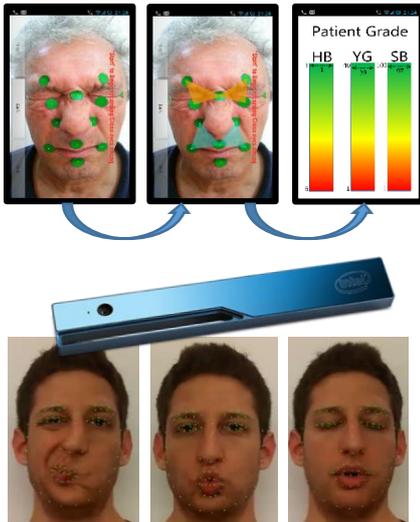


## VISL Newsletter – Issue 1, January 2016

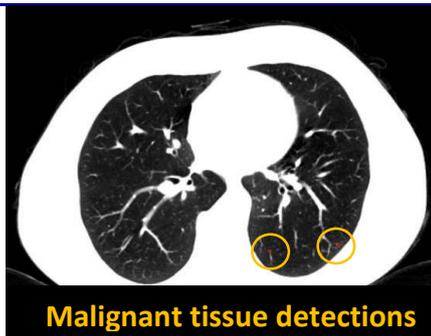
News from the Vision and Image Sciences Laboratory  
Department of Electrical Engineering, Technion, Israel  
[visl.technion.ac.il](http://visl.technion.ac.il)

### Lab activity highlights



#### Face nerve palsy project

In this project, we develop an objective, learning-based, application for the diagnosis and grading of facial nerve palsy (FNP), a facial movement dysfunction effecting functional, aesthetic and psychological disability. Grading the severity of FNP has prognostic and follow-up significance. Traditional grading systems are based on subjective physician observation, and are prone to inter and intra observer variability. In MobileMed (Nov. 2014, Prague) VISL students presented a proof of concept of a mobile application for FNP diagnosis, based on tracking facial points marked by paper stickers. Now we are working on an enhanced application, based on state-of-the-art methods for tracking facial feature points. Combining color and depth images and making advantage of INTEL's RealSense™ camera is being explored. The project is a collaboration with Dr. Ofer Azoulay (KAPLAN Medical Center).



#### Change detection in medical images

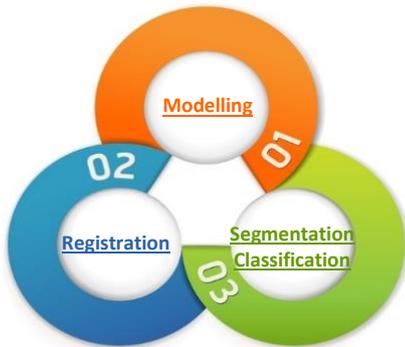
Change detection in medical images is a very challenging issue. VISL students adapted state-of-the-art methods used satisfactory for change detection in aerial images for the means of detecting small changes in CT and MRI scans. Those methods are based on ideas and techniques borrowed from geometry. In this project excellent results were achieved, which are currently in a clinical research stage at the Radiology division of RAMBAM medical center. Further research in this field is being conducted by the VISL.



#### 'Student Unmanned Aerial System' contest

Following the success in SUAS 2015 ([2nd place out of 55 teams from all over the world!](#)), a mixed team composed of Aeronautics and Electrical Engineering students is now preparing for SUAS 2016. This is a huge multi-discipline project in which the students design, build and demonstrate an aerial system capable of conducting complicated autonomous missions. The EE team, led by the VISL, in collaboration with the Communications lab, concentrates this year on improving the optical payload system, the overall communications and the image processing algorithms. The target detection and classification will be performed for the first time onboard the aerial system using a GPU powered computer and Deep-Learning algorithms.

## Research highlights

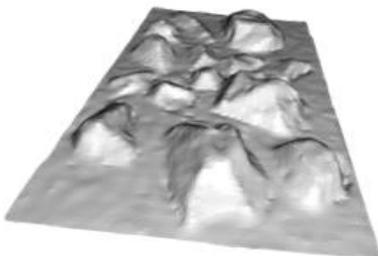


### OMEK consortium

VISL is a major partner in the OMEK 3D-consortium which combines academic and industrial partners in research of 3D image processing, analysis and understanding. VISL's OMEK research staff is divided to three groups working on three major problems: Filling missing information (led by Prof. Guy Gilboa), Similarity of 3D information (led by Prof. Yoshua Zeevi), Local based model for noise and uncertainty (led by Prof. Yoav Schechner).

VISL students are taking an active part in this activity (led by Dr. Eli Appleboim and Dr. Israel Berger).

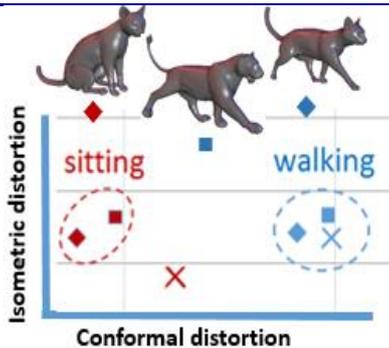
Main industry partners: INTEL, ELBIT, APPLIED MATERIALS



### Local noise and uncertainty models in 3D imaging

*Mark Sheinin, Prof. Yoav Schechner*

When taking a 3D-scan of an object noise and uncertainty are inevitable ingredients of the output 3D image. In contrast to common approaches to this problem in this research a local dependent model of the noise and uncertainty is developed. Such a model will substantially enhance the 3D image that is obtained, making it more accurate and robust to deformations.



### Shape classification

*Alex Naitzat, Prof. Yoshua Zeevi*

This research focuses on the analysis and classification 3D object that may have gone through some geometric deformations. The research aims at finding good similarity measures that can identify whenever two objects are essentially different or just two distorted representations of the same object.



### Filling in missing information

*Gilad Drozdov, Yevgeni Shapiro, Prof. Guy Gilboa*

In many cases the 3D information comes in very low resolution and large amount of information is missing. This research focuses on filling this depth information from some side information like color images of the same area.

## Latest publications

- M. Moeller, J. Diebold, G. Gilboa, D. Cremers, "Learning nonlinear spectral filters for color image reconstruction", Int. Conf. on Computer Vision (ICCV) 2015.
- O. Katzir, G. Gilboa, "A Maximal Interest-Point Strategy Applied to Image Enhancement with External Priors", Proc. IEEE Int. Conf. Image Processing (ICIP), 2015.
- G. Gilboa, E. Appleboim, E. Saucan, Y.Y. Zeevi, "On the Role of Non-local Menger Curvature in Image Processing", Proc. IEEE Int. Conf. Image Processing (ICIP), 2015. (Recognized as part of the Top 10% papers in ICIP 2015).
- J.-F. Aujol, G. Gilboa, N. Papadakis, "Non local total variation spectral framework", Scale Space and Variational Methods in Computer Vision, SSVM 2015, LNCS 9087, p. 66-77, 2015.
- M. Burger, L. Eckardt, G. Gilboa, M. Moeller, "A spectral framework for one-homogeneous functionals", Scale Space and Variational Methods in Computer Vision, SSVM 2015, LNCS 9087, p. 16-27, 2015.
- D. Horesh, G. Gilboa, "Multiscale orientation detection using the total variation transform", Proc. Scale Space and Variational Methods in Computer Vision, SSVM 2015, LNCS 9087, p. 486-497, 2015.
- A. Naitzat, E. Saucan and Y. Y. Zeevi, "Volumetric Quasi-conformal Mappings", Proc. of GRAPP/VISIGRAPP 2015
- A. Levis, Y. Y. Schechner, A. Aides, A. B. Davis, "Airborne three-dimensional cloud tomography, " Proc. IEEE ICCV (2015)
- Yoav Y. Schechner, "Self-calibrating imaging polarimetry, " Proc. IEEE ICCP (2015)
- Antoine Deleforge, Radu Horaud, Yoav Y. Schechner and Laurent Girin, "Co-Localization of audio sources in images using binaural features and locally-linear regression, " IEEE Trans. Audio, Speech and Language Processing **23**:4, pp. 718-731 (2015)
- Yuval Bahat, Yoav Y. Schechner and Michael Elad, "Self-content- based audio inpainting," Signal Processing **111**, pp. 61-72 (2015)

## Events and Lab News



### 12 Nov 2015 - Visit of Fiber Home Digital Co.

A delegation of senior managers of Chinese FHD visited the VISL, possible collaboration in the field of IOT and smart city applications was discussed.



### 14 Dec 2015 - INTEL equipment grant received

Happily the VISL received an equipment grant from INTEL for student research projects. The grant is planned to be used for capturing 3D data, combining depth with thermal imaging sensors, for smart city projects and for developing autonomous aerial and ground systems.



### 6 Dec 2015 - Visit of German Delegation

The VISL hosted a delegation of 30 German officials as part of a visit to the Ollendorff Minerva Center. The visit was led by Mr. Stanislaw Tillich, President of Bundesrat and Prime Minister of the Free State of Saxony. Prof. Y. Zeevi and the graduate students Mark Sheinin and Aviad Levis presented some of the research conducted in the lab including the [Stella Maris project](#).