Agniva Sengupta

PhD Student at Inria

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Research summary

My research area is computer vision, specifically related to deformable object tracking using monocular and depth cameras. Prior to my PhD, I have worked on multiple computer vision/machine vision projects such as: traffic sign recognition and ADAS using machine learning, monocular visual SLAM for Augmented Reality, visual odometry using monocular cameras and IMU, computational photography and motion planning for robots

Keywords: Deformation Tracking, Visual Tracking, FEM, Visual SLAM

Positions held

2020 – present **PostDoc at Université Clermont Auvergne**, *TGI - EnCoV, Institut Pascal*, CNRS, Université Clermont Auvergne and CHU, Clermont-Ferrand.

2017 – 2020 **PhD Student at Inria**, *Rainbow team, Inria Rennes at Bretagne Atlantique, France.*

2015 – 2016 **Computer Vision Engineer**, *Whodat Tech Pvt. Ltd., India.*

2014 – 2015 **Product Engineer**, *Continental AG (as consultant from KritiKal Solutions Pvt. Ltd.).*

2012 – 2014 **Product Engineer**, *TechBLA Solutions, India.*

2009 – 2010 **Engineer**, *Accenture Services Pvt. Ltd..*

Education

2017-20 **Ph.D**, *INRIA, Rennes, France.*, Title: Visual Tracking od Deformable Objects using RGB-D Cameras.

- **Summer School:** Robotic Vision Summer School (RVSS) at the Australian National University (ANU) in Canberra, Australia. Feb, 2018 cohort. *Organized by:* Australian Centre for Robotic Vision (ACRV)
- **Visiting Ph.D. Student:** March - April 2018 at SINTEF SeaLab, *Trondheim, Norway*

2012 **M.Tech in Mechatronics (Masters)**, *Indian Institute of Engineering Sciences and Technology, India.*

Technical Skills

- **Toolkits/libraries**: OpenCV, ViSP, PCL, VTK, SOFA, Eigen, NumPy/SciPy
- **Languages**: C/C++, Python, Matlab and Java. Also worked on OpenMP, SSE3 and CuBLAS based optimization.

PhD Topic

The objective of my PhD is to track the 3D deformation of non-rigid objects using RGB-D cameras. A combination of classical computer vision techniques (direct photometric minimization, sparse correspondence, depth based error minimization) with co-rotational Finite Element Methods has been used for this purpose. This approach enables us to track large deformations in non-rigid objects irrespective of large changes in volume, as well as gather additional information about the deformation, such as magnitude of external forces (with just the depth camera) and estimation of material properties (Young's modulus, Poisson's ratio etc.). This thesis is supervised by *Eric Marchand* and *Alexandre Krupa.*

Publications

1. Sengupta, Agniva, Romain Lagneau, Alexandre Krupa, Eric Marchand and Maud Marchal. "Simultaneous Tracking and Elasticity Parameter Estimation of Deformable Objects." *IEEE International Conference on Robotics and Automation (ICRA)* IEEE, 2020 - *accepted*

2. Sengupta, Agniva, Alexandre Krupa, and Eric Marchand. "Tracking of Non-Rigid Objects using RGB-D Camera." *IEEE SMC 2019: IEEE International Conference on Systems, Man, and Cybernetics)* IEEE, 2019.

3. Sengupta, Agniva, Alexandre Krupa, and Eric Marchand. "RGB-D tracking of complex shapes using coarse object models." *2019 IEEE International Conference on Image Processing (ICIP)* IEEE, 2019.

4. Sengupta, Agniva, and Shafeeq Elanattil. "New feature detection mechanism for extended Kalman filter based monocular SLAM with 1-point RANSAC." *International Conference on Mining Intelligence and Knowledge Exploration.* Springer, Cham, 2015.

5. **PhD Thesis:** Sengupta, Agniva. Visual Tracking of Deformable Objects with RGB-D Camera. Diss. *INRIA Rennes-Bretagne Atlantique and University of Rennes 1*, France, 2020.