

DATASET ANALYSIS “ebTrackApp”

Automated Analysis of Images of Fluorescent Proteins

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Team:

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App overview:

DataSet Analysis is releasing its first software product: our 3-in-1 ebTrackApp which runs on your desktop machine (Windows/Mac/Linux), your phone (iOS/Android) and your smartglasses (Vive/Hololens).

COMPANY INTRODUCTION

DataSet Analysis is an early stage biomedical company that aims to bring diagnostics software to the consumer market. To this end, the team combines expertise in biomedical research, computer vision, interactive design and user experience.

OUR MISSION

Our expertise is in extracting quantitative information from time-lapse series of microscopy images to elucidate mechanisms of human disease at the cellular level. Together with our software, we provide you with instructions for selection of image analysis parameters. Our core mission is to facilitate the precise automated measurements of sub-cellular events in the context of biomedical research and personalized medical care. In particular, our bioimage informatics software can facilitate the analysis of degenerative diseases and *ex-vivo* drug-susceptibility testing in functional assays. We provide high-content analysis for molecular oncology in the context of precision medicine or secondary screening of novel therapeutic compounds.

OUR 3-IN-1 APP

We present our **ebTrackApp**. This simple to use software product **will measure the motion dynamics of fluorescent biomarkers in your image datasets**. We offer this software platform as a niche app for the analysis of fluorescently tagged EB proteins [Ref.1] and we demonstrate its performance on three videos at www.datasetanalysis.com: An EB1 video courtesy of Gatlin Research Laboratory [Select DemoVid1] and a synthetic computer-generating video mimicking the motion of EB1 proteins [Select DemoVid2]. In addition, we have also calibrated our software to detect and track motor vehicles on the road, which you could use through your desktop computer camera or your phone embedded cameras [Select DemoVid3].

COMPUTER VISION

The underlying algorithm of **ebTrackApp** has three steps: 1) Image pre-processing step [Ref.2&3]. 2) Detection of features for tracking [Ref.4] and 3) Motion tracking [Ref.5&6]. The computer code we have implemented our platform is in `#C` programming language. We use an open source computer vision library *OpenCV*. We generated our Graphical User

Interphase (GUI) and all of the App's visualization/graphics capabilities, as well as the different OS-specific compilations, with the game engine of *Unity Technologies SF*.

USER MANUAL (Text for Demo Video)

Double-click ebTrackApp.exe to open the software platform. The App performance is controlled by five sliders and five buttons to the left of your screen. We have pre-programmed two combinations ("proteins" and "cars") of pre-set parameters for your convenience. In addition, the User is provided with the full control over our computing engine and its settings. Select an MP4 video from the "Load Video" button to the left. Below is the list of all controls and technical information.

Max # Detections – With values ranging from 0 to 10,000, this parameters allows you to limit the number of features for tracking. When ebTrackApp identifies more features than your limit, it will select for analysis only these detected with high certainty.

Quality Level – Sets the minimal accepted quality of detected features. If the detection with the highest score has the quality measure of 1500 and the Quality Level is set to 0.01, all detections which quality measure of <15 will be excluded from the analysis.

Min Distance – The minimum acceptable Euclidean distance between the detected features. This parameter allows you to take into consideration the size of your objects of interest.

Load Video – Click this button to select a video for analysis.

Playback Speed – Allows you to control the rate of frames displayed per second and this way our users could better judge the quality of the analysis.

Pre-Processing – Displays our pre-processing step of background subtraction.

Raw Images – Displays our tracking results with or without the raw imaging data underneath.

Traces – Allows the display of aggregated tracking results over the whole image sequence.

ROI – Allows the User to mark a Region Of Interest which will be excluded from the analysis.

The output result of our analysis is presented to the right of your screen in the form of two histograms, the direction of motion distribution is shown above and the speed of motion

distribution is shown below, which are updated each frame. In between, we display a counter showing the number of the current frame and the number of features detected. In order to visually inspect our analysis results, we overlay color-coded ellipsoids at the positions of tracked features. The color scheme we apply is the same as the histogram of angles. After the last movie frame is analyzed, all speed and angular orientation values measured throughout the movie are stored as CSV files. If you select the Batch Analysis option, our software will analyze all movies in the folder.

SCIENTIFIC REFERENCES

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