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Computer Graphics

Class 34. Introductory ideas in Computer Vision.

Professor: Eric Biagioli

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Today

- Image Stitching.
- Marker-based augmented reality.
- State of the art / applications of computer vision.

References

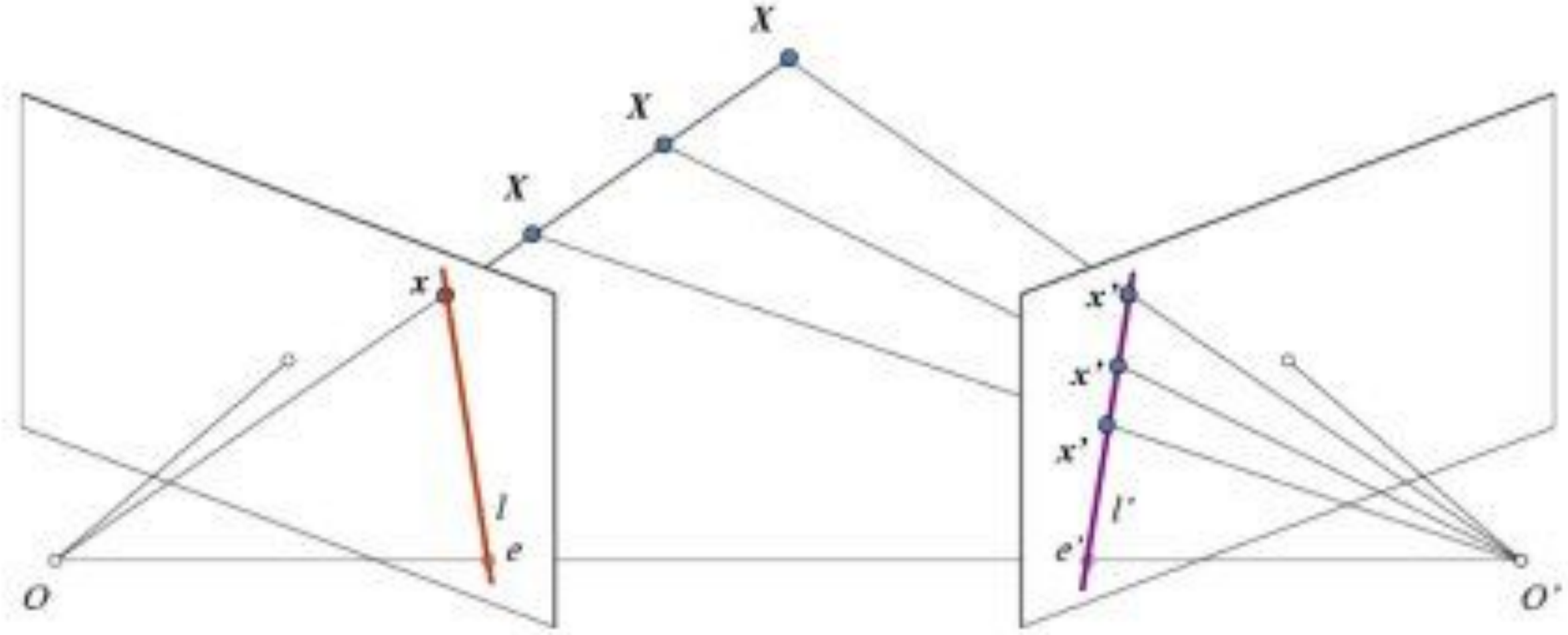
- Image stitching: https://www.opencvhelp.org/tutorials/advanced/image-stitching/
- Marker-based AR:
  - https://digitalpromise.org/initiative/360-story-lab/360-production-guide/investigate/augmented-reality/getting-started-with-ar/types-of-ar/
  - https://medium.com/@sakshi.dumbre31/marker-based-augmented-model-6e1fe1b3759c
- Augmented reality: https://blog.siggraph.org/tag/augmented-reality/

Announcements

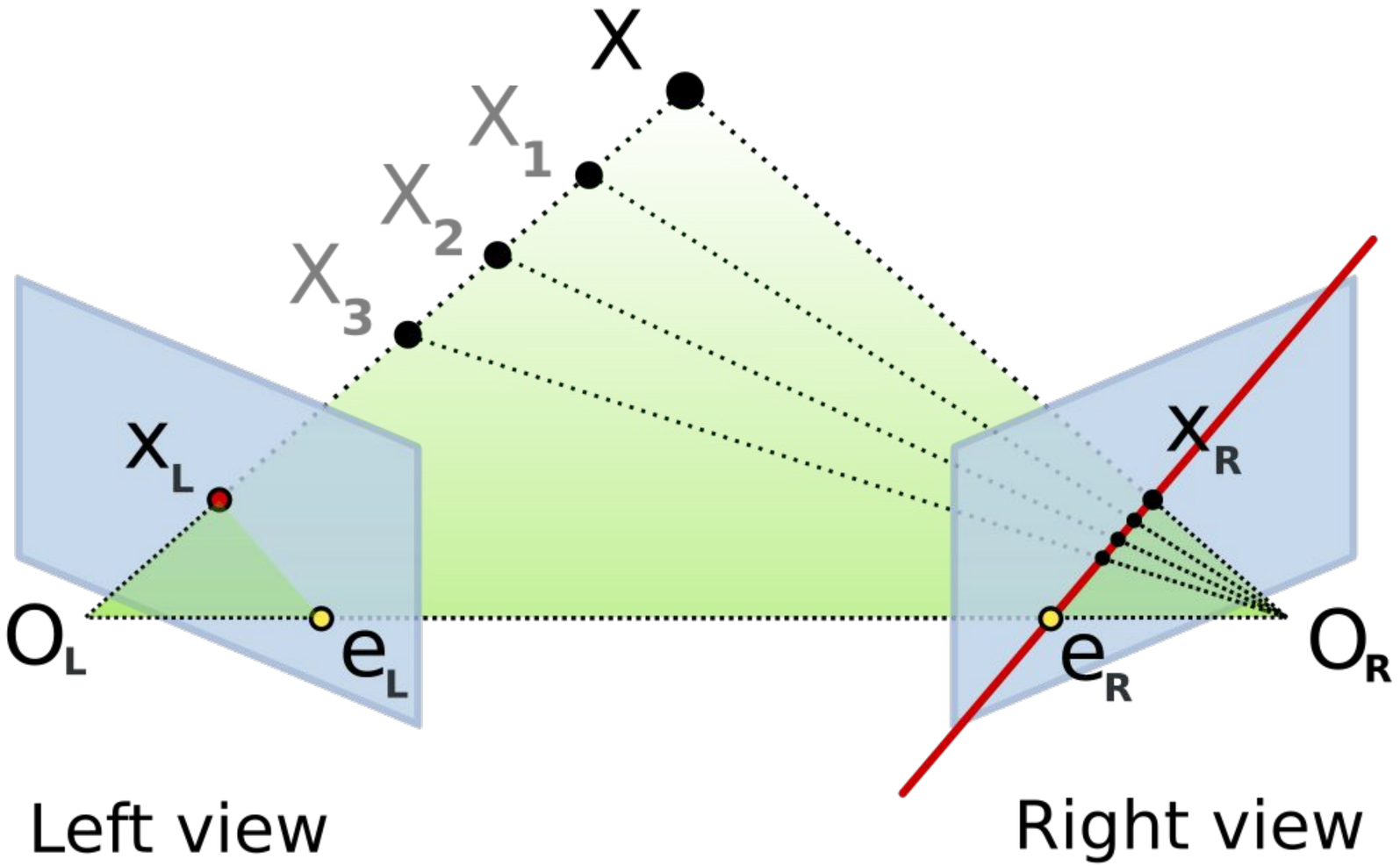
- PC3: one more corrected version is available on canvas (a correction in the angles of exercise 3. Big thanks to Nicolás Castañeda for noticing and pointing it!)
- Attendance: how will it be considered in the final grade.
  - Follow up note: how will it work in the future.
- Tomorrow the laboratory will start, exceptionally, at 10:00am and it will last 1 hour instead of 2 hours. The exercises will be available from tonight, and you are asked to already start the exercises in advance.
- The partial exam will be in 2 weeks from today. At some moment during this week there will be available a list of problems for practising.
- The format of the partial exam will be similar to the first partial exam, but this time it will be mandatory to submit a pdf (no paper submissions will be accepted).

Image stitching

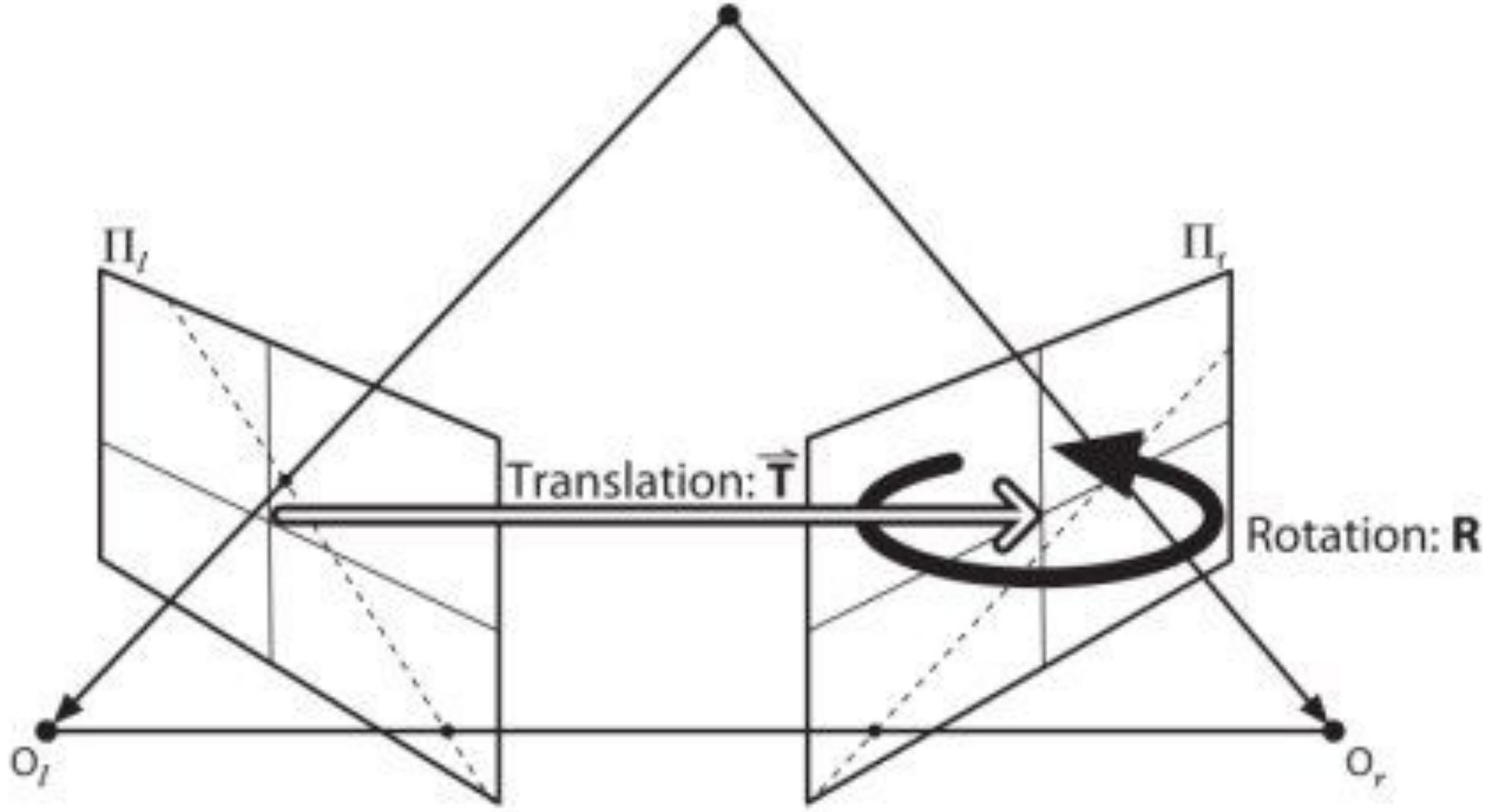
Stereo pairs

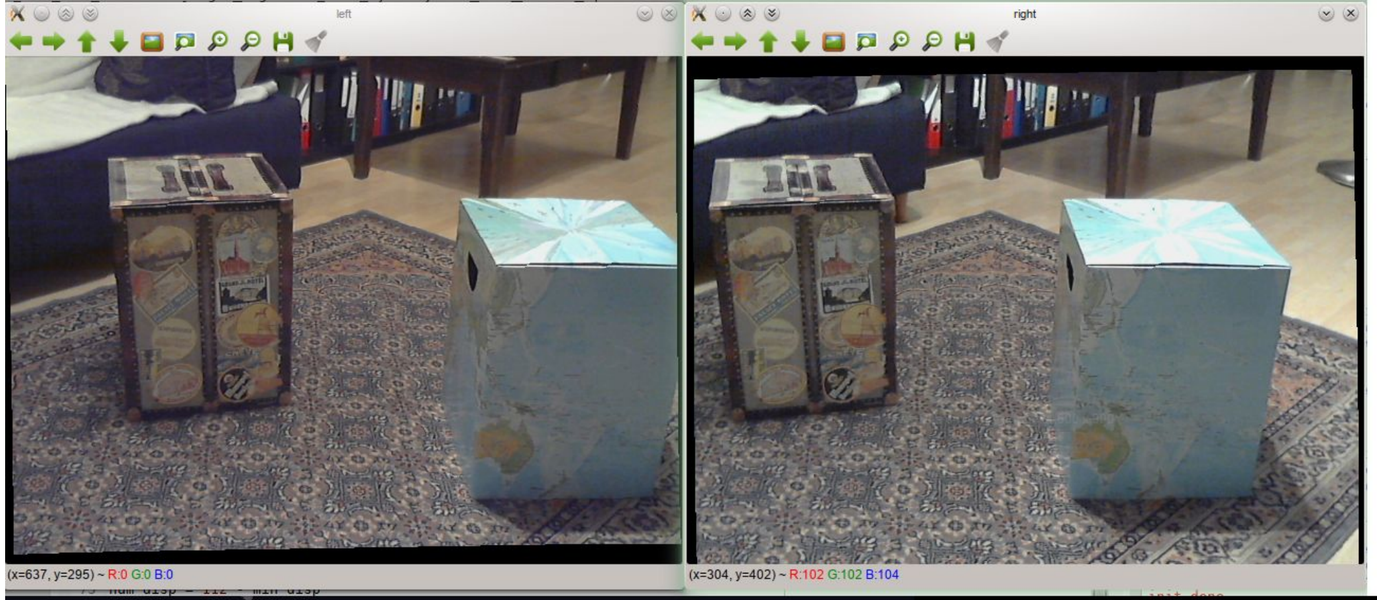


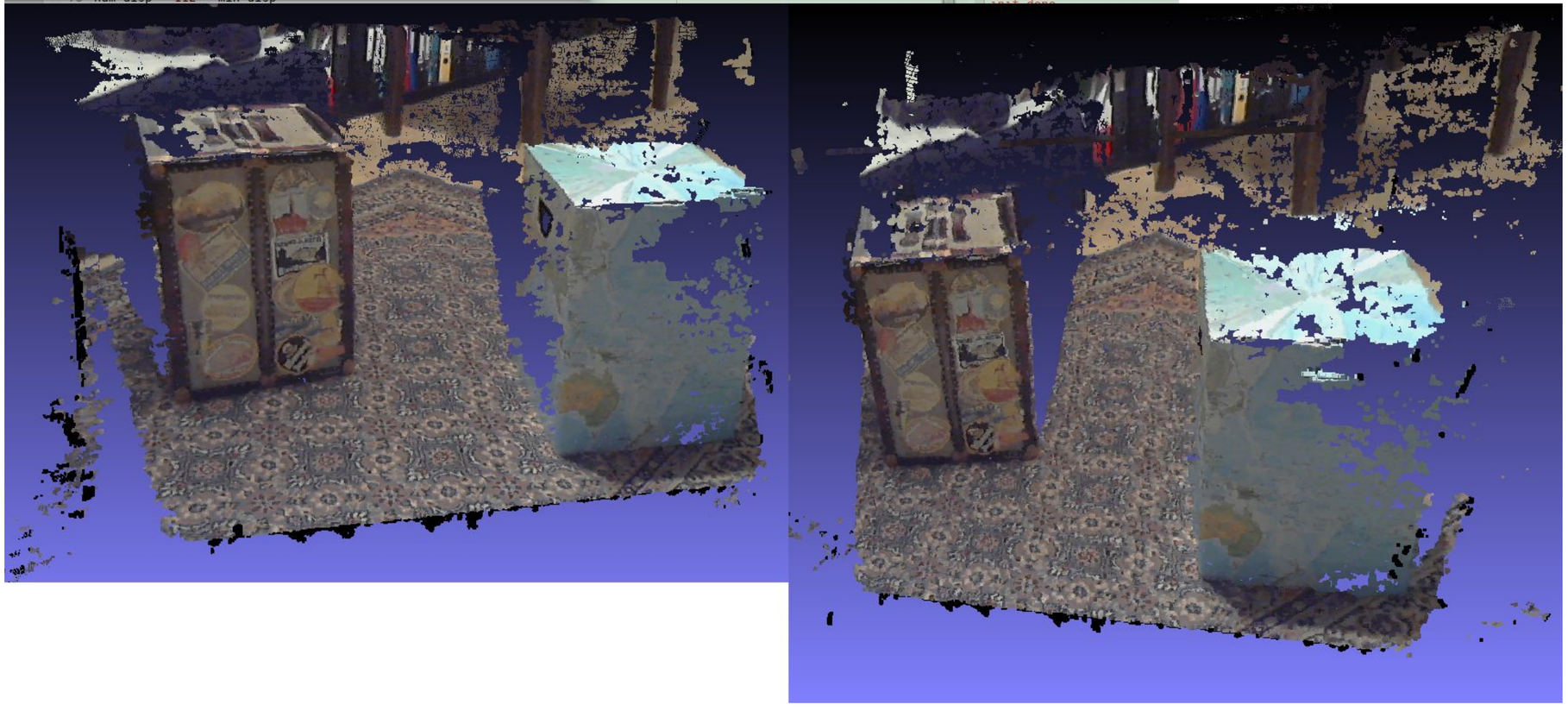
Stereo pairs

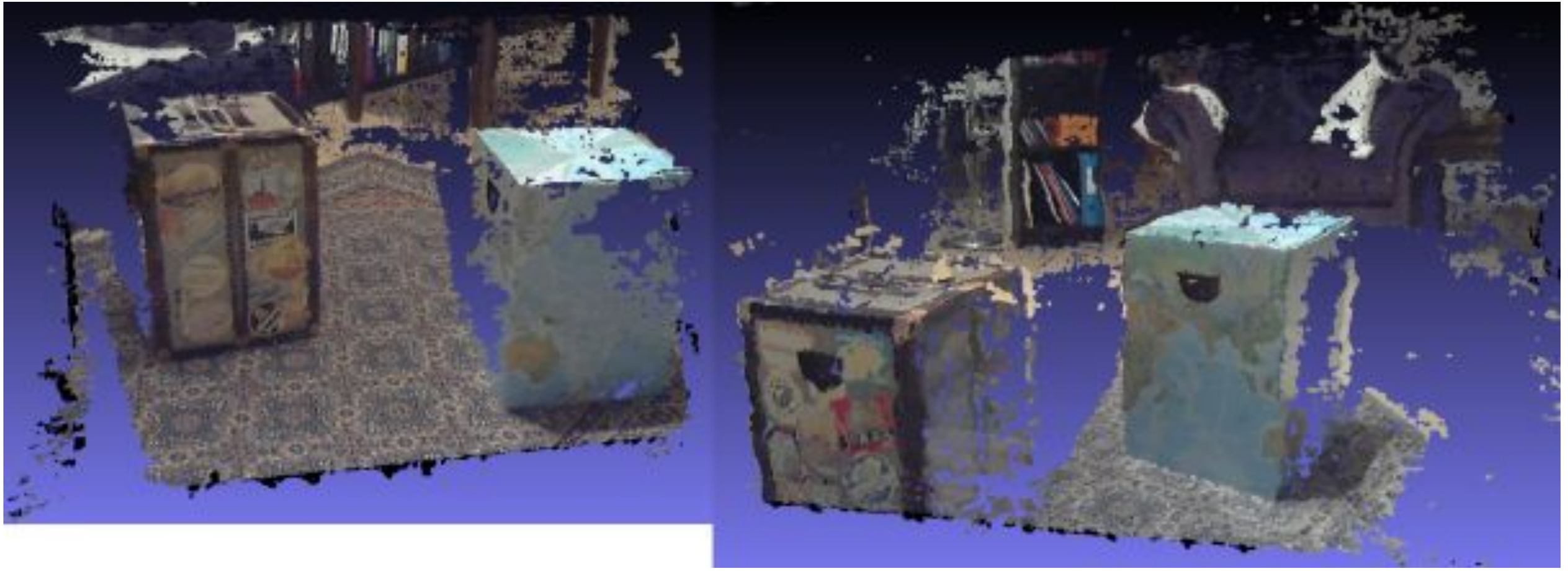


Stereo pairs




left
right
(x=637, y=295) ~ R:0 G:0 B:0
(x=304, y=402) ~ R:102 G:102 B:104





Marker-based augmented reality

Marker-based augmented reality

A "hello-world" marker-based example:

1. Brief discussion about Augmented Reality.
2. Download some marker from internet (example: a QR code. See marker.png in canvas for reference)
3. Use OpenCV to open and display the image captured by the camera of your laptop. (see display-camera.py in canvas for reference)
4. Use OpenCV to detect the marker in the camera feed (see detect-marker.py in canvas for reference)
5. Replace the marker by some overlay image (see detect-and-overlay.py)

A demo of a very preliminary version (with several small aspects to be fixed, but still transmitting on overall idea of what we can do with this technique) is available in canvas.

State of the art / applications of computer vision

- Health care: Medical image analysis, Surgical assistance, …
- Retail: inventory management, checkout systems, …
- Agriculture: Precision agriculture (more detailed example: deepagro), supervision drones, …
- Automotive: Autonomous vehicles, driving assistance, parking assistance, …
- Manufacturing: anomaly detection, predictive maintenance, …
- Security: monitoring, facial recognition, …
- Robotics: …
- Real estate: …
- …

State of the art / applications of computer vision

- Real time processing
- Explainability
- 3D Scene understanding
- Multimodal integration

Summary of today

- Image Stitching.
- Marker-based augmented reality.
- State of the art / applications of computer vision.

The activities for this week will include:

- Implement a simple marker-based augmented reality program. Use as a marker a simple QR code or any other image that you can easily detect using opencv. Draw a mesh with the correct pose and size in the place where you detected the marker.
- Use OpenCV's image stitcher, and create an image stitcher that is able to create a panorama from a set of input images.

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Thank you

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