To construct an optical odometer that is carried onboard a moving platform to online record its trajectory and orientation.

System Components:
1. Two wireless optical mice.
2. RC platform
3. MATLAB-based processing and display

An optical mouse contains a full image processing system that analyses optical flow and produces relative displacement.

An optical mouse with a laser illumination sensor was hacked to access the pixel data in order to show a live view of what the sensor is capturing through its lens.

Tests were devised to make sure that the mouse output does not change with different ground textures or speed profiles.

The raw mouse output displacement signal is extremely noisy. Different filters were examined to reduce noise.

Due to irregularities in the manufacturing of the mice and uncertainties in the measurements of the dimensions, tests are devised to calibrate the odometer as a whole system both software and hardware.

The platform was moved along a straight line to check if the readings of the two mice are identical. Irregularities were found and compensated for by multiplying the output of one of the mice by a correction factor.

A group of odometer linear estimates were compared to their base-truth counterparts to obtain the translation calibration constant.

A similar procedure was carried out to obtain the rotation calibration constant.

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The figures below show the results from the calibrated and uncalibrated odometer.

1- Increase the optical mouse distance from ground by at least 15 cm using a focusing lens.
2- Direct coupling of multi wireless mice to the processing software.
3- Better filtering (e.g. Kalman filter).