

Background: An optical mouse works by illuminating a surface so a small image sensor can track the revealed texture. This technology can be applied to the underwater realm in a similar manner. A downward facing camera can move along the seafloor and based on how it perceives the textures of the floor to move, it can estimate where it has traveled. We believe we can perform this estimation better than dead reckoning off of rudder angle and RPM and at a lower cost than sophisticated inertial measurement units (IMUs).

Goal: Although an IP camera does not have the FPS of an optical mouse sensor, it does allow for algorithmic flexibility. A customized optical flow algorithm with the high resolution of the camera should track at least as well as the mouse and generally be more robust. In the future, we can integrate a low-cost IMU to perform sensor fusion and achieve a more mature position estimate.

1080p security camera within a waterproof housing



Progress: So far, the new camera has been setup and some seafloor data has been collected. Overall, the images are tracked well with the Lucas-Kanade method, which is feature based. Additional data at different heights and speeds will be collected and a variety of optical flow algorithms and parameters within those algorithms will be tested.

Lucas-Kanade Optical Flow