Training data preparation with computer vision algorithms for a Mask R-CNN[⋆]

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Abstract. Mask R-CNN (Region with Convolutional Neural Network) is a framework for instance segmentation of objects. In order to train such a network, images need to be annotated/labelled, where one common method is using software like the VGG Image Annotator (VIA). To increase the speed of training data preparation, a method using traditional computer vision algorithms is proposed. (a) Contours, (b) watershed, (c) k-Means, (d) Circle Hough Transform (CHT), (e) graph-based segmenters and (f) edge detection are reviewed with the application being segmenting biological cells in microscopy images of in-vitro assays.

Keywords: image annotation · segmentation · training data

1 Introduction

Medical devices are tested with *ISO 10993-5* [1] to determine biocompatibility by analysing the morphology and cell growth of fibroblasts after adding an extract of the examined product. The cell's shape indicates the cytotoxicity grade, where dead (round) and inhibited (curved) cells are loose, and living cells are sticky. Currently, these assays are done and evaluated by an expert. To digitalize the evaluation process efficiently in terms of time, cell segmentation with traditional algorithms [2] to create masks for training a Mask R-CNN [3] is proposed.

2 Methodology

The following traditional algorithms were applied for segmenting the cells:

(a) **Contours** draws circles and shrinks until an object is encountered.
(b) **Watershed** handles images like a topographical surface and floods provided markers until they converge.
(c) **k-Means** is a cluster algorithm that, when a number of colours k are defined, learns the best way to most effectively recreate the image.
(d) **CHT** votes for high gradient pixels that lie in a circle.
(e) **Graph-Based** algorithms like the Felzenszwalb Huttenlocher Segmenter are based on region comparison.
(f) **Edge Detection** finds sudden changes in brightness.