SSIP 2013

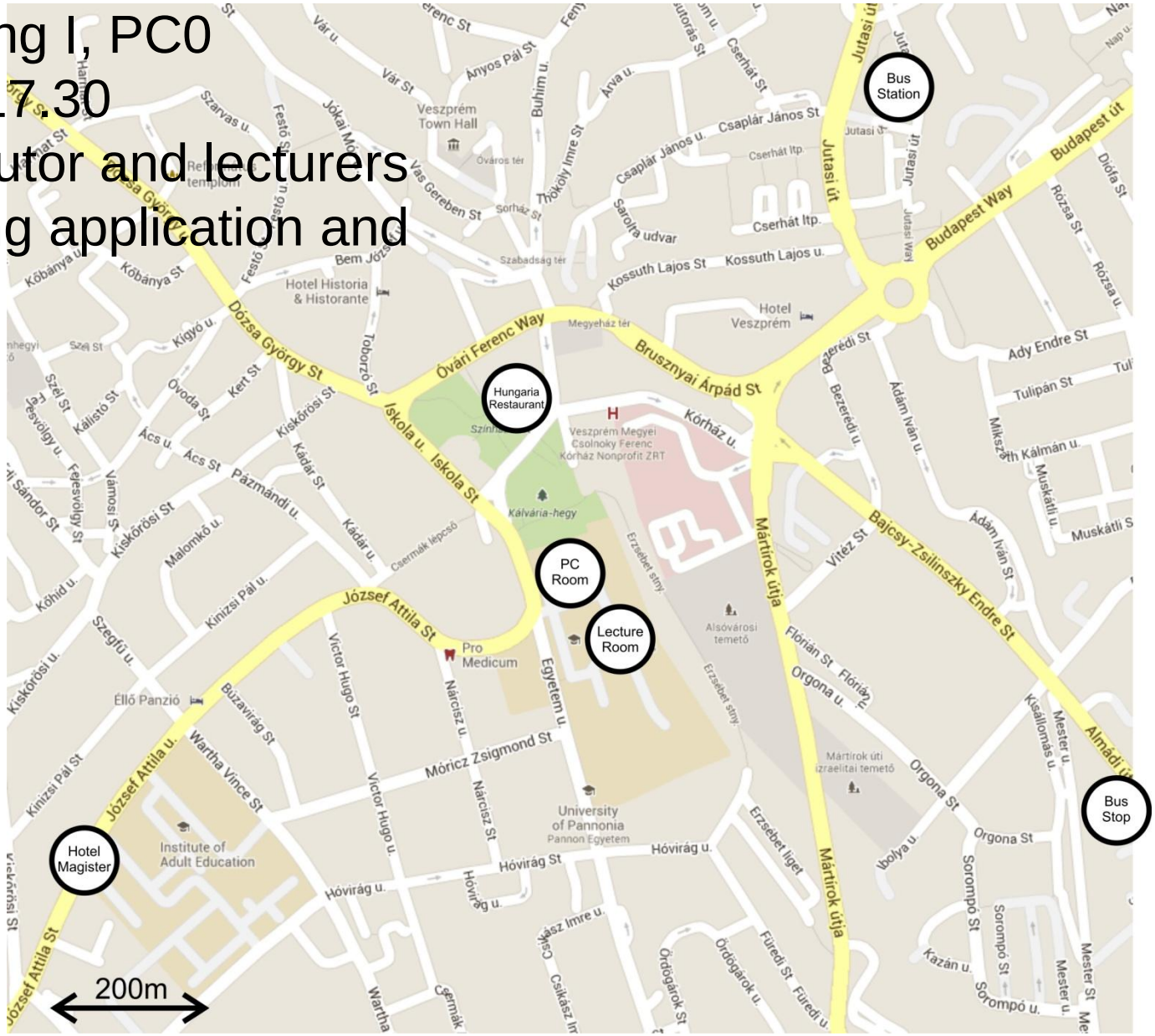
Introduction of projects

What to do now?

1. Handouts about projects are given…
2. Try to understand each task:
   - Discuss with each other
   - Ask teachers
3. Order the projects according to your priority
   1: most wanted
   13: less wanted
4. Tomorrow lab work starts with team announcements

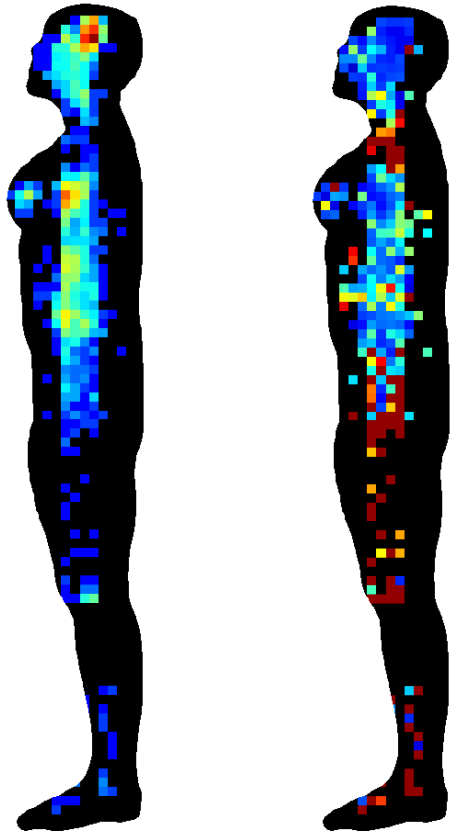
Name:……		
1.	3D Volume localization / image retrieval using miniatures	
2.	Segmentation using Active Shape Models	
3.	Particle Filter Segmentation	
4.	Cognitive 3D Indoor Scene Perception	
5.	Restoration and Enhancement Degraded Mammograms Using Different Algorithms	
6.	Intrusion detection	
7.	Left-item detection	
8.	Independent motion detection	
9.	Shadow detection in videos	
10.	Pass the Pigs	
11.	Text segmentation	
12.	Vehicle classification	
13.	Saliency detection	

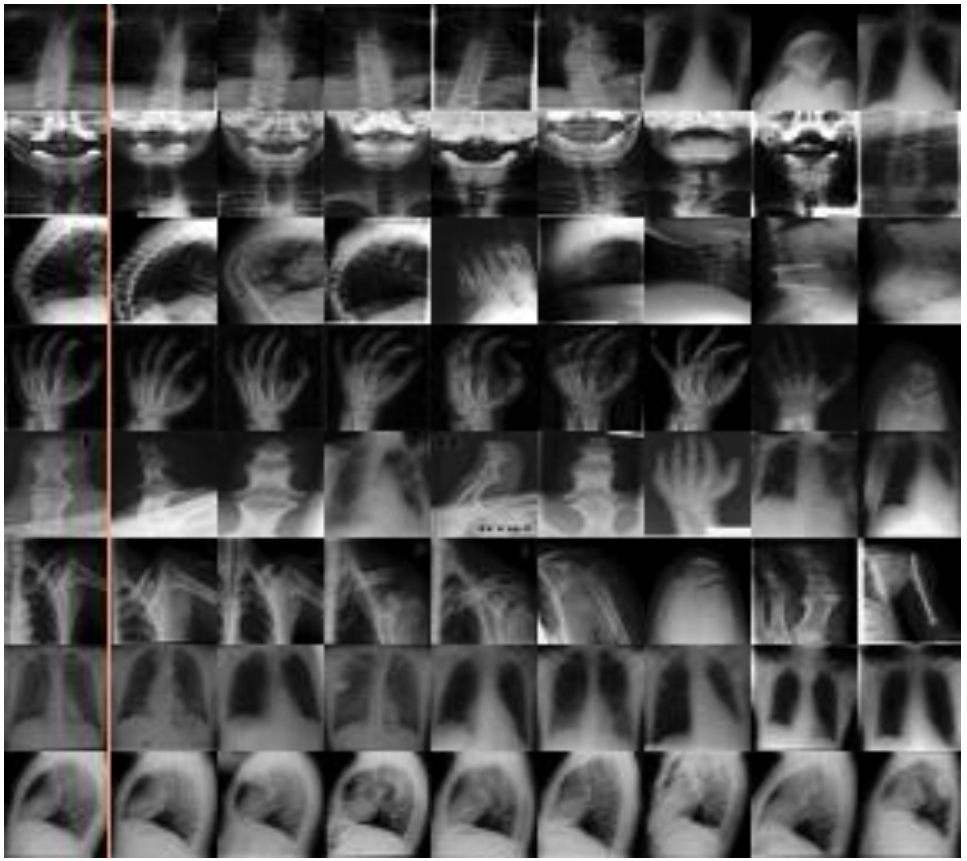
- Place: Building I, PC0
- Time:14:00-17.30
- Who: Local tutor and lecturers
- What: working application and project report



Title of the project:	**1: 3D Volume localization / image retrieval using miniatures**
Specification of the task:	As a first stage in Computer Aided Diagnosis systems, the rough localization of a volume is required. In this project you will try to **predict the position of a volume in a full body atlas**. Similarly, it is important to **find the most similar volumes** (from the hospital's database for example). Your second, very much related task is thus to find the most similar volume. * Build a retrieval framework that returns the 10 most similar volume when queried with one of the volumes in the collection. Try different approaches! * Position prediction: The most similar volume will tell you which body part your volume is probably depicting. Can you come up with a more sophisticated approach? Perhaps a regressor based approach? (eg with Random Ferns?)
Availability of test/train data if required:	You are provided with about 2000 volumes, resampled to 32x32x32, and their coordinates in the atlas, as well as 2 axial views of this atlas http://www.cir.meduniwien.ac.at/downloads/ssip2012/project6-3dretrieval.zip
Proposed readings:	http://cvlab.epfl.ch/alumni/oezuysal/ferns.html http://cvlab.epfl.ch/publications/publications/2010/OzuysalCLF10.pdf
Proposed software:	
Contact:	Rene Donner

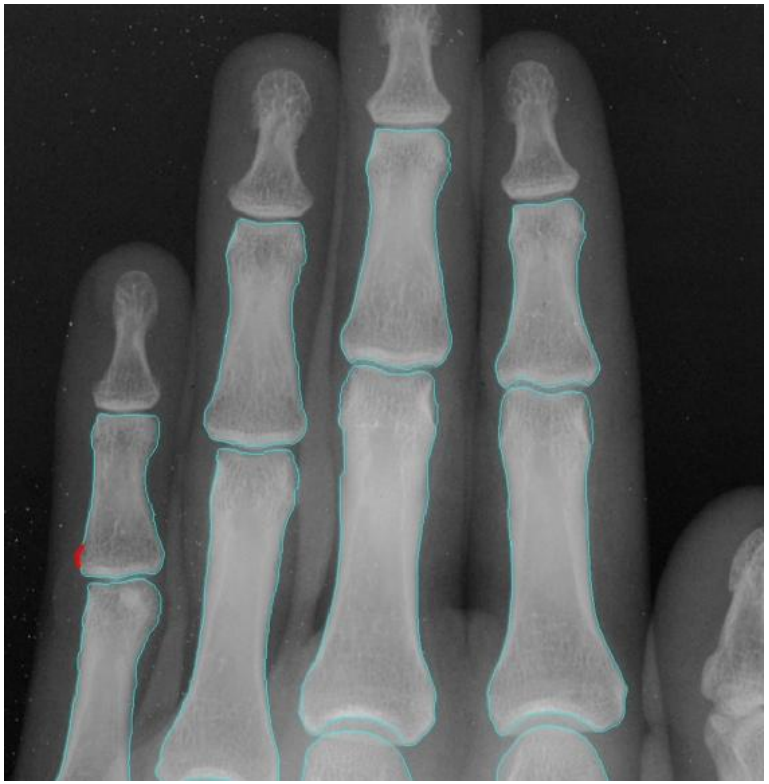
Project 1: 3D Volume localization / image retrieval using miniatures





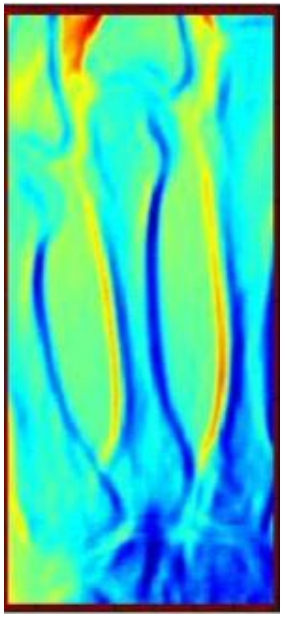
Title of the project:	**2: Segmentation using Active Shape Models**
Specification of the task:	In most radiological applications we have to perform segmentation of some object. In this project you will develop a fully automated system for bone segmentation in hand radiographs! There are several subtasks: * Build a shape model (from the data in the matrix "aligned") * Code the gray-level profile extraction and modelling * Code the actual search algorithm
Availability of test/train data if required:	http://www.cir.meduniwien.ac.at/downloads/ssip2012/project2-asms.zip
Proposed readings:	http://www2.imm.dtu.dk/~aam/downloads/asmprops/node2.html http://220.149.83.48/s1/medical_image_processing/Lecture/Active%20Shape%20Model%20-%20Their%20training%20and%20Application.pdf
Proposed software:	
Contact:	Rene Donner

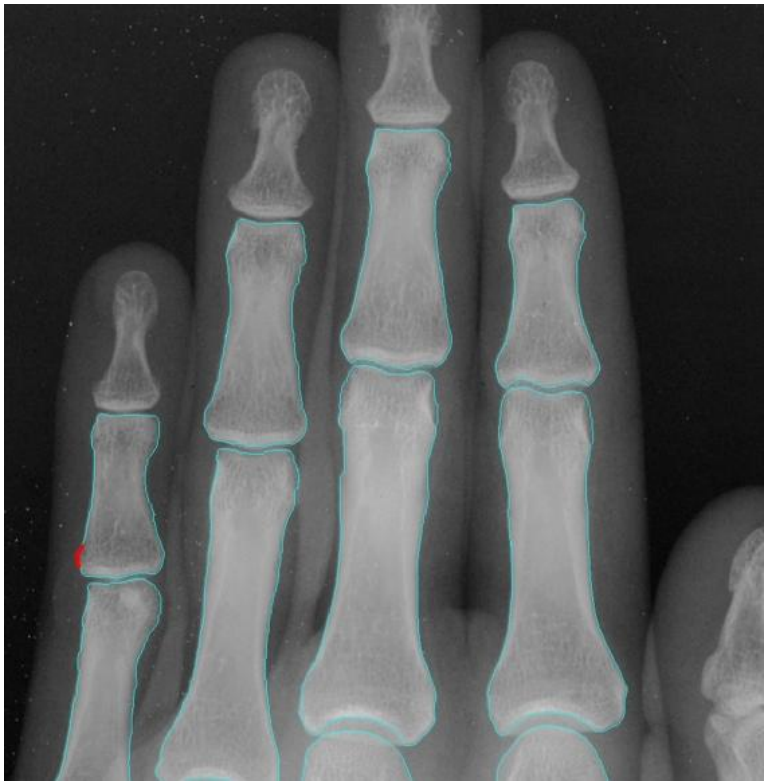
Project 2: Active Shape Models

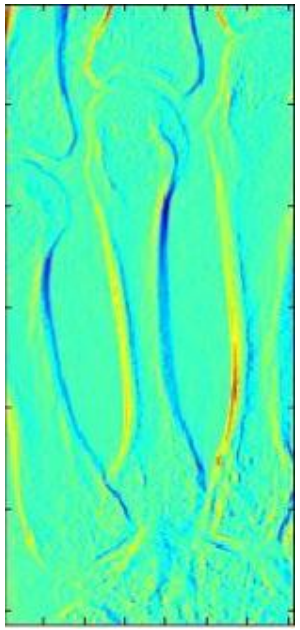


Title of the project:	**3: Particle Filter Segmentation**
Specification of the task:	Your task is to segment bones in 2D radiographs. We provide you with the radiographs and annotations, and would ask you to implement a (simplified!) segmentation algorithm based on Particle Filters. You need build the following parts for your system: * PCA shape model (use the landmarks in the "aligned" matrix) * Compute some image features (we suggest [[http://www.cognotics.com/opencv/servo_2007_series/part_2/sidebar.html|Haar-like wavelets]]) * Train a random forest on a subset of these features, using the Matlab TreeBagger class. * Implement (or download the official) Differential Evolution optimizer - or write your own * Implement a cost function which matches the shape to the classification probabilities
Availability of test/train data if required:	http://www.cir.meduniwien.ac.at/downloads/ssip2012/project2-asms.zip
Proposed readings:	
Proposed software:	
Contact:	Rene Donner

Project 3: Particle Filter Segmentation







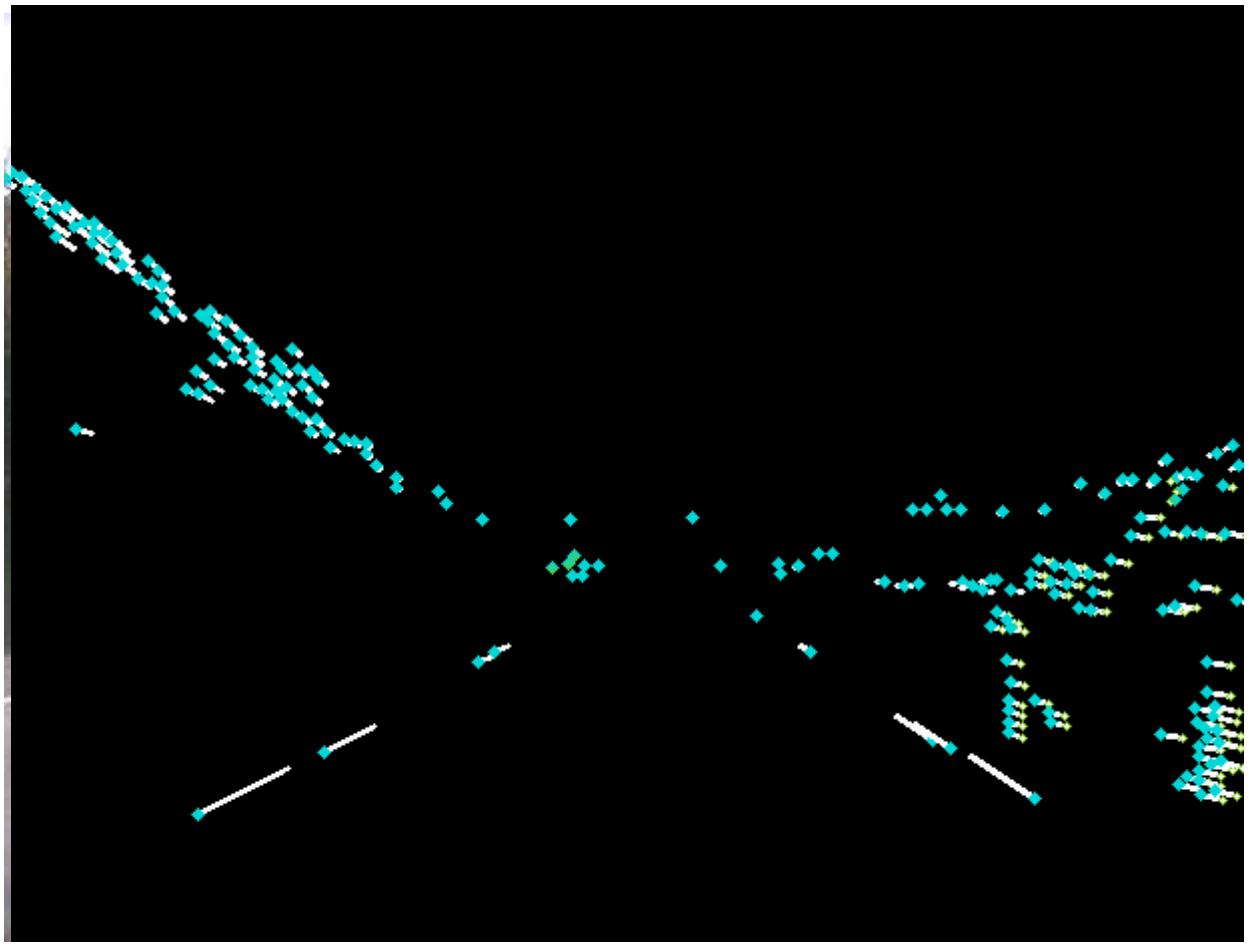
Title of the project:	**4: Cognitive 3D Indoor Scene Perception**
Specification of the task:	Load and pre-process the necessary 3D data (samples can be found on http://pointclouds.org/); - Segment out the major objects (tables, chairs, walls); - Try to find suitable object descriptors (corner/colour/feature descriptors) - Make a simple classification for the obtained set of objects.
Availability of test/train data if required:	http://pointclouds.org/
Proposed readings:	Available on-line documentation from the Point Cloud Library
Proposed software:	PCL/ROS (www.openperception.org)
Contact:	Levente Tamás

Title of the project:	**5: Restoration and Enhancement Degraded Mammograms Using Different Algorithms**
Specification of the task:	Students should take different mammograms from the database, make Fourier and inverse Fourier transforms and exercise different filter operation. Basic histogram manipulation of the mammogram like normalization, equalization, thresholding will be applied to increase image visibility and contrast. Convolution and deconvolution procedures with known Modulation Transfer Function will be applied for 'cleaning' the image. Other techniques known to student should be applied as well.
Availability of test/train data if required:	http://www.mammoimage.org/databases/
Proposed readings:	D. Narain Ponraj, M. Evangelin Jenifer, P. Poongodi, J. Samuel Manoharan, A Survey on Preprocessing Techiques of Mammogram for the Detection of Breast Cancer, Journal of Emerging Trends in computing and Information Sciences vol. 2, No2, 20011 www.cisjournal.org
Proposed software:	Matlab
Contact:	Slavoljub Mijovic

Title of the project:	**6: Intrusion detection**
Specification of the task:	Defining a volume segment (e.g. sphere) and any **intrusion** into this segment should be **detected** by analyzing the **3D** and **intensity** data (from Kinect sensor). Typical application scenarios for example: museum (protecting a displayed piece of art by vision sensors).
Availability of test/train data if required:	Use the Kinect sensor.
Proposed readings:	http://www.youtube.com/watch?v=m5uTH3S9P9g https://docs.google.com/file/d/0B3e4_6C5_YOjcmZpak12Q2MyZHM/edit?pli=1
Proposed software:	OpenCV, PointCloud Library
Contact:	Csaba Beleznai

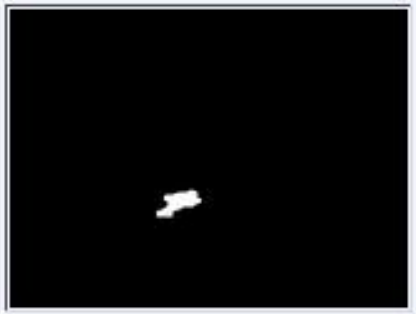
Title of the project:	**7: Left-item detection**
Specification of the task:	Using the Kinect data detect any addition and/or change in the observed scene involving objects left behind or moved.
Availability of test/train data if required:	Use the Kinect sensor.
Proposed readings:	http://www.youtube.com/watch?v=m5uTH3S9P9g https://docs.google.com/file/d/0B3e4_6C5_YOjcmZpak12Q2MyZHM/edit?pli=1
Proposed software:	OpenCV, PointCloud Library
Contact:	Csaba Beleznai

Title of the project:	**8: Independent motion detection**
Specification of the task:	There are several applications where we need to detect moving objects from a moving camera. There are approaches where some constraints help us in this task: the observed field of view is a smooth plane, the camera is calibrated or the ego-motion of the camera is known. Now the task is develop algorithms to detect camera independent motion with the minimal constraints. Use the test videos provided.
Availability of test/train data if required:	Test videos with groundtruth data will be handled to the team.
Proposed readings:	
Proposed software:	
Contact:	Mónika Gál



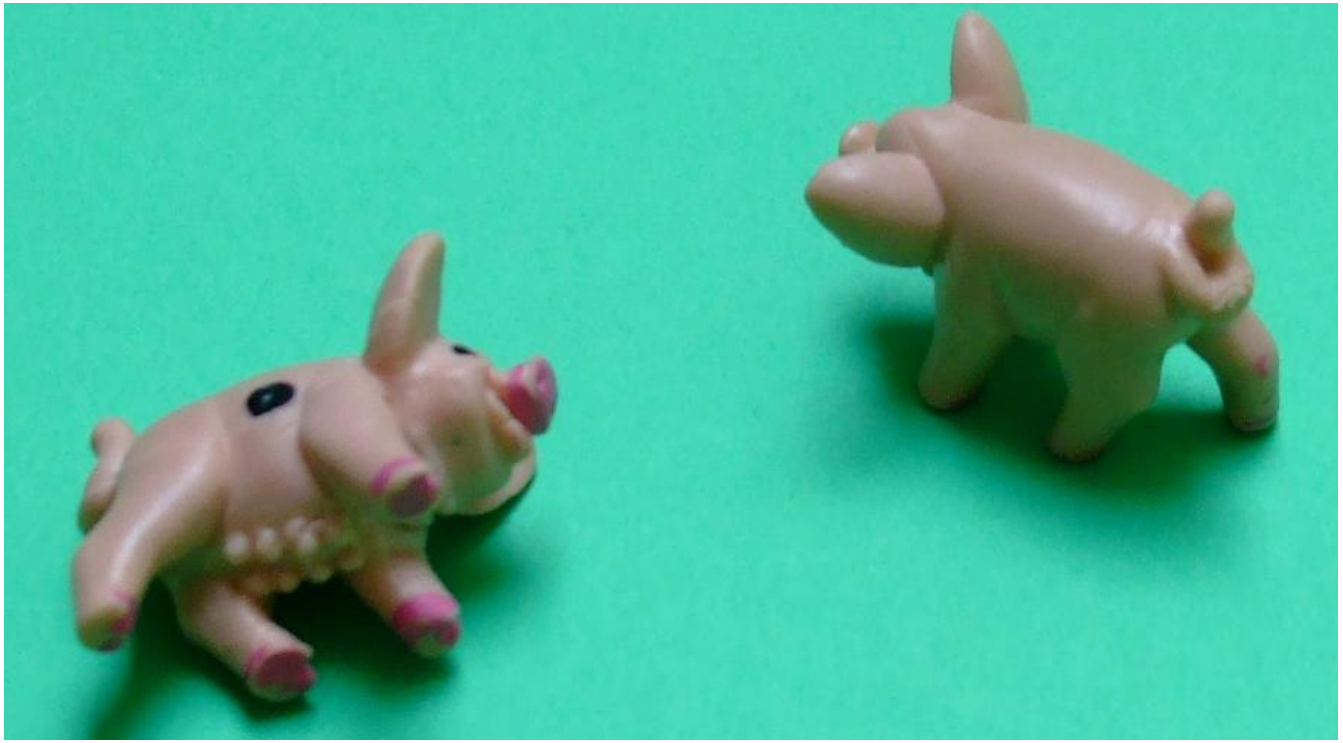
Title of the project:	**9: Shadow detection in videos**
Specification of the task:	Shadow areas can be misleading in surveillance applications.The task is to **detect shadow** areas, especially in videos. Try to develop an algorithm where the detection of shadow areas relies on **color** and the **motion** of neighboring moving regions.
Availability of test/train data if required:	http://web.eee.sztaki.hu/~bcsaba/FgShBenchmark.htm
Proposed readings:	
Proposed software:	
Contact:	Csaba Benedek

SZTAKI Benchmark set:

Seq.	Raw Data	Foreground GT	Shadow GT
SEAM (160 GT frames)			
SEPM (75)			
SENOON (251)			

Title of the project:	**10: Pass the Pigs**
Specification of the task:	Input: still color images with pig-like dices Objective: recognize the pig-dice values based on some fiexed poses the pigs landed in after the dice throw. Tasks to do: Try to classify the pig postures according to the possible fixed posterus and calculate the corresponding score. Input: still color images with pig-like dices Objective: recognize the pig-dice values based on some fiexed poses the pigs landed in after the dice throw. Tasks to do: Try to classify the pig postures according to the possible fixed posterus and calculate the corresponding score.
Availability of test/train data if required:	www.inf.u-szeged.hu/~palagyi/PassThePigs/
Proposed readings:	Rules and online playing: www.passthepigs.com/ http://old.toptrumps.com/play/pigs/pigs.html www.censusonline.net/games/pigs/passthepigs.html Probabilities: www.derepas.com/petco/
Proposed software:	
Contact:	Kálmán Palágyi

Test Images



www.inf.u-szeged.hu/~palagyi/PassThePigs/

Title of the project:	**11: Text segmentation in archive documents**
Specification of the task:	The task is to separate rows, columns and words in archive documents. The main problem in these pages is the overlapping of words and the noisy image of the text. The transparency of pages could be attacked.
Availability of test/train data if required:	The team will be served with JPG images of archive documents.
Proposed readings:	Likforman-Sulem, Laurence, Abderrazak Zahour, and Bruno Taconet. "Text line segmentation of historical documents: a survey." International Journal of Document Analysis and Recognition (IJDAR) 9.2-4 (2007): 123-138.
Proposed software:	
Contact:	László Czúni

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Title of the project:	**12 : Vehicle classification**
Specification of the task:	The task is to classify different types of vehicles at different video resolution. Possible classes are: bicycle, car, truck, bus. If the same vehicles appear it should also be detected. Recognition rate should be tested against resolution.
Availability of test/train data if required:	Video should be recorded near the University with a security camera given to the team.
Proposed readings:	Can start with motion segmentation: Stauffer and W.E.L. Grimson, “Learning Patterns of Activity Using Real-time Tracking”, IEEE Trans. on PAMI, 22(8): 747-757, 2000.
Proposed software:	
Contact:	László Czúni

Title of the project:	**13: Saliency detection**
Specification of the task:	Saliency detection is becoming very important in several application areas. Lossy video compression, human visual analysis need to know the visual attention in different scenarios. The task is the computation of visual saliency maps by the Itti method, comparison with visual fixation maps and STG saliency on video frames.
Availability of test/train data if required:	http://dept-info.labri.fr/~benois-p/WSImgProc2013/
Proposed readings:	http://ilab.usc.edu/publications/Itti_etal98pami.html,
Proposed software:	http://www.klab.caltech.edu/~harel/share/gbvs.php
Contact:	Jenny Benois Pineau