Two-Dimensional Tracking of Quadri-Flagellate *Ulva* Zoospores

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A critical stage in the development of anti-biofouling materials is testing under controlled and real conditions. For these tests, reproductive quadri-flagellate zoospores from the marine algae *Ulva*, are commonly used as a model biofouling organism. Tracking the movement of these zoospores enables us to visualize and understand Ulva zoospore movement patterns and the biofouling process. This experiment aims to test a two-dimensional particle tracking method for zoospore tracking applications. The experiment used a Lecia DMi8 Inverted Optical Microscope with a magnification of 100x and a Teledyne Photometrics Prime 95B high-speed camera at a speed of 100 frames per second and a pixel size of about 1 micron. These instruments were used to record videos that were then run through a MATLAB particle tracking algorithm capable of mapping the movement of individual zoospores contained within a volumetric slide made of one glass slide, three coverslips, and epoxy. A diluted solution of seawater, gametes, and zoospores was pipetted into this volumetric slide, recorded, and then run through the algorithm delivering a graph of particle paths that show visual similarities to known movement patterns of *Ulva* zoospores. Of these known patterns and the most visible from a top-down two-dimensional perspective was “spinning” shown as a continuous circular plot on the graph created by the algorithm. The spinning occurs in the last stage in a zoospore’s progress towards attaching to a surface, becoming a biofoulant. The results of this experiment show that tracking and analyzing zoospore movement is possible with this method, however, the five other known movement patterns; orientation, wobbling, gyration, hit & run, and hit & stick are difficult to definitively pick out in the data. Optimization is needed before this method can be considered completely viable for zoospore tracking and analysis.

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