UNIVERSITÀ DI PISA

DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE

Dottorato di Ricerca in Ingegneria dell'Informazione

Doctoral Course

"Machine Vision and Augmented Reality"

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Short Abstract:

Machine Vision and Augmented Reality are currently hot topics given the possible applications in many fields. This course gives a theoretical and practical introduction of these topics taking into account optical, geometrical, algebraic, SW, HW, and human factors aspects.

Course Contents in brief:

1. Course introduction and possible applications
2. Camera models and principles of geometric optics
3. Geometric and algebraic pinhole model of common cameras
4. Element of rigid transformations
5. Zhang method to determine the pinhole camera parameters
6. Tracking with single and multiple camera systems
7. 3D surface reconstruction with single and multiple camera systems
8. Basic principles of Virtual Reality and main HW&SW components
9. Augmented Reality definition and main HW&SW components
10. How to obtain the registration in VST systems
11. Challenges in OST systems

Total # of hours: 20

References:

-Elements of Geometric Computer Vision Andrea Fusiello,
http://www.diegm.uniud.it/fusiello/teaching/mvg/vismacGenova2012.pdf

CV of the Teachers

Vincenzo Ferrari received the Ph.D. degree from the University of Pisa. He is currently an Assistant Professor of biomedical engineering with the Department of Information Engineering, University of Pisa. He is the author of more than 80 peer-reviewed publications and has five patents. He is the coordinator of the EndoCAS Centre of the University of Pisa. His research interests involve image-guided surgery and simulation, computer vision and augmented reality devices and applications in medicine. He is involved in several national and international research projects.

Fabrizio Cutolo received the B.Sc. and M.Sc. degrees in electrical and computer engineering and the Ph.D. degree in translational medicine from the University of Pisa, Pisa, Italy, in 2006 and 2015, respectively. He is currently a Postgraduate Research Associate with the Department of Information Engineering, University of Pisa. His research interests include in developing and evaluating new mixed reality solutions for image-guided surgery and surgical simulation, machine-vision applications, visual perception, ubiquitous tracking, and human–machine interfaces for rehabilitation. He has been involved in several national and international research projects, and he is currently WP leader of the HORIZON2020 project VOSTARS (Call ICT-29-2016).

Room and Schedule

Room: *Aula Riunioni, Dipartimento di Ingegneria dell'Informazione, Largo L. Lazzarino 1, 56122 Pisa, Edificio A, piano 6*

Schedule:

N.	Lesson	Day
1	Course introduction and possible applications Camera models and principles of geometric optics Geometric and algebraic pinhole model of common cameras	February 24 - 9:00-13:00
2	Element of rigid transformations Zhang method to determine the pinhole camera parameters	February 28 - 9:00-13:00
3	Tracking with single and multiple camera systems 3D surface reconstruction with single and multiple camera systems	March 5- 9:00-13:00
4	Basic principles of Virtual Reality and main HW&SW components Augmented Reality definition and main HW&SW components	March 12 - 9:00-13:00

5	How to obtain the registration in VST systems Challenges in OST systems	March 19 - 9:00-13:00