

عنوان مقاله:

A New Method for Characterization of Biological Particles in Microscopic Videos: Hypothesis Testing Based on a Combination of Stochastic Modeling and Graph Theory

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Introduction Studying motility of biological objects is an important parameter in many biomedical processes. Therefore, automated analyzing methods via microscopic videos are becoming an important step in recent researches. **Materials and Methods** In the proposed method of this article, a hypothesis testing function is defined to separate biological particles from artifact and noise in captured video. Then, a decision about each hypothesis is made in the following steps: selecting primary candidates using stochastic modeling, pruning false candidates using graph theory, and confirming remained particles by Kalman filtering. **Results** Performance of the proposed method is evaluated on real videos containing low and high densities of live *Listeria* particles. The results show that in the first scenario, the proposed and MD algorithms detect 95% and 65% of particles in presence of 2% and 44% false detections, respectively. In the second scenario, the proposed and MD algorithms detect 91% and 55% of particles in presence of 14% and 45% false detections, respectively. **Conclusion** In the first scenario, the proposed algorithm detects and tracks particles typically 30% and 31% better than MD. Moreover, its false detected particles and trajectories are 42% and 27% less than MD. In the second scenario, the proposed method detects and tracks particles typically 36% and 38% better than MD, also its false detected particles and trajectories are 31% and 18% less than MD. Consequently, better characterization of particles in proposed algorithm not only does not lead to extracting more false particles and trajectories but also decreases the rate of false characterized particles and trajectories compared with existing algorithms.

کلمات کلیدی:

Biological Particle, Graph Theory, Hypothesis Testing, Microscopic Video

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