University POLITEHNICA of Bucharest
Faculty of Automatic Control and Computers

Splaiul Independenței nr.313, sector 6, cod 060042,
Bucharest, ROMANIA

Professor Florica Moldoveanu
PhD coordination in "Computers and Information Technology"
Doctoral School of Automatic Control and Computers
University POLITEHNICA of Bucharest

Contact:
Prof.dr.ing. Florica Moldoveanu
University POLITEHNICA of Bucharest
Faculty of Automatic Control and Computers
Department of Computers
Splaiul Independentei, 313, sala ED420, sector 6, 060042, București
Phone: Mobile: +40723336671; Office: +40214029518
E-mail: florica.moldoveanu@cs.pub.ro

Research areas: Computer Graphics, Augmented and Virtual Reality, Computer Vision, Computer animation, eHealth, Software Engineering, eLearning, Interoperability standards for eHealth (coauthor of the standard ISO IEEE 11073-20601, 2008: Health informatics - Personal health device communication).

PhD coordinator since 2000:

- 30 finalized PhD theses, of which 24 in the period 2011-2019
- 11 undergoing
- Some of the finalized theses can be seen here: http://graphics.cs.pub.ro/theses/phd

Publications (https://cs.pub.ro/index.php/people/userprofile/florica_moldoveanu):

- 24 books, 2 books chapters, 3 online courses;
- 227 scientific papers: 103 ISI indexed and 124 indexed in other international databases

Recent research projects (https://cs.pub.ro/index.php/people/userprofile/florica_moldoveanu):

- Sound of Vision - Natural sense of vision through acoustics and haptics (Horizon 2020, 2015-2018)
- HAI-OPS - Hospital Acquired Infection and Outbreak Prevention System (Eurostars, 2015-2018)
- TRAVEE -Virtual Therapist with Augmented Feedback for Neuro-motor Rehabilitation (PNII, 2014-2016)
- VISUAL-D - Visualization of Patient Data for easy management of care processes (Eurostars, 2011-2013)
- MORIS FD - Medical Operational Risks Identification Service and Fraud Detection (Eureka 2011-2013)
- RELIS - Risk detection in laboratory Information Systems (Eurostars, 2010-2012)
- EUGEN - Enterprise Unified Guideline Engine (Eurostars, 2010 – 2012)
- ReTeMeS - Reliability Testing of Medical Systems (Eureka, 2008-2010)

- SABIMAS - Advanced system based on medical imaging to produce custom implants for hip arthroplasty (PN II, 2008-2011)

President/Member of:

- President of HL7 Romania Association (www.hl7romania.ro), since 2006.
- President of the department of Geographical Informational Systems of ASRO (Romanian Organization for Standardization)
- Member of the UPB's Scientific Bulletin Editorial Board
- Member of ACM, IEEE, SRAIT

Proposed PhD subjects:

- **Innovative solutions based on Virtual, Augmented and Mixed Reality for education, medicine, health, entertainment, science, art.**

  A concrete proposal in this category of topics is to continue the research from the TRAVEE project (http://travee.upb.ro/). The project objectif was to develop a system based on Virtual and Augmented Reality to stimulate neuromotor rehabilitation of patients who have suffered a stroke followed by paralysis. Offering the patient an augmented feedback of his actions (moving hand or leg) with support actions (robotic, FES) can stimulate learning, exceeding difficult rehabilitation situations.

  Also, the developed system gives to the patients the possibility of independent physical training for motor rehabilitation with the help of a virtual terapist.

  The doctoral research will investigate the use of modern technologies for human-machine interaction, such as those used in the TRAVEE project (Kinect, Leap Motion, Oculus Rift), or some more recent, given the rapid evolution of this type of equipments.

- **Processing and analysis of medical images, 3D reconstruction from images, with applications in medical diagnosis, prototyping, pre and intra-operatory guidance**

  A concrete PhD research subject is the following:

  Near Infrared Imaging for Tissue Analysis

  Generally, the main components of biological tissue which absorb light are the blood and the water. But, the waves from the Near InfraRed (NIR) spectrum – (650-1350 nm), also known as optical window or therapeutic window, are not well absorbed by water and blood. Using the light from this spectrum it can be reached a significant depth of optical penetration, thus achieving increased illumination of internal structures.

  Therefore, the transillumination in the NIR has been useful for non-invasive medical investigations, such as measuring tissue oxygenation and hemodynamics, analysis of sinuses, diagnosing breast cancer, monitoring joints regarding rheumatoid arthritis and others.

  Even such approaches of analyzing the tissue bellow the skin exist, very few researches combine the NIR images with 3D images of the illuminated areas.

  We propose the investigation of a solution which combines the images obtained by transillumination in the NIR with depth information obtained from a 3D video camera. A 3D reconstruction from a sequence of 2D NIR and RGB-D images can be very useful for diagnosis, offering a fast view of the subcutaneous tissue, together with the covering skin, view which otherwise could be obtained with expensive acquisition devices (and most times invasive). In addition, the solution can lead to a small device, may be portable.

- **Real - time rendering of massive 3D virtual environments**

Massive 3D virtual environments contain many unevenly spatially distributed objects, of varying sizes and properties. These are usually rendered using massive textures and illumination techniques to simulate real words. Such virtual environments are very common in rendering because they depict regular types of vistas, like the natural or urban views.

Real-time rendering algorithms usually generate more than 30 frames per second (FPS) and must produce photorealistic images on a much lower computational budget, therefore algorithms design, optimization and hardware utilization maximization represent key subjects in this specialized topic.

Real-time rendering of massive 3D environments has many practical applications, especially in performance critical fields such as aviation and military simulators, video games and others.

Although the performance of GPUs and their spread on the large majority of computing devices are continuously increasing, inclusively on mobile devices, the need for new real-time rendering algorithms or methods is still a challenge. Beside this, real-time rendering of massive virtual scenes in browsers is becoming more and more a requirement.

- **Environment rendering through sound and vibration, using artificial vision, for visually impaired people**

The Sound of Vision project (http://www.soundofvision.net/), which will conclude at the end of 2017 was a challenge for the project consortium. Different hardware sollutions for the realization of a portable device were investigated, many computer vision algorithms were analysed and new algorithms for real-time analysis of the environment were created. Also, more models for the coding of the environment by sound and vibrations were created and tested.

During this research we encountered many problems in object recognition from images, especially due to the imperfections of the current 3D video cameras, which cause a lack of information in images, especially depth information.

The PhD research proposal is to continue the research initiated in the Sound of Vision project, both on the computer vision algorithms and on the coding of the real-world images through sound and vibrations, especially because we expect the emergence of more performant 3D video cameras.

- **ICT solutions for visually impaired people (education, entertainment)**

This proposal aims at finding new solutions for the interaction of the blind people with the computer and developing inovative applications that facilitate learning, access to information and entertainment for this category of users.

There will be investigated solutions based on cheap equipment, such as cheap cameras or devices for interaction through gestures (Leap Motion, Real Sense) and also solutions based on more expensive equipment (Kinect, haptic belt, haptic glove) for applications dedicated to research.