

Biotech companies often own compound libraries with several ten- or hundred thousands compounds, which a sample is supposed to be tested with, resulting in a brute-force-approach to collect large amounts of experimental data for biochemical reactions. The challenge is to compute the necessary data and also to interpret the results - preferably automatically.

Introduction

In a close cooperation with a microscope-producer from the biotech centre in Munich, Germany - with customers all over the world - a smart sensor was implemented by utilising computer vision methods to initially detect distinct, fluorescent marked cells and to track their movements over long periods of time to determine the effectiveness of target compounds. While currently lab personnel needs to observe image sequences manually in a very time consuming process to tag the distinct cells for examining their trajectories, the smart sensor reduces the human effort enormously through complete automation.

Challenges

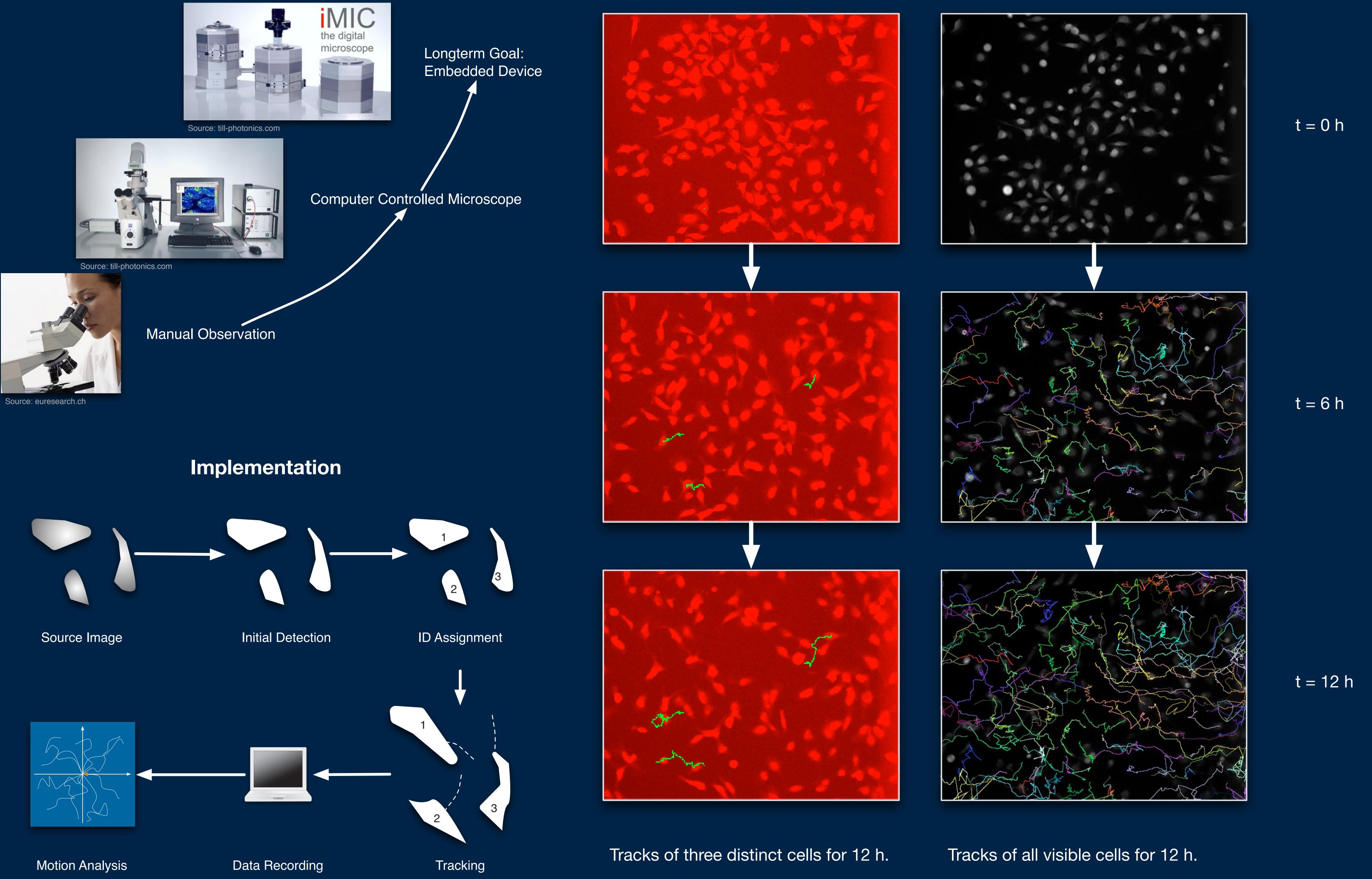
- Many targets to be tracked
- Decreasing Cell Illumination over time
- Random Cell motion
- Overlapping, merging and splitting Cells
- Changing Cell Shapes

Goals

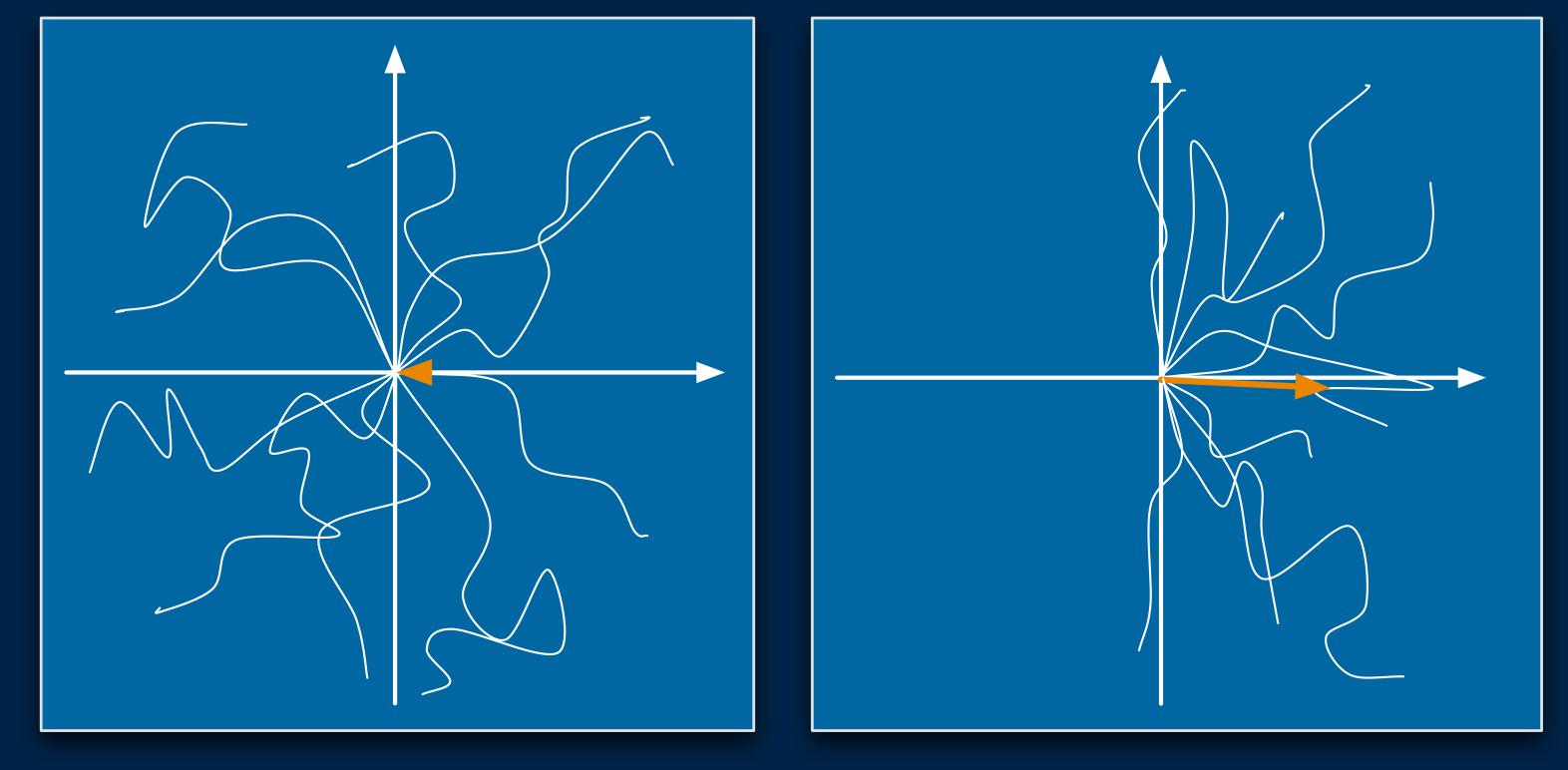
- Adaptive cell detection (Shape, Illumination)
- Realtime capable Image Processing
- Loss Detection
- Out of Bounds Detection
- Automated Cell Tracking
- Automated Data Interpretation
- Embedded System

A Computer Vision based Approach for Cell Tracking to increase Throughput in Visual Drug Discovery

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Plotting the cells' trajectories with normalized origins helps to make conclusions about an attached compound's effectiveness. A non-uniform distribution results in an overall directional vector as depicted in the right image in contrast to the left image. This implies, that cells have been attracted to one or killed at the other side of the carrier.

Results

First tests with real world image sequences showed, that fluorescent cells were detected and tracked correctly with a probability of 85%. This project is a successful example for an interdisciplinary project, combining key technologies from biotechnology, informatics and automation to increase productivity in visual high throughput screening for drug discovery.

References

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