# POSTER SESSION BOOKLET


http://www.dmi.unict.it/icvss

University of Catania - University of Cambridge

International Computer Vision Summer School 2013

*Computer Vision and Machine Learning*

Sicily, 14-20 July 2013

## International Computer Vision Summer School

Computer vision is the science and technology of making machines that see. It is concerned with the theory, design and implementation of algorithms that can automatically process visual data to recognize objects, track and recover their shape and spatial layout.

The International Computer Vision Summer School - ICVSS was established in 2007 to provide both an objective and clear overview and an in-depth analysis of the state-of-the-art research in Computer Vision. The courses are delivered by world renowned experts in the field, from both academia and industry, and cover both theoretical and practical aspects of real Computer Vision problems.

The school is organized every year by University of Cambridge (Computer Vision and Robotics Group) and University of Catania (Image Processing Lab). The general entry point for past and future ICVSS editions is:

http://www.dmi.unict.it/icvss

## ICVSS Poster Session

The International Computer Vision Summer School is especially aimed to provide a stimulating space for young researchers and Ph.D. Students. Participants have the possibility to present the results of their research, and to interact with their scientific peers, in a friendly and constructive environment.

This booklet contains the abstract of the posters accepted to ICVSS 2013.

***Best Presentation Prize***

A subset of the submitted posters is selected by the school committee for short oral presentation. A best presentation prize is given to the best presentation selected by the school committee.

***Scholarship***

A scholarship is awarded to the best PhD student attending the school. The decision is made by the School Committee at the time of the School, taking into account candidates'cv, poster and oral presentation.

***Sicily, May 2013***

***Roberto Cipolla***
***Sebastiano Battiato***
***Giovanni Maria Farinella***

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# MIXED REALITY ENVIRONMENT FOR MISSION CRITICAL SYSTEMS SERVICING AND REPAIR

Abate A.F., Narducci F., Ricciardi S.

**Abstract:** Mixed Reality (MR) technologies are progressively becoming more diffused and accessible, though they often reveal many limitations when applied to challenging application environments. Specific requirements, such as tracking accuracy and coverage, augmentation strategies and interaction capabilities, determine whether a MR application is useful or not. We describe an MR environment aimed to improve the effectiveness of servicing and repairing procedures in mission critical systems.

**Contact:** fnarducci@unisa.it

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS1

# IMAGE GUIDANCE DURING LIVER TACE USING 2D/3DRA REGISTRATION

Ambrosini P., Moelker A., Ruijters D., Niessen W.J., van Walsum T.

**Abstract:** 2D/3D registration is a key technology in image guidance because it facilitates fusion of 2D X-ray images with 3D pre/intraoperative images. Several methods have been presented in literature. Here we describe a possible improvement of image guidance during TACE procedure using 3D rotational angiography (3DRA) and 2D X-rays. The idea is to extract the catheter in the 2D X-rays, extract blood vessels in the 3DRA and then fuse 2D/3D using the knowledge that the catheter is inside the blood vessels.

**Contact:** p.ambrosini@erasmusmc.nl

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS1

# PORTABLE PDMS ELISA TOOL

Anandan P., Bucolo M.

**Abstract:** Enzyme Linked Immuno-Sorbent Assay (ELISA) is a commonly used tool in clinical immunology. The drawbacks of this system is that often involves time consuming procedure, requires significant quantity of sample or reagents, and for the read-out could require a bulky instrumentation. The Optimiser microplate proposed on the market by the BioTek has combined the microfluidics technology with the standard SBS-configured 96-well microplate architecture. Being based on microfluidics this system allows the conservation of samples or reagents and, the improvement of the reaction kinetics, despite that a bulky instrumentation is still necessary for the fluorescent signal detection. Moreover recently in literature some case studies employs portable colorimetric detection systems (i.e. a cell phone ) to quantify biomarker. The presented activity combines the potentiality of both approaches with the advantages of low-cost micro-fabrication of multilayer polymeric miniaturized devices based on soft-lithography to design a PDMS ELISA tool. The chosen polymer is well known for its good optical properties, transparency and biological compatibility. A four layer PDMS platform similar to the traditional 96well architecture, but in which each well ends with a microfluidic spiral has been designed and an algorithm for the colorimetric detection based on image processing has been implemented. To test the feasibility of this system a standard enzyme linked immunosorbent assay to measure plasmatic dopamine level in samples obtained from an animal model of cardiac arrest has been performed by using a 96 well polystyrene plate coated with a commercially available primary antibody specific for dopamine. The absorbance measured at 450nm using a multi-well plate reader were compared with the results obtained through the image processing procedure.

**Contact:** princia.ece@gmail.com

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

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**Room:** PS1

# VISUAL MONITORING OF ACTIVITY FOR HUMAN STATE ESTIMATION

Anishchenko S., Vtyurina A., Petrushan M., Shaposhnikov D.

**Abstract:** The operator often becomes the least reliable element in complex man-machine systems because of a person's fatigue and drowsiness. Therefore, the task of contactless monitoring of human functional state is crucial. The fatique and drowsiness are reflected in person's motor activity which can be assessed visually. In this work the set of visually registered attributes of human activity has been assessed for using in the task of humans' state estimation.

**Contact:** sergey.anishenko@gmail.com

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS1

# CODING VIDEO SEQUENCES OF VISUAL FEATURES

Baroffio L., Cesana M., Redondi A., Tubaro S., Tagliasacchi M.

**Abstract:** Visual features provide a convenient representation of the image content, which is exploited in many applications. In several cases, visual features need to be transmitted over a bandwidth-limited network. We propose an efficient coding architecture designed for local features extracted from video content. We exploit both spatial and temporal redundancy by means of intra-frame and inter-frame coding modes. In addition, we propose a coding mode decision based on rate-distortion optimization.

**Contact:** baroffio@elet.polimi.it

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS1

# LIVELAYER REAL-TIME PROJECTION OF TRAFFIC VIDEO ONTO MAPS

Berger K, Walton S, Ebert D, Chen M

**Abstract:** Real-time Projection of Traffic Video onto Maps: The system is developed using Qt, with (a)synchronous interaction with Google Maps via the Java-Script communication model supplied by QWebFrame. OpenGL is used for rendering and OpenCV for the homography matrix computations. The fragment shaders are implemented in GLSL.The computed homography matrix is passed to fragment shaders to map the texture coordinates of projected roads into the frames of the video stream. A multi-scale adaptive refinement system is used on most CPU-heavy components to ensure that the most suitable rendering quality.

**Contact:** kai.berger@oerc.ox.ac.uk

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS1

# GLACIER MONITORING BASED ON SATELLITE IMAGERY

Blaha M., Vogel C., Schindler K.

**Abstract:** We attempt to provide accurate and automated methods for continuous glacier monitoring based on optical satellite imagery. So far we have focused on registration of challenging spaceborne imagery. While an adapted version of SIFT is in many cases successful, a significant amount of failure cases still needs to be addressed.

**Contact:** maros.blaha@geod.baug.ethz.ch

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS1

# IMAGE PREPROCESSING OF LARGE DATA SETS DURING FLY WING DEVELOPMENT

Blasse C., Myers G.

**Abstract:** Using time-lapse microscopy, the developmental process of a fly wing can be recorded. Here we present a new pipeline to efficiently preprocess and enhance the acquired data. A novel algorithm projects the apical band of monolayer tissues into 2D images containing all signals of cell boundaries. To address uneven illumination in tiled images, we designed a contrast adjustment using a flat field correction and a linear intensity scaling. The final preprocessing projects, optimizes, stitches and filters the raw images to provide optimal conditions for successive segmentation.

**Contact:** blasse@mpi-cbg.de

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

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# MOBILE, COLLABORATIVE AUGMENTED REALITY IN THE CLOUD

Bohez S., De Turck J.

**Abstract:** Mobile applications have been evolving towards fully interactive and collaborative multimedia experiences. This is however hindered by the limited capabilities of mobile devices, such as processing power. The cloudlet concept, where additional computing resources are freely available in the network edge, is a solution to deliver these multimedia experiences. Our work focuses on collaborative applications and autonomic configuration. As a use case, we developed a distributed augmented reality game based on PTAM capable of collaboration and basic interaction with the environment.

**Contact:** Steven.Bohez@UGent.be

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS1

# IMAGE PROCESSING IN DROPLET MICROFLUIDICS

Brandes S., Figge M.T.

**Abstract:** In the field of droplet-based microfluidics, pL-droplets as high-throughput screening platforms for Actinobacteria are emerging. Therefore, novel methods for automatic droplet investigation in real-time become an increasing need. We demonstrate an image processing approach for label-free droplet analysis, including Actinobacteria detection, size determination, and tracking.

**Contact:** susanne.brandes@hki-jena.de

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS1

# DANCO: AN INTRINSIC DIMENSIONALITY ESTIMATOR

Ceruti C., Bassis S., Rozza A., Lombardi G., Casiraghi E., Campadelli P.

**Abstract:** The estimation of intrinsic dimensionality of a given dataset has gained considerable attention due to its relevance in several application fields. Unfortunately, most of the proposed solutions prove to be unreliable when facing non linear embedding and high values of intrinsic dimensionality. DANCo is a novel robust intrinsic dimensionality estimator that exploit the twofold complementary information conveyed both by the normalized nearest neighbor distances and by the angles computed on couples of neighboring points.

**Contact:** claudio.ceruti@unimi.it

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS1

# LANGUAGE MODEL FOR HANDWRITTEN TEXT RECOGNITION WITH OUT-OF-THE-DICTIONARY WORDS

Cirera N., Forns A., Frinken V. , Llads J.

**Abstract:** We present a hybrid language model for the recognition of handwritten historical documents with a structured syntactical layout. Using a hidden Markov model-based recognition framework, a word-based grammar with a closed dictionary is enhanced by a character sequence recognition method. This allows to recognize out-of-dictionary words in controlled parts of the recognition, while keeping a closed vocabulary restriction for other parts.

**Contact:** ncirera@cvc.uab.es

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

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**Room:** PS1

# A TRANSFER LEARNING APPROACH FOR MULTI-CUE SEMANTIC PLACE RECOGNITION

Costante G., Ciarfuglia T., Valigi P., Ricci E.

**Abstract:** As robotic systems need to be able to move into the the wild, the interest towards novel learning paradigms for domain adaptation has increased. In the specific application of semantic place recognition we propose a transfer learning approach to decide if and how much knowledge to transfer between different scenario. Differently from previous approaches we deal with environments with very different categories and we propose a novel method to merge informations from multiple visual cues.

**Contact:** gabriele.costante@gmail.com

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS1

# LINE DETECTION VIA AN EM ALGORITHM

Cruz F., Ramos Terrades O.

**Abstract:** This work presents a handwritten line segmentation method devised to detect multi-oriented lines on docu- ments composed of several regions. The method is based on a variation of the EM algorithm for the estimation of a set of regression lines between the connected components that com- pose the text. The evaluation of the method showed promising results on well-known benchmark datasets.

**Contact:** fcruz@cvc.uab.es

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS1

# CAST SHADOWS AND SELF SHADOWS DETECTION IN NATURAL IMAGES

Davesa, C., Baldrich, R.

**Abstract:** We investigate a new method for cast and self shadow detection. Detecting shadows would allow to create a new image representation where further methods could obtain better results, as multi illuminant estimation, object detection or scene understanding. We propose a method based on regions: first we segment the images in superpixels [1] and then we group them creating regions with similar features using the dendrogram technique. We assume that the relation between a shadow region an a non shadow region from the same surface is the same for all surfaces. Due to the databases available only take into account the cast shadows, we only have preliminary results.

**Contact:** cdavesa@cvc.uab.es

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS1

# DETECTION AND TRACKING OF CLOUDS USING GROUND-BASED CAMERA SYSTEMS

Dev S., Lee Y. H., Winkler S.

**Abstract:** High-frequency ground-to-air (e.g. satellite) communication links may be greatly affected by cloud coverage -Using ground-based cameras, the project aims to detect clouds, cloud type, cloud cover, cloud bottom altitude, cloud motion and other parameters -Corroborate image analysis findings with satellite, radar, and weather data

**Contact:** soumyabr001@e.ntu.edu.sg

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS1

# IMAGE ANALYSIS OF BACTERIAL COLONIES ON SOLID AGAR

Ferrari A., Signoroni A.

**Abstract:** The role of image processing and classification methods to the analysis of microbiological images of bacteria cultures on solid agar plates is gaining importance in the context of the technological advancements in the field of microbiological laboratory automation systems. The objective of this work is to detect and classify bacterial colonies which grow on chromogenic agar. Before to propose a particular implementation, we define a modular and reconfigurable solving approach, where a sequence of basic task modules (preprocessing, bacterial growth segmentation, single colony identification, bacteria recognition) are described in their role, connections with other modules and verification requirements. The complex nature of the problem to solve also suggested us to find and indicate a coherent way to exploit machine learning approaches in each of the task modules (except from the preprocessing one). The proposed image analysis system is a particular realization of the above framework for which we provide a complete (single task and global) experimental evaluation. In particular, a classification-based segmentation approach has been implemented in order to discard undesired segments and to preserve only segments actually involving bacterial growth. The results of this module have been processed then by an additional classification module, selecting all segments containing isolated colonies, not confluential with others, so that the successive modules may perform colonies classification based on morphological features. Once that isolated colonies have been detected, a final feature-based classification module carries out bacteria recognition based on specific morphological appearance criteria. The whole system allowed to distinguish different bacteria species with encouraging classification performance. Together with the results of the classification system, a first release of an image database for algorithm benchmarking of bacterial colonies on chromogenic solid agars is presented, with images collected in a real clinical scenario: the laboratory automation system installed at the Niguarda Hospital of Milan.

**Contact:** alessandroferrari87@gmail.com

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS1

# AUTOMATIC FACE MODELING FROM LASER SCANNER

Fratarcangeli M., Aburumman N.

**Abstract:** Facial Modeling is among the fastest developing technologies in the field of computer graphics. Therefore, we propose an efficient automatic algorithm for modeling 3D virtual faces based on finding the correspondences between the landmarks on the input laser scan and a template face mesh without any reliance on texture information. Using our method, we obtain 3D virtual faces with topological properties suited for facial animation.

**Contact:** aburumman@dis.uniroma1.it

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS1

# GENERALISED PERSPECTIVE SHAPE FROM SHADING IN SPHERICAL COORDINATES

Galliani S., Ju Y. C., Breu M., Bruhn A.

**Abstract:** We consider a general Shape from Shading scenario based on a perspective camera, where the light source can be po- sitioned anywhere in the scene. To this end, we propose a novel SfS model that is based on a Hamilton-Jacobi equa- tion formulated in terms of spherical coordinates. On the numerical side, the formulation as Hamilton-Jacobi equa- tion enables us to develop a specifically tailored variant of the fast marching method.

**Contact:** gsilvano@ethz.ch

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS1

# MONITORING MOTION OF PIGS

Gronskyte R., Kulahci M., Clemmensen L., HviidM.

**Abstract:** Animal well-being has become a concern for consumers and it has been suggested that the stress level of pigs before slaughter influences meat quality. To ensure animal well-being the pigs should be constantly monitored and in case of a stressful situation actions should be taken. A lot of research has been done in human crowd monitoring and human action recognition, however most of the methods cannot be directly applied to animals. There are several reasons for this. The first and the most obvious reason is the different appearance and conditions of the scenes. Also there is no clear definition of normal and abnormal pig behavior. It is important that the method can work on-line and can be interpreted easily. This will allow one to react in time to ensure animal well-being. The first part of my research is to identify and define stationarity and movement of pigs. For this analysis I used thermal videos of pigs filmed in constrained area walking from left to right. However, some pigs can change direction or stop walking. Such event can block movement for other pigs that can cause unnecessary stress for the animals. The classification becomes challenging because some pigs can slow down or stop for a short time to sniff around. Also most pigs look similar in the thermal videos. Our suggested method combines visual analysis and principals of quality control for a fast and easy overview of a scene (a collection of consecutive frames). In the visual analysis step optical flow and blob detection were used. From the optical flow only the optical flow vectors within the blobs were used for further analysis. This ways we select only those optical vectors that represent pig movement. Selected optical flow vectors were quantified using histograms of the angle and length. The two histograms were used in the quality control step. Multivariate principal component analysis was used to provide an overview of a scene. A special unfolding technique was used on the data such that the ordinary principal component analysis algorithm could be applied. The results of a scene were presented in a score plot using the first two principal components. In a training stage the analyzed data was used to compute confidence intervals for the score plot. The suggested method can classify 66

**Contact:** rgro@dtu.dk

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

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# OBJECT CLASSIFICATION WITH SPATIAL VISUAL WORDS

Grzeszick R., Rothacker L., Fink G. A.

**Abstract:** Spatial information is a key aspect of object classification with Bag-of-Features approaches. Spatial Visual Words directly include this information at feature level. They represent similar appearance features in roughly the same spatial region. Spatial Visual Words allow building small but specific codebooks for each region. The approach is therefore able to reduce the dimensionality of the representation compared to Spatial Pyramids.

**Contact:** rene.grzeszick@udo.edu

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS1

# INFLUENCE OF IMAGE REGISTRATION ON THE REPRODUCIBILITY OF ADC IN FREE-BREATHING DIFFUSION MRI OF THE ABDOMEN

Guyader J.-M., Bernardin L., Douglas N., Poot D. H. J., Niessen W. J., Klein S.

**Abstract:** Misalignments in DW-MRI datasets can cause errors in ADCs (apparent diffusion coefficients), especially in abdominal free-breathing acquisitions. We aim to increase the relevance of the ADC in cancer research by developing an image registration pipeline. It compensates for motion within each image and brings all the MRIs to a unique image space. ADCs are then extracted using a maximum likelihood estimator. Our pipeline proves to have a positive effect on the reproducibility of ADCs.

**Contact:** j.guyader@erasmusmc.nl

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS2

# TOWARDS AUGMENTED GALLERY GUIDE

Haladova Z., Sikudova E., Boylos C.

**Abstract:** Nowadays, there is a strong interest in the interactive/augmented mobile guides which utilize different methods for the recognition (visual, emitters/detectors...) and the registration of interesting objects. We introduce new pipeline of visual recognition and registration using both local and global features. We achieve the speed up of the process by minimizing the number of local feature comparisons. We are working on the AR library for Android devices which implements the proposed pipeline.

**Contact:** zhaladova@gmail.com

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS2

# AUTOMATIC CLASSIFICATION OF FUNDUS IMAGES

Hamad H.

**Abstract:** The retina is easily depicted throw fundus images giving an additive credit to analyze it. To identify the morphological properties of the vessels in the retina many methods were suggested to estimate the segmentation, on the other hand, others worked on classifying vessels into arteries and veins. The proposed method starts from the segmented image, detects vessel trees, and then identifies the arteries and veins. This poster describes our classification approach and the difficulties we are facing.

**Contact:** hadi.hamad@math.unipa.it

**Presentation Type:** Poster

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**Time:** 21:30

**Room:** PS2

# TOWARDS A VISUAL GYROSCOPE

Hartmann W., Havlena M., Schindler K.

**Abstract:** Visual camera pose estimation is currently an active research topic in the fields of computer vision, photogrammetry and robotics. We propose a rotation-only SLAM approach for handheld navigation and ranging systems based on a single fisheye camera, aimed at replacing unreliable magnetic compasses or low-grade IMUs prone to drift. We aim at an accuracy level of 0.5 degrees. We have evaluated our preliminary method on realistic outdoor data and compare it with VisualSFM.

**Contact:** hartmann@geod.baug.ethz.ch

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS2

# EFFICIENT INDOOR SEMANTIC SEGMENTATION USING RANDOMIZED DECISION FORESTS

Hermans A.

**Abstract:** We propose an efficient semantic segmentation pipeline, based on Randomized Decision Forest (RDF) classifiers and fully connected Conditional Random Fields. RGB-D images from a Kinect sensor are used to improve the classification accuracy of the RDF classifiers and to obtain a semantic 3D point cloud reconstruction of a scene. We extensively evaluate our approach on indoor scenes and show how the classification accuracy of these can be improved to achieve state-of-the-art performance.

**Contact:** Alexander.Hermans0@gmail.com

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS2

# SMOOTHING POSTERIOR PROBABILITIES WITH DIRICHLET PARTICLE RILTER OF FOR STABILIZING COLORECTAL NBI ENDOSCOPY RECOGNITION

Hirakawa T.

**Abstract:** This poster proposes a method for smoothing the posterior probabilities obtained from classification results of time series input. We deal with this problem as a filtering problem with Dirichlet distribution and develop a particle filtering for this task. As a practical example of smoothing, we apply the proposed method to stabilizing NBI endoscopy recognition results over time. Experimental results demonstrate that our approach can effectively smooth highly unstable probability curves.

**Contact:** hirakawa@eml.hiroshima-u.ac.jp

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS2

# MODEL-BASED FACIAL FEATURE DETECTION AND FACE ANALYSIS

Huber P., Kittler J., Christmas W., Dugelay J.-L., Rtsch, M.

**Abstract:** Most existing approaches for face and facial feature detection are limited to a range of up to half-profile view. Only recently, more holistic approaches [1] have been published able to cope with uncontrolled scenarios. We adapt a WVM detector [2] from face to facial feature detection and improve the accuracy combining it with a 3D face model [4]. In a first step we use the landmarks with a tree (ERT, [3]) for head pose estimation up to full profile and show the influence of displaced features.

**Contact:** p.huber@surrey.ac.uk

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

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**Room:** PS2

# EDUSAFE: EDUCATION IN ADVANCED VR/AR SAFETY SYSTEMS FOR MAINTENANCE IN EXTREME ENVIRONMENTS

Itoh Y., Lakshmiprabha N. S., Crivellaro A., and Abdallah A.

**Abstract:** EDUSAFE [1] is a Marie Curie ITN project focusing on research into the use of Virtual and Augmented Reality (VR/AR) during planned and emergency maintenance in extreme environments. Our goal is to develop a usable Wireless Personnel Safety System (WPSS). It is integrated with wearable VR/AR techniques. A prototype system will be implemented and tested by the personnel of LHC at CERN.

**Contact:** yuta.itoh@in.tum.de

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

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**Room:** PS2

# THE INTERACTIVE MOTHER MACHINE – A CRF APPROACH FOR SIMULTANEOUS CELL SEGMENTATION AND CELL TRACKING

Jug F., Myers G.

**Abstract:** We describes an approach for simultaneous cell segmentation and cell tracking of bacteria held in narrow growth-lines (GL). Our model includes real-world knowledge like (i) a pixel intensity measure along the GL, (ii) the migration speed of cells, (iii) the continuity of size and growth rate, and (iv) volume conservation and symmetry of cell divisions. We find the MAP assignment by solving a minimization problem in the log-likelihood domain using an integer linear program solver.

**Contact:** jug@mpi-cbg.de

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS2

# LOW-LATENCY AND REAL-TIME TRACKLET CLUSTERING WITH INCOMPLETE DETECTIONS

Julien V.

**Abstract:** Current tracklet clustering algorithms have a high latency, are computationally complex and are not suitable for real-time surveillance. We propose novel techniques to limit the number of tracklets and connection updates between tracklets. The algorithm yields only two avoidable false positives on the i-LIDS SZTE dataset. The worst-case execution time on a popular DSP is only 54 ms per frame and only 35 seconds are required to process the complete i-LIDS dataset on a PC.

**Contact:** j.a.vijverberg@tue.nl

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS2

# ITERATIVE HYPOTHESIS TESTING FOR MULTIPLE OBJECT TRACKING WITH NOISY/MISSING APPEARANCE FEATURES

KC A. K., Delannay D., Jacques L. and De Vleeschouwer C.

**Abstract:** We propose an iterative hypothesis testing framework to track multiple targets. It can exploit appearance features even if they are sporadic or unreliable. It iteratively considers each node as a key-node and hypothesizes that the appearance of a target is defined by the key-node appearance. Doing so, it allows favoring the nodes that have similar appearance than the key-node. A shortest path is computed to test the hypothesis, and is validated only if it is sufficiently better than other paths.

**Contact:** amit.kc@uclouvain.be

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS2

# INVERSE RAYTRACING FOR SHAPE FROM REFRACTION

Kettern, M.

**Abstract:** The shape of transparent objects cannot be reconstructed by standard methods without calibrated projection of a lighting pattern onto the surface since surface correspondences cannot be established otherwise. We investigate how this reconstruction can be achieved by examining the distortion of the scene behind the object introduced by refraction. We propose two reconstruction schemes for different types of objects and setups based on a framework of inverse raytracing.

**Contact:** markus.kettern@hhi.fraunhofer.de

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

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**Room:** PS2

# DETECTION OF MOVING OBJECTS WITH A MOVING CAMERA

Kim S.W., Yun K., Yi K.M., Kim S.J., Choi J.Y.

**Abstract:** We present a fast and reliable method for moving object detection with moving cameras. Instead of a large panoramic background model, we construct a small-size background model with a novel single spatio-temporal distributed Gaussian model to decrease computation time and memory. Our model can solve registration error and background adaptation problem in moving background. Several pre- and post- processing methods are adopted and organized systematically to enhance the detection performances.

**Contact:** soowankim@snu.ac.kr

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

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**Room:** PS2

# LABEL PROPAGATION METHODS FOR FETAL BRAIN SEGMENTATION

Koch L., Rueckert D.

**Abstract:** Recent advances in fetal MR imaging further fuel research of neurological development before birth. This work explores label propagation methods for the segmentation of anatomical structures in the fetal brain. Preliminary experiments investigate the effect of atlas selection on segmentation accuracy. Results show decreased accuracy for dissimilar images and justify a stepwise propagation approach.

**Contact:** l.koch@imperial.ac.uk

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS2

# SEMI-AUTOMATIC SHOEPRINT MATCHING

Kortylewski A., Albrecht T., Vetter T.

**Abstract:** Scene of crime shoeprint marks can be a valuable evidence for a crime investigator if the type of the shoe can be identified. One of the main drawbacks in most previous works on shoeprint classification is the assumption of a simple gaussian noise model [1], [2]. In real cases the noise distortions are highly unconstrained and extremely different from such simple noise models. Another main drawback of most previous works is that they are not scale, rotation and translation tolerant [3]. In this work we present a semi-automatic approach to shoeprint matching which is tolerant to rigid transformations and works on real case data.

**Contact:** adam.kortylewski@unibas.ch

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS2

# PROBABILISTIC LABELING COST FOR HIGH-ACCURACY MULTI-VIEW RECONSTRUCTION

Kostrikov I., Horbert, Leibe B.

**Abstract:** We propose a novel labeling cost for globally optimal continuous optimization for multi-view reconstruction. Existing approaches use data terms that are vulnerable to common challenges, such as low-textured regions or specularities. Our new probabilistic method implicitly discards outliers and can be shown to become more exact the closer we get to the true object surface. Our ap- proach achieves top results among all published methods on the Middlebury Dino Sparse dataset.

**Contact:** ilya.kostrikov@rwth-aachen.de

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

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**Room:** PS2

# VIDEO QUALITY ASSESSMENT FOR SIGN LANGUAGE

Kucerov J., Tarcsiov D., Polec J.

**Abstract:** Visual information is very important in human perception of the surrounding world. Video is one of the most common ways to capture it. The utilization of video has many benefits and can be used in various applications. For the most part, the video information is used to bring entertainment and help to relax. However, it can improve the quality of life of deaf people. Visual information is crucial for hearing impaired people, since it allows them to communicate personally, using the sign language. Some parts of the speaking person are more important than others (e.g. hands, face). Therefore, the information about visually relevant parts of the image allows us to design an objective metric for video quality assessment in this particular case. We present an example of such a metric based on human visual attention and detection of salient regions in the observed scene.

**Contact:** kucerova@sccg.sk

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS2

# FILTER-BASED ROBUST CALIBRATION FOR AN IMU AND A CAMERA

Lee C., Yoon J., Yoon K.

**Abstract:** The fusion of Inertial Measurement Units (IMUs) and cameras is useful in many visionbased applications. Recently popularized low-cost IMUs accelerate the fusion of them. However, measurements of the low-cost IMUs are extremely inaccurate. It naturally degrades the performance, accuracy, and reliability of IMU-camera calibration. We present the filterbased robust IMU-camera calibration method to IMU uncertainty. The experimental results on both simulated and real data validate the superiority of the new calibration method.

**Contact:** crlee@gist.ac.kr

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

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**Room:** PS2

# EFFICIENT NONLINEAR MARKOV MODELS FOR HUMAN MOTION

Lehrmann A., Gehler P., Nowozin S.

**Abstract:** Dynamic Bayesian networks such as Hidden Markov Models are successfully used as models for human motion. However, inference is approximate and requires expensive procedures like particle filters or Markov Chain Monte Carlo methods. In this work we replace the latent space by a highly expressive Markov model. We propose a higher-order Markov model based on autoregressive tree ensembles (ARTE) which is non-parametric, non-linear, conditional, and multimodal. We retain exact O(1) filtering inference and O(T) computation of log-likelihoods.

**Contact:** andreas.lehrmann@tue.mpg.de

**Presentation Type:** Poster

**Date:** Monday 15 July 2013

**Time:** 21:30

**Room:** PS2

# SENSOR FUSION METHODS FOR MOTION TRACKING

Ligorio G., Sabatini A.M.

**Abstract:** INTRODUCTION In the last few years, a growing attention has being paid to hybrid tracking systems. In fact, no-one of the stand-alone tracking technologies can presently fulfill, at the same time, the requirements of accuracy, promptness of response and robustness of many applications. In particular, the great deal of complementarity between inertial sensors and vision-based systems makes their fusion, which has the oculo-vestibular system as a biological counterpart, very appealing. The main topic of this research is to develop cooperation strategies between these sensors in different application fields, such as navigation and human motion tracking. NAVIGATION In the first part of this work, two Extended Kalman Filters (EKF) were created to tightly couple inertial/magnetic and vision system and track the 6 DOF camera ego-motion. The experimental setup consistednof an off-the-shelf webcam and an Xsens MTx Inertial Measurement Unit (IMU). The software, instead, was developed with Matlab. In both filters, inertial sensors predicted new features locations, saving computing load with respect to the Lucas-Kanade Tracker (KLT). However, the different implementation of the EKF visual channel influences the trade-off between accuracy and promptness of the overall architecture. The following table shows the Root Mean Square (RMS) errors, with respect a ground truth, both for theorientation ([]) and position ([mm]): RMS Errors EKF 1 EKF 2 Orientation 1.08 (0.13) 1.46 (0.25) Position 3.40 (1.10) 10.00 (1.75) HUMAN MOTION TRACKING Inertial sensors can convey information about gravity direction in the image plane, which can be particularly useful in gait analysis: due to the planarity of the motion, angles between body segments and gravity can be estimated with a simple 2D cross product. The tracking stage is performed by wrapping the CamShift tracker within an EKF containing a simple gait model. The system consisted of an off-the-shelf webcam and an Xsens MTx IMU, while the software is being developing in C++ environment, by using OpenCV 2.4. OUTLOOKS Both system are being improved in the following ways: - Development of a multithread real-time strategy with different tasks (frame acquisition, inertial reading, data processing); - Hardware synchronization of all sensors; - Navigation within an unprepared environment and markerless tracking; - Application of different stocastic filtering techniques such as particle filters;

**Contact:** g.ligorio@sssup.it

**Presentation Type:** Poster

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**Room:** PS2

# RAPID ROOM UNDERSTANDING FROM WIDE ANGLE VISION

Lukierski R, Davison A.

**Abstract:** This work aims to develop techniques for rapid indoor scene understanding based on an omnidirectional vision system for computer vision and robotics applications. On the basic level it might be only a geometric map that enables the robot to navigate and localize itself purely based on the camera input. However, this sort of understanding may still lack the abstract level of information (e.g. semantic labeling, object detection) that the robot might need to be able to perform its tasks.

**Contact:** r.lukierski12@imperial.ac.uk

**Presentation Type:** Poster

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**Room:** PS2

# EXTENDED FIELD ITERATIVE RECONSTRUCTION TECHNIQUE (EFIRT) FOR CORRELATED NOISE REMOVAL FROM 3D RECONSTRUCTIONS

Mahmood F., fverstedt, L.G., Skoglund U.

**Abstract:** 3D Structure determination is vital for understanding the functionality of macromolecules. Cryo-electron tomography is an electron microscopy technique, which can be used to determine such structures. These 3D reconstructions encounter 3 types of noise, shot noise, specimen noise, and correlated noise. This study presents a technique which can be used to reduce correlated noise, which increases the resolution and reveals hidden structural information. It has been applied for structure determination of inorganic nanoparticles and a receptor protein.

**Contact:** faisal.mahmood@oist.jp

**Presentation Type:** Poster

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**Room:** PS2

# UNCALIBRATED DYNAMIC STEREO USING PARALLAX

Malapelle F., Fusiello A., Rossi B., Piccinelli E., Fragneto P.

**Abstract:** We present a novel method for computing parallax maps from monocular and uncalibrated video sequences. Frames are processed pairwise, keeping the first as reference and progressively integrating information coming from subsequent frames using a Kalman filter. Temporal stabilization of generated maps is obtained, as well as more consistency with the video content. Findings coming from the benchmark of the system show significant improvements over the maps obtained without temporal integration.

**Contact:** francesco.malapelle@gmail.com

**Presentation Type:** Poster

**Date:** Tuesday 16 July 2013

**Time:** 21:30

**Room:** PS1

# MOBILE AND INTERACTIVE AUGMENTED REALITY FOR DRIVING ASSISTANCE

Minh Tien P., Indira T., Vincent F., Vronique C.

**Abstract:** Taking into account the drivers state is amajor challenge for designing new advanced driver assistance systems. We present a driver assistance system strongly coupled to the user. RAMIAC stands for Mobile and Interactive Augmented Reality for driving assistance. It is an augmented reality interface powered by several sensors. The detection has two goals: one is the position of obstacles and the quantification of the uncertainty of the detection. The other is the drivers behavior. A suitable visualization metaphor allows the driver to perceive at any time the location of the relevant hazards while keeping his eyes on the road. First results show that our method could be applied to a vehicle but also to aerospace, fluvial or maritime navigation.

**Contact:** mrtienminhphan@gmail.com

**Presentation Type:** Poster

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**Time:** 21:30

**Room:** PS1

# ANOMALOUS EVENT DETECTION USING A SEMI 2D-HMM

Nallaivarothayan H., Ryan D., Simon D., Sridharan S., Fookes C.

**Abstract:** Many researchers have tried various sets of features to train different learning models to detect abnormal behaviour in video footage. In this work we propose using a Semi-2D HMM to model the normal activities of people. The outliers of the model with insufficient likelihood are identified as abnormal activities. Our Semi-2D HMM is designed to model both the temporal and spatial causalities of the crowd behavior by assuming the current state of the HMM depends not only on the previous state in the temporal direction, but also on the previous states of the adjacent spatial locations.

**Contact:** h.nallaivarothayan@qut.edu.au

**Presentation Type:** Poster

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**Room:** PS1

# TRACKING FOR QUANTIFYING SOCIAL NETWORK OF DROSOPHILA MELANOGATER

Nath T., Liu G., Weyn B.,De Backer S., Scheunders P.

**Abstract:** We introduce the FlyTracker algorithm for tracking and quantifying the social network of Drosophila Melanogaster. It is a fully automated software for detecting and tracking multiple flies using low resolution video. The algorithm segments and tracks the flies using prior knowledge on the number of flies to detect. This allows FlyTracker to improve on the results of current state of the art fly tracking algorithm (CTrax). We demonstrate that the algorithm is able to track flies in low resolution with better accuracy and thus providing an aid in quantifying thier obscured social network.

**Contact:** tanmay.nath@ua.ac.be

**Presentation Type:** Poster

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**Room:** PS1

# ACCURATE 3D RECONSTRUCTION FROM SELECTIVE CAMERA ARRAY

Nishioka Y., Sakaue F., Sato J.

**Abstract:** For reconstructing 3D objects from a camera array, all the cameras are in general used for accurate reconstruction. However, if we use the linear reconstruction method, it is not the best way. Also, the best combination of cameras depends on the position of the 3D point. Thus we propose a method for reconstructing 3D points accurately by deriving optimal combination and weight of multiple cameras for each 3D point in advance. By using the proposed method, we can obtain highly accurate 3D reconstruction from the linear reconstruction method.

**Contact:** nishioka@cv.nitech.ac.jp

**Presentation Type:** Poster

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**Room:** PS1

# D-SB GPLVM FOR MOCAP BASED ACTION RECOGNITION

Ntouskos V., Papadakis P., Pirri F.

**Abstract:** We address the problem of recognizing human actions in MoCap sequences. We introduce a method based on Gaussian Process Latent Variable Models and Alignment Kernels. We employ a latent variable model with back-constraints induced by the similarity of the original sequences. The proposed method is compared with classification based on Dynamic Time Warping and with the recently proposed V-GPDS model. Our method gives satisfying results even for datasets which have not been manually preprocessed and provides the possibility of fast inference be exploiting the back constraints.

**Contact:** ntouskos@dis.uniroma1.it

**Presentation Type:** Poster

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**Room:** PS1

# SINGLE TREE SPECIES IDENTIFICATION FROM T-LiDAR DATA FOR FOREST INVENTORY

Othmani A., Piboule A., Stolz C., Lew Yan Voon L.F.C

**Abstract:** Tree species recognition from Terrestrial Light Detection and Ranging (T-LiDAR) scanner data is essential for estimating forest inventory attributes in a mixed planting. In this paper, we propose a new method for individual tree species recognition based on the analysis of the 3D geometric texture of tree barks. Our method transforms the 3D point cloud of a 30 cm segment of the tree trunk into a depth image on which a hybrid segmentation method using watershed and region merging techniques is applied in order to reveal bark shape characteristics. Finally, shape and intensity features are calculated on the segmented depth image and used to classify five different tree species using a Random Forest (RF) classifier. Our method has been tested using two datasets acquired in two different French forests with different terrain characteristics. The accuracy and precision rates obtained for both datasets are over 89%.

**Contact:** ahlem.othmani@u-bourgogne.fr

**Presentation Type:** Poster

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**Room:** PS1

# 3D OBJECT MODELS AND OCCLUSION MODELS FOR OBJECT DETECTION

Pepik B., Stark M., Gehler P., Schiele B.

**Abstract:** Object class detection has made remarkable progress on the level of bounding box driven object localization in 2D image space. These object hypotheses are not appropriate for many high-level applications e.g. 3D scene understanding. These applications can benefit from more expressive and richer object hypotheses. In our work, we build such detectors, starting from a recent, state-of-the-art 2D object class detector, and adding 3D geometric and occlusion information at training time.

**Contact:** bpepikj@mpi-inf.mpg.de

**Presentation Type:** Poster

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**Room:** PS1

# SEGMENTATION OF THIN AND RAMIFIED STRUCTURES

Perciano T., Hirata Jr. R., Cesar Jr. R. M.

**Abstract:** Line-like, elongated and ramified structures are commonly found in different ecosystems. Some examples are blood vessels, neurons, and plant roots. The process to extract this kind of structure is a constant challenge in image analysis problems. Their characteristics are very complex and variable, and their "fragility" leads to crucial data loss when processing them. We present a new method for detection of thin structures in digital images using a Markovian model and computer vision concepts.

**Contact:** talitaperciano@gmail.com

**Presentation Type:** Poster

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**Room:** PS1

# DESCRIPTORLESS COARSE REGISTRATION

Petrelli A., Di Stefano L.

**Abstract:** Inspired by our recent work on robust and fast computation of Local Reference Frames (LRF) [1], we propose a novel descriptorless 3D registration pipeline. Key to the method is the observation that any two corresponding points endowed with just a LRF provide a hypothesis on the rigid motion between two views. Experiments on several diverse datasets vouch the effectiveness and speed of our proposal.

**Contact:** alioscia.petrelli@unibo.it

**Presentation Type:** Poster

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**Room:** PS1

# SPACE-VARIANT DESCRIPTOR FOR FACE IMAGE ANALYSIS

Petrushan M., Anishchenko S., Samarin A.

**Abstract:** The space-variant retina-like image descriptor was developed and evaluated within face recognition and facial expression estimation tasks. Intensity-based and colour-based gradients can be used as primary features. Any image area can be described by gradients distribution in receptive fields of the descriptor input window. Description components are supplemented with weights, which depend on invariance and uniqueness of each component and can be modified during recognition procedure without relearning. Matching is based on calculating of weighted Euclidean distance between feature vectors.

**Contact:** drn@bk.ru

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**Room:** PS1

# ARICULATED PEOPLE DETECTION AND POSE ESTIMATION

Pishchulin L., Andriluka M., Jain A., Gehler P., Thormaehlen T., Schiele B.

**Abstract:** In this work we advance the articulated human detection and pose estimation in two ways: 1) we investigate how 3D human shape and pose models can be leveraged to ease training data generation; these models allow to sample from the space of 3D shape and pose and thus to directly control data variability; 2) we propose a conditional pose estimation model that incorporates higher order part dependencies while remaining efficient. The effectiveness of our methods is shown on several benchmarks.

**Contact:** leonid@mpi-inf.mpg.de

**Presentation Type:** Poster

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**Room:** PS1

# PART-BASED PEDESTRIAN DETECTION: NEW ALGORITHMS AND EVALUATIONS

Prioletti A., Mogelmose A.

**Abstract:** This work presents a high performance part-based pedestrian detection system with tracking, running on a real hardware platform.

**Contact:** prio@vislab.it

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**Room:** PS1

# IMPROVING IMAGE GUIDED CANCER TREATMENT BY SHAPE MODELS FOR SEGMENTATION OF CANCER

Rahmat R., Nailon B., Robertosn N., McLaughlin S.

**Abstract:** The goal of radiotherapy, the treatment of cancer by ionising radiation, is to deliver as high a dose of radiation as possible to diseased tissue whilst sparing healthy tissue. In curative (radical) radiotherapy planning, delineation of the volume of interest is primarily based on visual assessment of medical images by a clinical oncologist. The accuracy of the volume of interest is dependent primarily upon the ability to visualise the tumour, interpret radiological anatomy and understand the potential areas of tumour involvement based on tumour biology. Interpretation of these variables is complex, time consuming and requires considerable clinical expertise. There is a growing interest in the field on the use of models of anatomy, which contain information about the expected shape and appearance of structures of interest. These models can assist with the segmentation of different structures either as part of a semi- or fully-automatic approach and have the potential to increase accuracy and reduce the time spent by doctors defining target volumes.

**Contact:** roushanakrahmat@gmail.com

**Presentation Type:** Poster

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**Room:** PS1

# ON-LINE SEMANTIC PERCEPTION USING UNCERTAINTY

Ramos S., de Nijs R., Roig G., Boix X., Van Gool L., Kuhnlenz K.

**Abstract:** Awareness of the uncertainty in predictions made by probabilistic models is often critical but computationally challenging in applications like image semantic segmentation. To address this, we employ a Perturb-and-MAP Random Field [2], a probabilistic model that allows performing fast approximate sampling from its probability density function. This enables to effectively compute the uncertainty of the solution, indicating the reliability of the most likely labeling in each region of the image.

**Contact:** sramosp@cvc.uab.es

**Presentation Type:** Poster

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**Room:** PS1

# A FLEXIBLE OBJECT RECOGNITION ON A DOMESTIC SERVICE ROBOT

Rezapour-Lakani S., Niemueller T., Schiffer S.

**Abstract:** In this work, we present a flexible approach for object recognition. We extract in-hand classifiers from each object and assign attributes to them which reflect possible classes they belong to. Our aim is to find a classifier for an arbitrary combination of attributes by combining the in-hand classifiers. We name this later a meta-classifier.

**Contact:** safoura.lakani@rwth-aachen.de

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**Room:** PS1

# SERVICE ROBOTICS FOR ELDERLY CARE AT HOME

Rocque M., van Heesch F.

**Abstract:** Elderly suffer from a steady decline of physical and cognitive functions such as limited mobility, reduced social contact, risk of falling, memory loss, and reduced medication adherence. At the same time, in many European countries, elderly want to stay independent longer in their homes. As such, a multi-purpose mobile robot for ambient assisted living is proposed.

**Contact:** mukul.rocque@philips.com

**Presentation Type:** Poster

**Date:** Tuesday 16 July 2013

**Time:** 21:30

**Room:** PS1

# FORCING SPARSITY IN UNSUPERVISED LEARNING

Romero A., Radeva P., Gatta C.

**Abstract:** Unsupervised feature learning has emerged as an alternative to manually design feature representations. Sparsity has shown to work well for learning discriminative feature representations. Most of the existing methods require tuning numerous meta-parameters and focus only on one sparsity aspect. We propose a non-parametrical method, which trains a network exclusively optimizing for sparse target. Preliminary results show that the method is promising and competitive with other related approaches.

**Contact:** adriana.romero@ub.edu

**Presentation Type:** Poster

**Date:** Tuesday 16 July 2013

**Time:** 21:30

**Room:** PS1

# FAST AND ROBUST L1-AVERAGING-BASED POSE ESTIMATION FOR DRIVING SCENARIOS

Ros G., Sappa A., Ponsa, D., Guerrero J., Lopez A.

**Abstract:** We present a novel technique for the problem of robust camera-pose estimation in the context of Visual Odometry and Visual SLAM frameworks. The proposed approach is very robust and more suitable for dealing with large amount of data, which further helps improving the results. The method is based on a combination of a very fast coarse-evaluation function and a robust $l_1$-averaging procedure. Such scheme leads to high-quality results while taking considerably less time than RANSAC. Experimental results on the challenging KITTI Vision Benchmark Suite are provided, showing the validity of the proposed approach.

**Contact:** gros@cvc.uab.es

**Presentation Type:** Poster

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**Time:** 21:30

**Room:** PS1

# HYPOTHESIS TESTING FRAMEWORK FOR ACTIVE OBJECT DETECTION

Sankaran B., Atanasov N., Daniilidis K. and Pappas G.

**Abstract:** A central problem in computer vision is the detection of semantically important objects and the estimation of their pose. Most of the work in object detection has been based on single image processing and its performance is limited by occlusions and ambiguity in appearance and geometry. We demonstrate an active approach to object detection by controlling the point of view of a mobile depth camera. When an initial static detection phase identifies an object of interest, several hypotheses are made about its class and orientation. The sensor then plans a sequence of viewpoints, which balances the amount of energy used to move with the chance of identifying the correct hypothesis. We formulate an active M-ary hypothesis testing problem, which includes sensor mobility, and solve it using a point-based approximate POMDP algorithm. The validity of our approach has been verified through simulation and real-world experiments with the PS2 robot. The results suggest a significant improvement over static object detection and other methods currently employed in the domain of active perception. Our contributions include a new static object detector and pose estimator called the Viewpoint-Pose Tree, and a framework for active view planning. Our active vision algorithm is agnostic to the detector.

**Contact:** bsankara@usc.edu

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**Room:** PS1

# SYMMETRY BASED COMPUTER AIDED SEGMENTATION OF OCCLUDED CEREBRAL ARTERIES ON CT ANGIOGRAPHY

Santos EMM., Marquering HA. , Berkhemer OA., van der Zwam W., van der Lugt A., Majoie CB., Niessen WJ.

**Abstract:** Thrombus volume and length are predictors of treatment success in acute ischemic stroke. The lack of contrast between low density thrombus and surrounding brain tissue in CT images makes manual delineation difficult and time consuming. We present an automated lumen and thrombus segmentation method using a shape prior from the segmented contralateral artery. It showed an accuracy comparable to interobserver variability, opening a way to automatic thrombus characterization for treatment planning.

**Contact:** e.santos@erasmusmc.nl

**Presentation Type:** Poster

**Date:** Tuesday 16 July 2013

**Time:** 21:30

**Room:** PS1

# DISCRIMINATIVE NON-BLIND DEBLURRING

Schmidt U., Rother C., Nowozin S., Jancsary J., Roth S.

**Abstract:** Non-blind deblurring is an integral component for removing image blur. From a novel analysis of common half-quadratic regularization, we introduce the first discriminative non-blind deblurring method for arbitrary images and blurs. Specifically, our proposed cascade model is based on a learned Gaussian CRF at each stage. We demonstrate state-of-the-art performance on three benchmarks.

**Contact:** uwe.schmidt@gris.tu-darmstadt.de

**Presentation Type:** Poster

**Date:** Tuesday 16 July 2013

**Time:** 21:30

**Room:** PS1

# DIFFEOMORPHIC MODELLING OF EARLY BRAIN DEVELOPMENT

Schuh A., Rueckert D.

**Abstract:** Recent advances in medical imaging enable the study of the fetal brain in-utero during the gestational period. This allows the construction of three-dimensional (3D) computational models of the normally developing brain which can be employed in computer aided diagnosis. In our work, we aim to model the early brain growth by a spatio-temporal deformation which is parametrized by a velocity field. The advantage of such representation is that displacements from any time frame to any other time frame can be readily obtained from the learned deformation model by numerical integration. Moreover, the resulting deformation is guaranteed to be diffeomorphic, a necessary property for statistical analysis.

**Contact:** a.schuh12@imperial.ac.uk

**Presentation Type:** Poster

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**Time:** 21:30

**Room:** PS2

# SURFACE COMPLETION OF HEAD VIA LOW-RANK DECOMPOSITION

Sousa S., Kropatsch W.

**Abstract:** With the advent of RGB-D sensors, it is possible to obtain reliable point clouds of objects in real time. However, in order to obtain the full model of an object, we need either to rotate the object or the sensor. In this paper, we deal with the problem of 3D surface completion of a human head from a single viewpoint. We use the partial head obtained by Kinect along with several complete head models to compose a matrix D. We pose the completion as a low-rank decomposition of this matrix.

**Contact:** samuel@felixjr.org

**Presentation Type:** Poster

**Date:** Tuesday 16 July 2013

**Time:** 21:30

**Room:** PS2

# ADVANCING THE STATE-OF-THE-ART IN LARGE-SCALE IMAGE SEARCH

Spyromitros-Xioufis E., Papadopoulos S., Kompatsiaris I.

**Abstract:** Retrieving images which are visually similar with a query image is a popular problem that appears in many applications such as object retrieval, landmark detection and copyright violation. In our study with deal with the problem of large-scale image search, i.e. when the size of the image database is in the order of millions. We manage to push the state-of-the-art performance boundary in this problem by building upon an existing, top-performing framework [1] that is based on a highly discriminative method for aggregating local features and an extremely efficient vector encoding and indexing scheme. Specifically, by a)using higher quality (and more efficient) local features b) incorporating extensions which further improve the aggregated representation, and c) optimizing the parameters of the indexing scheme, we develop an enhanced framework that that outperforms the previous best reported result [2] on standard datasets by 8.5% in terms of accuracy while requiring 37.5% less memory per image (80 bits).

**Contact:** espyromi@csd.auth.gr

**Presentation Type:** Poster

**Date:** Tuesday 16 July 2013

**Time:** 21:30

**Room:** PS2

# K-NN BASED HEP-2 CELLS CLASSIFIER

Stoklasa R., Majtner T., Svoboda D., Batko M.

**Abstract:** Indirect Immunofluorescence (IIF) is a methodology used to detect autoimmune diseases by searching antibodies in the patient serum. Unfortunately, the IIF is still a subjective method too dependent on the experience and expertise of the physician. Therefore, a significant amount of research was put into development of computer aided diagnostic systems which could help with the analysis of images from microscope. Our classifier solves one part of this process it can classify each cell into one of the 6 categories.

**Contact:** rstoki@seznam.cz

**Presentation Type:** Poster

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**Room:** PS2

# MANIPULATE WITH DEFORMABLE OBJECT: FLATTENING WRINKLED CLOTHES

Sun L.

**Abstract:** In this poster, we present a novel heuristic-based approach to flatten wrinkled garments by means of autonomous robotics. We have designed a heuristic-based strategy to flatten crumpled cloth by eliminating visually detected wrinkles. In order to explore and validate visually guided clothing manipulation, we have developed a hand-eye interactive learning system that incorporates a clothing simulator to close the effector-garment-visual sensing interaction loop. We also propose a criterion to evaluate the various approaches used to flatten cloth. Our heuristic-based method is applied to virtual cloth in our simulator and the resulting flattening performance is compared to that obtained by manual flattening methods. These experiments demonstrate that the effectiveness and efficiency of our heuristic-based garment flattening methods approach that of manual flattening.

**Contact:** lisunsir@gmail.com

**Presentation Type:** Poster

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**Room:** PS2

# MULTIPLE PEOPLE DETECTION AND TRACKING WITH EXPLICIT OCCLUSION REASONING

Tang S., Andriluka M., Schiele B

**Abstract:** In this work we consider the problem of detection and tracking of multiple people in crowded street scenes. State-of-the-art tracking-by-detection approaches perform well in scenes with relatively few people, but are severely challenged in scenes with large number of subjects that partially occlude each other. This limitation is due to the current people detectors that often fail when person becomes strongly occluded. We observe that typical occlusions in street scenes are due to overlaps between people and propose a people detector tailored to various occlusion patterns. Instead of treating partial occlusions as distractions, we leverage the fact that person/person occlusions result in very characteristic appearance patterns that can be used to improve detection results. We demonstrate the performance of our occlusion-aware person detector on a new dataset of people with controlled level of occlusion and on two challenging publicly available benchmarks outperforming single person detector in each case.

**Contact:** tang@mpi-inf.mpg.de

**Presentation Type:** Poster

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**Room:** PS2

# TENSOR ANALYZERS

Tang Y., Salakhutdinov R., Hinton G.

**Abstract:** Factor Analysis is a statistical method that seeks to explain linear variations in data by using unobserved latent variables. Due to its *additive* nature, it is not suitable for modeling data that is generated by multiple groups of latent factors which interact *multiplicatively*. In this paper, we introduce Tensor Analyzers which are a multilinear generalization of Factor Analyzers. We describe an efficient way of sampling from the posterior distribution over factor values and we demonstrate that these samples can be used in the EM algorithm for learning interesting mixture models of natural image patches. Tensor Analyzers can also accurately recognize a face under significant pose and illumination variations when given only one previous image of that face. We also show that Tensor Analyzers can be trained in an unsupervised, semi-supervised, or fully supervised settings.

**Contact:** tang@cs.toronto.edu

**Presentation Type:** Poster

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**Room:** PS2

# A FRAMEWORK FOR POSE-BASED GAIT RECOGNITION USING KINECT

Theodorakopoulos I., Kastaniotis D., Economou G. Fotopoulos S.

**Abstract:** An efficient framework for pose-based person identification using Kinect sensor is proposed. First, a sequence of poses acquired from the sensor, are represented by a vector of dissimilarities to a set of labeled training pose sequences. Then, a sparse representation of the dissimilarity vector is computed, using the corresponding labeled data from the training set as dictionary. The computed sparse coefficients are used in order to perform person identification and validation, along with gender recognition.

**Contact:** fnarducci@unisa.it

**Presentation Type:** Poster

**Date:** Tuesday 16 July 2013

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**Room:** PS2

# OREN-NAYAR SHAPE FROM SHADING WITH ARBITRARY POSITION OF LIGHT

Tozza S.

**Abstract:** Although significant advances in Shape from Shading (SfS) in the last decade, it is still a challenging task to design SfS approaches that are flexible enough to handle a wide range of input scenes. To this end, we propose a novel perspective SfS model based on the Oren-Nayar reflectance model. To our knowledge, this is the most advanced and flexible approach that can deal with an arbitrary position of the light source and that is able to handle rough surfaces and thus more realistic objects.

**Contact:** tozza@mat.uniroma1.it

**Presentation Type:** Poster

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**Room:** PS2

# REGISTRATION OF IMAGES FROM IMMUNO-HISTOCHEMICAL STAINED SLIDES OF SERIAL SECTIONS

Trahearn N.

**Abstract:** Histopathology is the practice of disease diagnosis from stained tissue sample sections. An increasing amount of histopathological image data is now stored digitally, which allows for automation to play a greater role. Accurate diagnosis of a sample often requires the analysis of several adjacent sections, however the sectioning process removes the continuity between sections meaning that the sample must be realigned before this can take place. This process is known as registration. Currently pathologists perform this manually, which is slow and inaccurate. The intent of the research therefore is to develop an automated means of performing registration on such sections.

**Contact:** n.trahearn@warwick.ac.uk

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**Room:** PS2

# BUNDLE METHODS FOR STRUCTURED OUTPUT LEARNING

Uricar M., Franc V., Hlavvac V.

**Abstract:** Learning of the structured output classifiers leads to solving a convex minimization problem, still hard to solve by standard algorithms in real-life settings. A significant effort has been put to development of specialized solvers among which the Bundle Method for Risk Minimization (BMRM) [1] is one of the most successful. We propose several speed-up improvements of the BMRM. Experiments on real-life data show consistently faster convergence achieving speedup up to factor of 9.7.

**Contact:** uricamic@cmp.felk.cvut.cz

**Presentation Type:** Poster

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# USING SHAPE PRIORS TO REGULARIZE INTERMEDIATE VIEWS IN WIDE-BASELINE IMAGE-BASED RENDERING

Verleysen C., Maugey T., Frossard P., De Vleeschouwer C.

**Abstract:** We focus on the synthesis of intermediate views of an object captured by two cameras with very different viewpoints. This (wide-baseline) setup raises multiple issues compared to two close cameras. We propose to solve this ill-posed problem by adding, in an image-based rendering method, prior information about the shape of the object in the virtual views. This preserves the topology of the virtual object by allowing the apparition (vanishing) of parts during the transition between the cameras.

**Contact:** cedric.verleysen@uclouvain.be

**Presentation Type:** Poster

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**Room:** PS2

# FAST ROAD DETECTION OF COLOR IMAGES

Wang B., Fremont V.

**Abstract:** In this research, we present a novel method for drivable road detection from a color image which is mainly composed of 3 parts: specular intrinsic feature extraction, confidence interval based classification and stereo vision-based road profile extraction. Besides, sky removal is added to speed up the detection processing. The experimental results show that the proposed approach can be adapted for real-time ADAS system in various driving conditions.

**Contact:** bihao.wang@hds.utc.fr

**Presentation Type:** Poster

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**Room:** PS2

# ROBUST OBJECT STRUCTURE DISCOVERY VIA FEATURAL AND SPATIAL FEEDBACK

Wang C., Huang K., Tan T.

**Abstract:** Invariant object representation is critical in visual recognition. Inspired by human perception, we attempt to discover robust object structure via visual mechanisms for invariant object representation, and we propose a unified framework to learn the structure by visual feedback. The framework is effective to discover robust object structure and describe invariant object representation, which demonstrates the strong relation between object structure and visual mechanisms.

**Contact:** cwang@nlpr.ia.ac.cn

**Presentation Type:** Poster

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**Room:** PS2

# EVALUATING A SHARPNESS METRIC USING EYE-TRACKING

Wechtitsch S., Bailer W.

**Abstract:** Automatic quality control is essential in the professional audiovisual media production. The proposed sharpness metric detects production insufficiencies (lens out of focus) and if material is suitable for up scaling. A sharpness value is computed bymeasuring thewidth of high saliency edges. In order to obtain subjective user scores and fixation points, a complete user study was performed including an eye tracking system. Experimental results show a high correlation with the human perception and a significant improvement of noise/interlacing handling.

**Contact:** stefanie.wechtitsch@joanneum.at

**Presentation Type:** Poster

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**Room:** PS2

# PER INTEREST POINT GEOMETRIC BLUR FOR LOCAL DESCRIPTORS

Westlake N., Brown M

**Abstract:** Many existing state-of-the-art local detectors, such as SIFT, feature a pooling operation to improve the robustness of the descriptor. This pooling operation is identical for each interest point. We propose replacing this uniform pooling operation with an interest point specific geometric blur.

**Contact:** n.westlake@bath.ac.uk

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# MPI-SINTEL: CINEMATIC CGI FOR VISION SCIENCE

Wulff, J., Butler, D.J., Stanley, G.B., Black, M.J.

**Abstract:** This work presents a universal dataset for computer vision applications, created from the open source CGI movie Sintel. By using synthetic data, we can extract the structure and the motion of the world, including effects such as motion blur and strong non-rigidity, which are often absent in datasets containing real images. On the other hand, by using an existing movie we benefit from its high visual quality, which surpasses that of other synthetic datasets.

**Contact:** jonas.wulff@tuebingen.mpg.de

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# PATHOLOGICAL SITE RETARGETING UNDER TISSUE DEFORMATION USING GEOMETRICAL ASSOCIATION AND TRACKING

Ye M., Giannarou S., Patel N., Teare J., and Yang G.Z.

**Abstract:** Gastroscopy is the gold-standard of visualising the upper gastrointestinal (GI) tract. Probe-based microscopic detection techniques allow cancer to be detected at an early and pre-invasive stage. Systematically screening large surface areas under tissue deformation such as retargeting a pathological site, is difficult. In this work, an online approach for pathological site retargeting under tissue deformation and partial instrument occlusion is proposed.

**Contact:** menglong.ye11@imperial.ac.uk

**Presentation Type:** Poster

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**Room:** PS2

# SUPER-RESOLUTION OF LICENSE PLATE IMAGES USING DISCRETE ALGEBRAIC RECONSTRUCTION TECHNIQUE

Zarei K., van Aarle W., Batenburg K. J., Sijbers J.

**Abstract:** Vehicle license plate detection from surveillance cameras is widely used in traffic monitoring and control systems. Surveillance cameras have limited spatial resolution, which may not always suffice to resolve the alpha-numeric characters from the license plates. Therefore, super-resolution (SR) image reconstruction techniques, which can reconstruct a high resolution (HR) image from a sequence of low-resolution (LR) images of the same scene, have been widely researched in the last two decades. Here, we introduce Discrete Algebraic Reconstruction Technique (DART) as a super-resolution method to reconstruct a high resolution image from a set of low resolution images. Knowing the fact that license plate consists of a limited number of colors (gray levels), DART1 exploits the discreteness of the license plate grey levels in an iterative reconstruction framework to generate a higher quality image which facilitates the recognition procedure.

**Contact:** Karim.ZareiZefreh@ua.ac.be

**Presentation Type:** Poster

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# DETECTION OF ELEPHANTS IN WILDLIFE VIDEO

Zeppelzauer, M.

**Abstract:** Animals are amongst the most difficult objects to detect and track automatically. We propose a fully automated method for detection and tracking of elephants in unconstrained wildlife video, collected by biologists in the field. The method learns a color model of elephants from a small set of training images and combines color-based localization and spatio-temporal tracking to obtain temporally consistent detections. Elephants of different sizes, poses, and degrees of occlusion are robustly detected.

**Contact:** mzz@ims.tuwien.ac.at

**Presentation Type:** Poster

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**Room:** PS2

# FAST L0-BASED IMAGE DEBLURRING VIA VARIATIONAL BAYESIAN METHODS

Zhang G., Kingsbury N.

**Abstract:** A new wavelet-based image deconvolution algorithm is proposed to restore the blurred image based on a Gaussian scale mixture prior within the variational Bayesian framework. Our sparsity-regularlised model effectively smooths out local minima and approximates l0 norm by reweighting l2 norm iteratively. A hierarchical Bayesian estimation with the use of majorisation-minimisation technique is derived to achieve fast computation.

**Contact:** gz243@cam.ac.uk

**Presentation Type:** Poster

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**Room:** PS2

# DENSE, AUTO-CALIBRATING VISUAL ODOMETRY FROM A DOWNWARD-LOOKING CAMERA

Zienkiewicz J., Davison A.

**Abstract:** We show how a single camera can be used as a high precision visual odometry sensor in a wide range of practical settings using efficient parallel implementation. Taking full advantage of the local planarity of floor surfaces, we use dense alignment of frames from a real-time 30Hz video stream as the camera looks down from a robot, making use of the whole texture available rather than sparse feature points. Our system fully and quickly auto-calibrates for camera extrinsics.

**Contact:** jz4411@imperial.ac.uk

**Presentation Type:** Poster

**Date:** Tuesday 16 July 2013

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**Room:** PS2

# BLIND IMAGE DECONVOLUTION USING SYLVESTER MATRIX METHOD

Alkhaldi N., Winkler J.

**Abstract:** This research aims to solve the blind image deconvolution problem using a robust Sylvester matrix approach. Several algorithms have been established to estimate the original image from its distorted versions based on the computation of the greatest common divisor (GCD) of two univariate polynomials. However, the GCD computation algorithm is not appropriate in the presence of noise and instead it requires an approximation to the GCD.

**Contact:** n.alkhaldi@sheffield.ac.uk

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