Leibniz Institute for Natural Product Research and Infection Biology - Hans Knöll Institute

# Automated Characterization of Cell Tracks: Step forward



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# Introduction

The focus of this project is on the development of algorithms for (i) automated cell tracking in two and three spatial dimensions and (ii) automated characterization and parameter-free classification of cell tracks. The implementation of these algorithms will be based on our previous work on cell tracking and quantitative track characterization [1]. The main objective is to arrive at classifier models based on dynamic cell properties that allow distinguishing infection scenarios in various species and caused by different pathogens. This work is part of the project "Whole Blood Imaging" (BLOODi) within the framework of the Leibniz ScienceCampus InfectoOptics. The scientific aim of this project is to combat infectious diseases with advanced optical technologies by establishing the concept of a dynamic hemogram from whole blood infection assays. The dynamic hemogram goes beyond standard blood count examination in that information on the migration and interaction of blood cells is captured. This novel source of information will be investigated for its potential to function as a biomarker in the characterization of whole blood infections caused by various pathogens and in different species. While exciting new insights can certainly be expected at the level of basic research in the fields infection biology and optical technologies, we do envisage right from the start our long-term goal of translating knowledge from bench to bedside.



ing combinations of random and directed track segments. Due to the rich diversity of cell tracks in general, their classification into different types of migration behavior can be a challenging task.

Step II: calculation of deciles of each level



#### **Descriptors: staggered measures**

# Schematic cell track characterization [1].



A - asfericity ratio, C - confinement ratio, O - outreach ratio, D - displacement ratio.

### The examples of calculated descriptors (matrix form).





# Output example (matrix form)



# The advantages of algoritm:

• Keep the scale information;

• Produce the feature vectors of the same length;

• The produced vectors are useful for classification.

# References

Mokhtari at al. PLoS One. 2013 Dec 6;8(12):e80808 doi:10.1371/journal.pone.0080808

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