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Title: ORB-SLAM on Android
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Will be using Android: Yes

Description: The use of SLAM has many applications in drones and augmented reality to track the 6DOF position of the camera. Currently there are two state of the art methods: ORB-SLAM and LSD-SLAM. We would be choosing to use ORB-SLAM because of the speed benefits of constructing a sparse feature map instead of a dense feature map and its robustness in tracking from literature. On the other hand, an implementation of semi-direct visual odometry is similar to ORB-SLAM but uses direct methods by use of photometric error to estimate pose instead of feature-based methods in SLAM which allows for speed-up.

For now, we plan on using ORB-SLAM because of Android support online, but if possible we would like to use the implementation of Semi-Direct Visual Odometry to do the tracking since it is faster, however there is no loop closure or relocalization included with the open-source code at the current time.

After ORB-SLAM is implemented and there is extra time, we would like to use the pose estimation to place a 3D object in a scene.

Goals:

1. Get ORB-SLAM running on PC to get a sense of its output and to test possible object overlay
2. Calibrate the Android Camera using either OpenCV or ROS implementation
3. Get ORB-SLAM running on Android using open-source code
4. Since the default ORB-SLAM does not have relocalization, enable a reset to start over again if pose gets lost
5. Extra: Add relocalization and loop closure if time permits
6. Extra: Do object placement using the pose-estimation in the following order
    a. Place a cube
    b. Place an OBJ file
    c. Create UI for selecting object and placing them

References:

1. Castoryan. "Castoryan/ORB-SLAM-Android." *GitHub*. N.p., 31 Mar. 2016. Web. 21 Oct. 2016.
2. Solem, Jan Erik. "How to Calibrate a Camera with OpenCV and Python."*Solem's Vision Blog:*. N.p., 01 Jan. 1970. Web. 21 Oct. 2016.
3. Mur-Artal, Raul, J. M. M. Montiel, and Juan D. Tardós. "Orb-slam: a versatile and accurate monocular slam system." IEEE Transactions on Robotics 31.5 (2015):
4. Forster, Christian, Matia Pizzoli, and Davide Scaramuzza. "SVO: Fast semi-direct monocular visual odometry." 2014 IEEE International Conference on Robotics and Automation (ICRA). IEEE, 2014.