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Image Processing Laboratory (IPLab)

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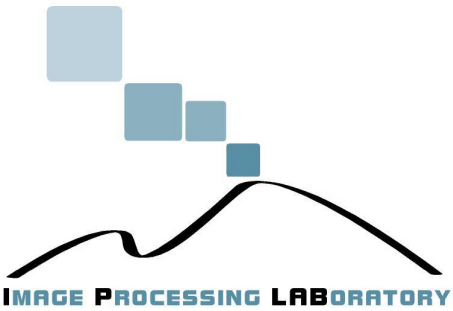
Abstract

The Image Processing Lab [ewa] is the core of competence in Multimedia, Image Processing, Computer Graphics and Computer Vision of the Department of Mathematics and Computer Science of the University of Catania. The laboratory has been established in 2005 and currently employs 2 Full Professors, 1 Associate Professor, 1 Assistant Professor, 8 Ph.D. Students, 1 Consultant. The group has published more than 250 papers and holds also more than 20 patents on topics related to the aforementioned disciplines.



1. Our Mission

The scientific knowledge of the IPLab group is focused on Multimedia with specific competences in the fields of Image processing, Digital Cultural Heritage, Assistive Computer Vision, Medical Imaging, Computer Forensics, Computer Graphics and Computer Vision applications. IPLab has established a number of international relationships with academic/industrial partners for research purposes.

2. Main Activities

In these years, the group has been interested in the following activities:

- Cultural Heritage:

  3D Modeling – 3D Scanning – Artificial Mosaics – Video Artifacts Removal – Augmented Reality – Virtual Tour;

- Computer Vision:

  Face Re-Identification – Age and Gender Recognition – Video Analysis and Summarization – Augmented Reality – Video Stabilization – Smoke Detection – Vehicle Tracking and Classification – Scene Recognition – Cash Machine – Panorama Stitching;

- Medical and Assistive Technology:

  Breast Shape Analysis – Food Understanding – Finger Tracking – Braille Converter – Obstacle Avoidance.

- Computer Forensics:

  Digital Balistic Analysis – Digital Graphology – Double Compression Estimation – Social Multimedia Forensics.

3. Main Events

In these years, the group has been involved in the organization of the following events in Sicily:

- International Computer Vision Summer School (ICVSS), every year from 2007 to present;
- Medical Imaging Summer School (MISS), 2014 and 2016; 1item Advanced Concepts for Intelligent Vision Systems ACIVS, 2015;
- ArcheoFOSS Workshop Open Source, Free Software e Open Format nei processi di ricerca archeologica, 8-th edition, 2013;
- International Workshop on Computer Vision (IWCV), 2012;
- Visione delle Macchine (VISMAC), 2010;
- International School for Computer Science Researchers

- Molecular and Medical Imaging and Bioinformatics, 2009;
- Conference Eurographics: Italian Chapter, 2006.

and the following events outside Sicily:

- International Workshop on Assistive Computer Vision and Robotics (ACVR), 2014–2016;
- International Workshop on Multimedia Assisted Dietary Management (MADiMa), 2015;
- International Conference on Computer Vision Theory and Applications (VISAPP), 2013–2016;
- Video Analytics for Audience Measurement in Retail and Digital Signage (VAAM), 2014;
- European Conference on Mathematics for industry (ECMI), 2014;
- SPIE EI Digital Photography, 2011–2016;
- European Conference on Computer Vision (ECCV) - Video Proceedings Chairs, 2012;
- International Conference on Image Analysis and Processing (ICIAP), 2011;
- ACM Multimedia in Forensics, Security and Intelligence (MiFor), 2010–2011;
- Mini Symposiums SIMAI:
  - Image and Video Forensics, 2010;
  - Image Analysis Methods for Cultural Heritage, 2008 and 2010;
  - Image Analysis Methods for Industrial Applications, 2006.

3.1. ICVSS

The International Computer Vision Summer School (ICVSS) [ewb] aims to provide an in-depth analysis of the state-of-the-art research in Computer Vision and Machine Learning. The courses are delivered by world renowned experts in the field of Computer Vision, from both academia and industry, and cover both theoretical and practical aspects of real Computer Vision problems as well as examples of their successful commercialisation. The school aims to provide a stimulating opportunity for young researchers and Ph.D. students. The participants will benefit from direct interaction and discussions with world leaders in Computer Vision. Participants have also the possibility to present the results of their research, and to interact with their scientific peers, in a friendly and constructive environment.

3.2. MISS

The aim of the Medical Imaging Summer School (MISS) [ewc] is to train a new generation of young scientists to bridge this gap, by providing insights into the various interfaces between medical imaging and computer vision, based on the shared broad categories of: image segmentation, registration and reconstruction, classification and modelling, and computer-aided interpretation. The courses contain a combination of in-depth tutorial-style lectures on fundamental state-of-the-art concepts, followed by accessible yet advanced research lectures using examples and applications. A broad overview of the field is given, and guided reading groups complement lectures. The courses are delivered by world renowned experts from both academia and industry, who are working closely at the interface of medical imaging/computer vision.

4. Projects

The Image Processing Laboratory is involved also in many other research projects. Collaborating with other partners, both public and industrial, is the key to ensure an economical and cultural growth not only of the Laboratory itself, but also of the geographic area of South-East Sicily.

4.1. Archeomatica

In 2007 the Image processing Lab started out a digital archaeology research program named “Archeomatica Project” [epw], aimed to produce 3D models of prehistoric archaeological sites and cultural heritage with a high level of accuracy. Digital Archaeology improves the quality of the data available in classical archaeology.

4.2. Computer Forensic

Support and technical advices to investigations, referring more precisely on multimedia contents analysis (Images, Videos, etc.). Applied and basic R&D in partnership with private and public institutions: Polizia Scientifica (Direzione Nazionale Roma); RIS (Reparto Investigativo Speciale) - Carabinieri Messina; IISFA (Italian Information System Forensics Association); Telefono Arcobaleno; NIT (Nucleo Investigativo Telematico) - Siracusa.

4.3. ENIAC – Panorama Ultra wide Context Aware Imaging

Over recent years, the use of images and videos in real-life applications has increased exponentially. There has also been a shift from basic recording and playback towards highly sophisticated image processing. This shift has happened in the complete image-processing chain, ranging from acquisition to quality-enhancing processing and reproduction. The ENIAC JU project PANORAMA will develop and implement applications in medical imaging, broadcasting systems, and security and surveillance, all of which face challenges in the real-time handling and processing of large quantities of image data.

4.4. DIGINTEGRA

This project is aimed at developing modules and standard interfaces for dynamic communication, two-way and multi-channel, in the field of digital and proximity marketing,

through the study of interaction, waiting and dialogue patterns in public places and the subsequent experiential, behavioral and semantics analysis of the user.

4.5. IT@CHA

During the last years many products based on collections of images have been developed. The most famous one, Google Street View, is able to provide panoramic views related to many streets in the world. One of the aims of the It@cha project is the development of a prototype able to collect data from a real scene (e.g., archeological site, museum, etc.) and combine them to build up a panoramic view to be used in cultural heritage applications. Specifically, both images and laser scanner technology will be used to provide a virtual tour of the site giving also a 3D reconstruction of specific objects in the scene.

4.6. FARM.PRO

Health system in Italy is based on a strong public network, composed by hospitals and family doctors, and on efficient private actors, such as private clinics and pharmacies. This research project, funded by Regione Siciliana, aims to move the pharmacies at the center of what we call the "distributed health system", in order to improve as much as possible the range and quality of services offered to the end user. To achieve this objective, the partners (institutions, academia and industries) cooperate to provide remote services such as booking for specialist medical analysis via pharmacies (CUP), user-drugs-purchase surveillance for users safety, accessibility to services with to allow easy access to new services for people with disabilities (Totem, Natural interfaces, etc.)

5. Partners

We have several industrial partnership for research and technological transfer with the following partners:

- ST Microelectronics;
- TechLab Works;
- Telecom Italia JOL WAVE;
- Amped;
- INGV;
- ParkSmart;
- EdisonWeb;
- Corfilac;
- Telefono Arcobaleno;
- Neodata;
- IISFA.

References

[epw] *Archeomatica* PROJECT WEBSITE:. http://www.archeomatica.unict.it/index.php. 2

[ewa] *Image Processing Lab (IPLab)* WEBSITE:. http://iplab.dmi.unict.it. 1

[ewb] *International Computer Vision Summer School (ICVSS)* WEBSITE:. www.dmi.unict.it/icvss. 2

[ewc] *Medical Imaging Summer School (MISS)* WEBSITE:. http://iplab.dmi.unict.it/miss16/. 2