

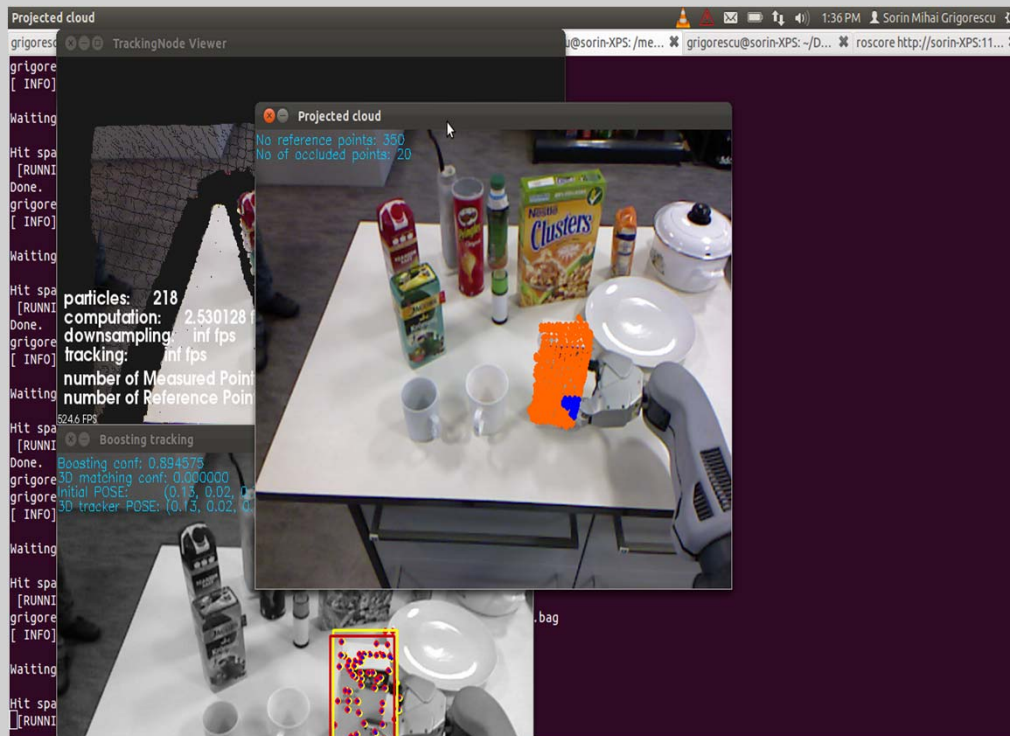


2D-3D Features for Object Tracking in Robotics

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The goal of the project is to build an evaluate sets of 2D and 3D object features that could be used in the context of object tracking. Hence, the main characteristics that should be evaluated are the complexity of calculation, precision in describing certain object characteristics and computation time. Such features can be so-called 2D Harris corners, HOG features, SIFT keypoints, color, or 3D spin and shot images.



Tasks:

1. Get acquaintance with manipulating images and point clouds acquired from robotic scenes and scenarios;
2. Extract 2D features: Histogram of Oriented Gradients (HOG), Scale Invariant Features (SIFT), Harris corners, color and region descriptors, etc.;
3. Extraction of 3D features from point clouds: spin images, point features histograms, etc.;
4. Combine different features based on statistical methods;
5. Evaluate the performance of the features in the context of object tracking (a tracking framework will be provided);
6. Boost the speed of 2D-3D feature extraction through parallel computation (GPU).

Literature:

1. Ros.org; Pcl.org
2. Gonzalez and Woods, Digital Image Processing, Ed. Prentice Hall, 2008.
3. Hartley and Zisserman, Multiple View Geometry in Computer Vision, Ed. Cambridge University Press, 2004.