Jim Braux-Zin

Ph.D. candidate in Computer Vision

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Education

2011 – 2014 **Ph.D.**, *CEA LIST*, Saclay (91).
Design and implementation of an Augmented Reality system.

2010 – 2011 **Master's Thesis**, *CEA LIST*, Saclay, France.
Dense 3D reconstruction by stereovision.

2009 – 2011 **Master of Science in Engineering**, *The Royal Institute of Technology (KTH)*, Stockholm.
Double-degree with Supélec. Major in digital communications and signal processing. Minors in robotics and computer vision.

2007 – 2011 **Master *Diplôme d'ingénieur***, *Supélec*, Gif-sur-Yvette (91).
Information, communication and energy sciences.

Scientific Skills

3D Vision Projective geometry, camera calibration, localization in known environments (using CAO models) or unknown environments (SLAM), sparse and dense multi-view 3D reconstruction.

2D Vision Optical flow, stereovision, non-rigid surface registration, feature detection and matching (points and segments).

Optimization Convex variational optimization, Total Variation regularization, Levenberg-Marquardt.

Publications

J. Braux-Zin, A. Bartoli, and R. Dupont. Calibrating an optical see-through rig with two non-overlapping cameras: The virtual camera framework. *3DimPVT*, 2012. Zürich.

J. Braux-Zin, A. Bartoli, and R. Dupont. Caméras virtuelles pour la calibration d'un système de réalité augmentée composé d'un écran transparent et deux caméras à champs disjoints. *ORASIS*, 2013. Cluny.

J. Braux-Zin, R. Dupont, and A. Bartoli. Feature and pixel based cost for wide-baseline non-rigid surface detection. *BMVC*, 2013. Bristol.

J. Braux-Zin, R. Dupont, and A. Bartoli. A general dense image matching framework combining direct and feature-based costs. *ICCV*, 2013. Sydney.

Computer Skills

Programming **Advanced (+4 years):** C, C++, CUDA, Python, OpenCV, Eigen
Experienced: Matlab/Octave, Android, Qt, Bash, Web

Other Windows/Linux (+10 years), Blender (modeling and scripting), LaTeX

Languages

English Fluent (TOEFL 2009 107/120)

Swedish Basics

Detailed Experience

Ph.D. thesis

2011 – 2014 **Design and implementation of an Augmented Reality system.**, *CEA LIST*.

Supervisor Adrien Bartoli (ISIT, Université d'Auvergne/CNRS, Clermont-Ferrand)

Instructors Romain Dupont (CEA LIST), Mohamed Tamaazousti (CEA LIST)

Description Augmented Reality could be of great help for critical applications such as driving or surgery assistance. However in these cases every millisecond counts and the user cannot afford to add any latency to reality. This dismisses all video see-through solutions for optical see-through ones, where virtual augmentations are layered onto the reality thanks to a semi-transparent display. This adds new constraints on the system for proper alignment with reality. We focused on a tablet-like system composed of a transparent LCD screen and two localization devices. We believe this kind of systems would be more practical to the user (well-delimited window, no heavy head-mounted device) and the designer (less constraint on the weight, slower motion) relative to current head-mounted displays.

The estimation of a dense motion field (optical flow) is a very important building block for many computer vision tasks such as 3d reconstruction. We introduce a new framework allowing to leverage the information provided by sparse feature matches (point or segment) to guide a dense iterative optical flow estimation out of local minima. This allows to vastly increase the convergence basin without any loss of accuracy. A wide range of application is then possible, without modification, such as wide-baseline stereovision or non-rigid surface registration.

Both topics resulted in publications in renowned international conferences (ICCV, BMVC, 3DIMPVT).

Master's thesis

2010 – 2011 **Dense 3D reconstruction by stereovision**, *CEA, LIST*.

Description Most localization algorithms in unknown environments generate a sparse map of point features. This allows fast and accurate localization but discards a lot of valuable information. This project aimed to densify this sparse map to generate a dense 3D reconstruction. The chosen approach is a variational optimization with a TV-L^1 regularization, and a novel initialization from 2D feature matches. This project has obtained the maximum grade (*A*).

Projects

2010 **Robotics and Autonomous Systems**, *KTH*.
Design and implementation of an autonomous mobile robot.
Domains: mechanics, control, vision, SLAM, artificial intelligence.
Multi-cultural work group: 4 people from France, Sweden, Iran.

2010 **Image Classification and Recognition**, *KTH*.
Face detection using Viola & Jones method.

2009 **Pattern Recognition et Speech Signal Processing**, *KTH*.
Speech recognition with Hidden Markov Models.

Associations

2008 – 2009 **Co-founder and *Team Leader* of the Student In Free Enterprise (SIFE) team**, *Supélec*.
Management of the 7 people team for 4 ethical entrepreneurship projects.
English presentation for the national selection of the SIFE competition.
The team was granted the Goldman Sachs award.

2007 – 2009 **Communication manager and vice-president of Espérance en Béton**, *Supélec*.
Mission of combating the lack of interest among young people for science (support and tutoring...)
Organization of a science fair welcoming 300 junior high school students.
Solicitation and communication with the 12 partner companies and research organizations.