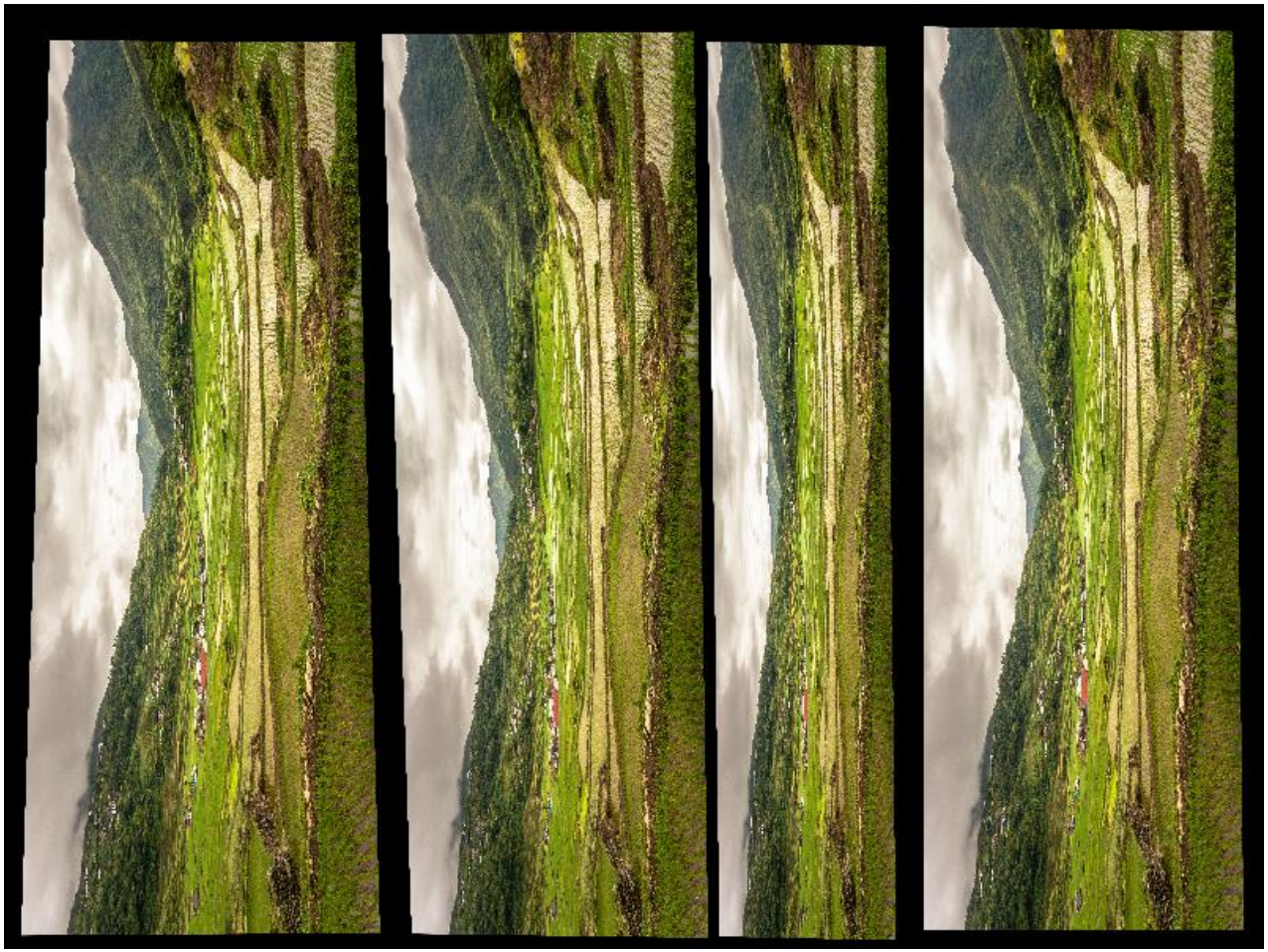
Planar area segmentation (v)

Results



Planar area segmentation

Results



Warped image

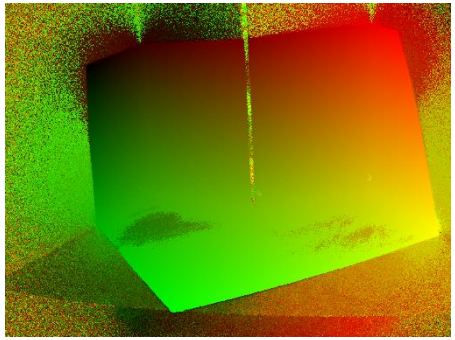
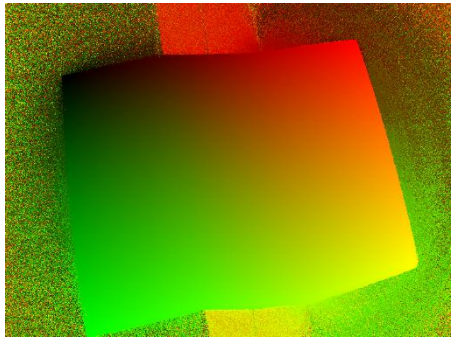
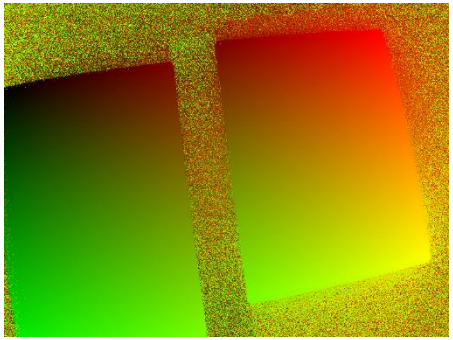
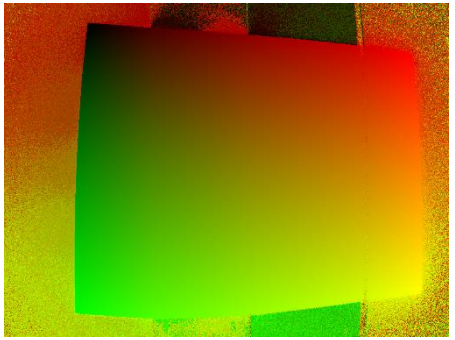
Results

Corrected projection

Results

Corrected projection

Results

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Future works

- Add GUI to control
- Test on more complex surfaces
- From structured light to real time uvmap (Ambroise's thesis …)

That’s it

ANY QUESTION?