

Computer Vision

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- BEng in Electrical and Computer Engineering @ FEUP, Portugal
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 - Computer Vision
- IEETA Post-Doc @ IEETA, University of Aveiro, Portugal
 - Biomedical imaging

Francesco Renna

- BEng, MSc, and PhD in Information and Telecommunication Engineering @ Università di Padova, Italy
- Post-Doc and Invited Researcher @ UPorto, University College London, UK, Cambridge University, UK, Duke University, USA
 - Compressed sensing, Biomedical imaging
- **Researcher, Invited Assistant Professor, UPorto**
 - Biomedical imaging and signals

Program

- Digital image (4 classes)
- Image processing (2 classes)
- Pattern recognition (4 classes)
- Segmentation (2 classes)
- Advanced deep learning (2 classes)

Methodology

- **Theoretical-practical classes:**
 - Presentation of content
 - Discussion of examples
 - Practical demonstration of the contents lectured
- **Additional work:**
 - Java/Android/C/Python/Other Programming
 - Implementation of the studied algorithms

Evaluation - Theoretical Evaluation

- **Two possibilities:**

- Final Exam (EF)

- Theoretical examination with the whole syllabus
- Minimum score 40%

- Simplified Final Exam (EF-S)

- For those who presented practical work
- Theoretical examination with half of the syllabus (T1-T8)
- Minimum score 40%

Evaluation - Practical Evaluation

- **Practical evaluation (PA):**
 - Optional
 - Implementation project done by groups of two students
 - Theme chosen among the various proposed by the teacher
 - (Optional) Preparation of a small simple report describing the implementation of the project
 - Minimum AP score = 40%

Evaluation - Final grade

- **Option 1**
 - Practical Evaluation (PA), Simplified Final Exam (EF-S)
 - $NF = AP*0.5 + EF-S*0.5$
- **Option 2**
 - Final Exam (EF)
 - $NF = EF*1.0$

Some (old) inspirational links

- <http://www.dfki.uni-kl.de/mp3konzertarchiv/exhibition>
- <http://www.youtube.com/watch?v=MTSWjkXBHOs&feature=youtu.be>
- <http://www.nytimes.com/video/2013/02/27/science/100000002087758/finding-the-visible-in-the-invisible.html>
- <http://cbarker.net/blog/projects/applications/cubr>



<https://www.youtube.com/watch?v=csuS2ibPVtU>

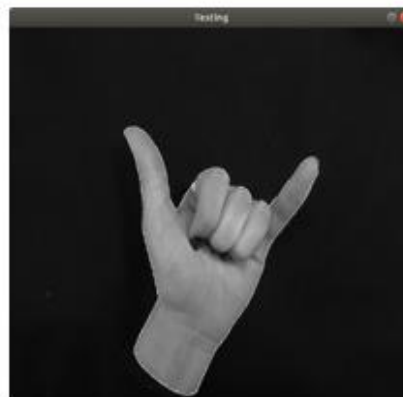
U.PORTO

VC 21/22 - Presentation

Imagens de teste

Segmentação da imagem

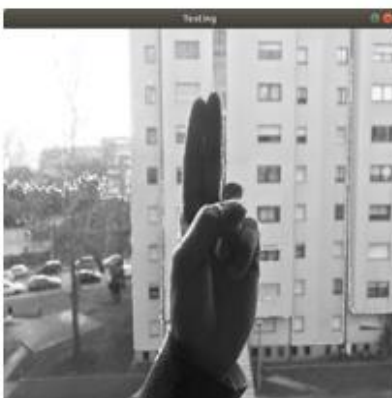
Resultado/Tradução



Gesture Recognition



Corresponde -> Y



Várias traduções se assemelham,
nomeadamente:



|-> Y

|-> O

|-> U

|-> 5

|-> 5

|-> 4

|-> 3

|-> 2

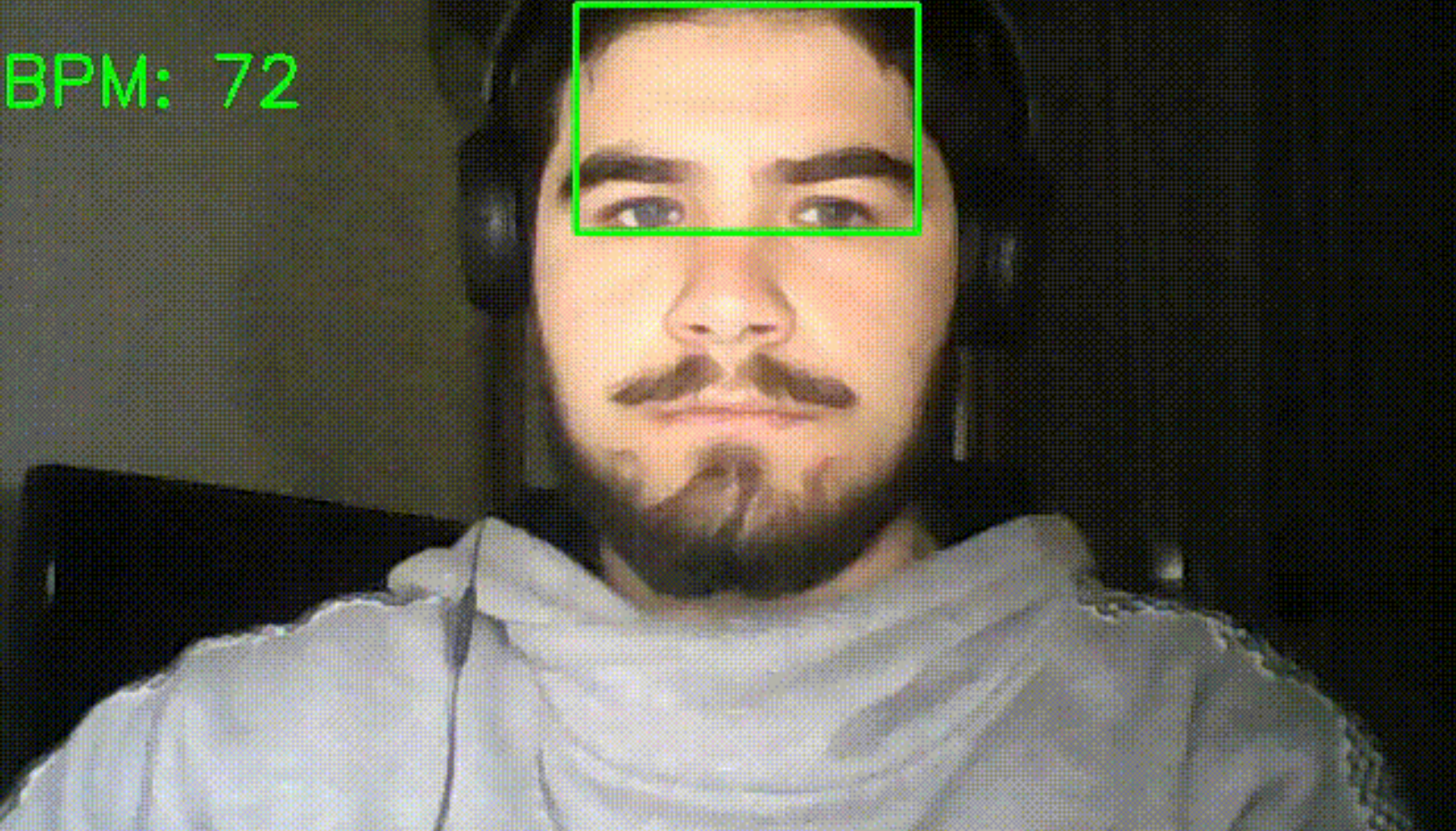


Corresponde -> O

Heartbeat Quantification



BPM: 72



(x=331, y=407) ~ R:207 G:197 B:202



Self-Driving System

```

CarlaDriving\server\init_.py", line 17, in init
CarlaDriving\server\service.py", line 39, in _init_
(ame)
simulator is ready and connected to 127.0.0.1:2000
he simulator is ready and connected to 127.0.0.1:2000
CarlaDriving\python run.py

```

pygamewindow

Server: 65 FPS
Client: 51 FPS

Vehicle: Tesla Model3
Map: Town04
Simulation time: 0:00:27

Speed: 0 km/h
Heading: 93° SE
Location: (381.6, -123.1)
GNSS: (0.001096, 0.003420)
Height: 0 m

Throttle:
Steer:
Brake:
Reverse:
Hand brake:
Manual:
Gear:

Lane Detection: On
Lane Auto Steer: OFF

Traffic Sign Detection: OFF

Collision:

Number of vehicles: 1

Turn Left

se.py:380: RuntimeWarning: Mean of empty slice

py:170: RuntimeWarning: invalid value encounte

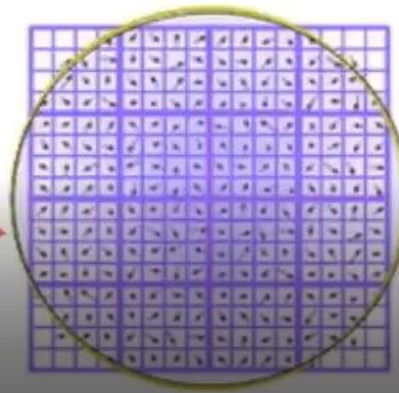
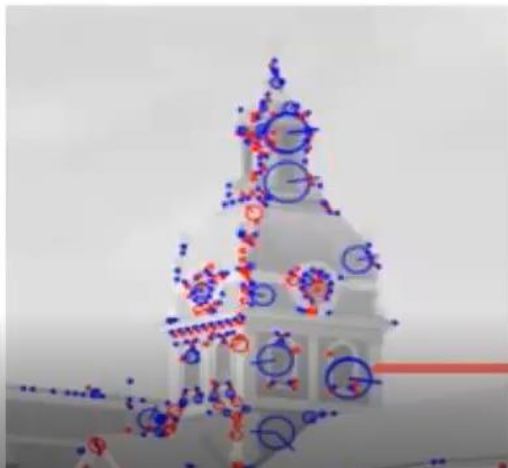
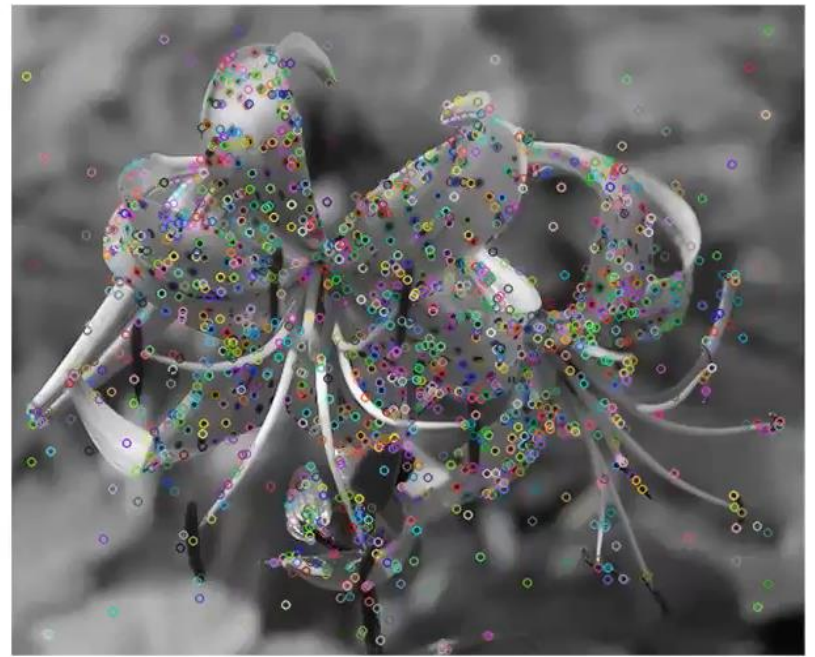
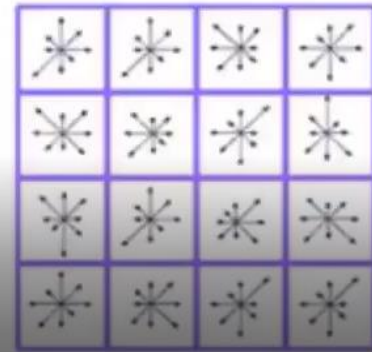


Image gradients

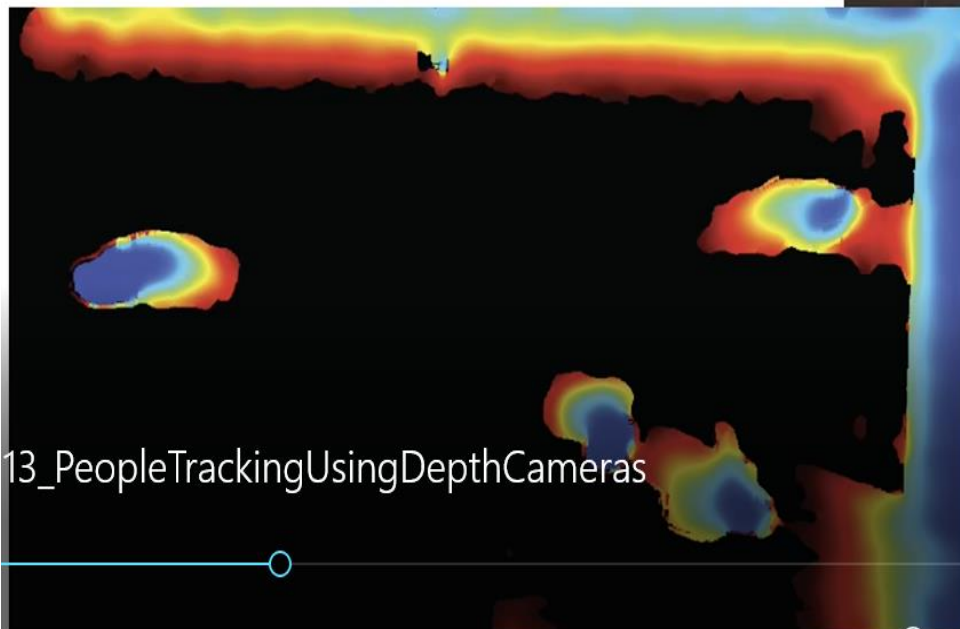


Keypoint descriptor

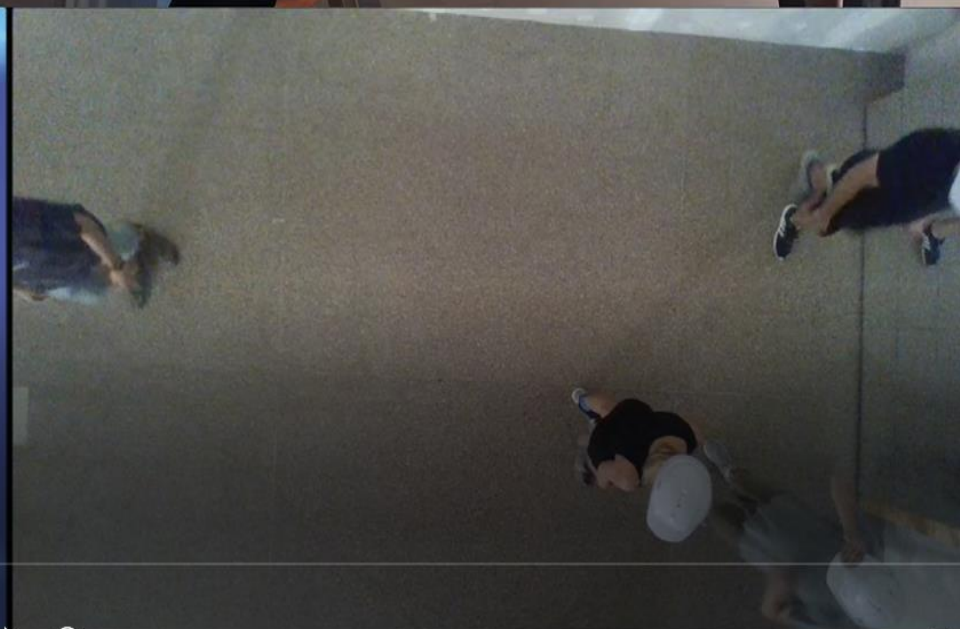
Flower Classification

People tracking using depth cameras

- 6 depth cameras placed on the ceiling in a matrix
- **already collected** a dataset
- ~60 GB of recordings



13_PeopleTrackingUsingDepthCameras



Bibliography

1. R. Szeliski, “Computer Vision: Algorithms and Applications”, Springer, 2011, ISBN: 978-1-84882-935-0
2. R. Gonzalez, R. Woods, and S. Eddins, “Digital Image Processing using Matlab”, Prentice Hall, 2004
3. I. Goodfellow, Y. Bengio, and A. Courville. Deep learning. Vol. 1. Cambridge: MIT press, 2016. (<https://www.deeplearningbook.org/>)

~~Good Luck~~ Good Work!

- Forget luck
- You work well and you don't need it
- Focus on enjoying classes!

- “Luck favors the bold”
 - John Wick tattooed it so it must be true... right?

