Abstract

Vesicles are spherical shaped particles which vary in radius between 30 nm and 1 μm and are found in all body fluids. These particles play a paramount role in communication, transport, coagulation, immune response and inflammation. Vesicles are recently affiliated as real particles, instead of artifacts, in transmission electron microscopy (TEM) images. Their size, concentration, morphology and function are disease dependent. Research of vesicles are therefore important. Nowadays the vesicles are counted by hand which is labor intensive, where the results can vary from person to person due to different interpretation of particles. We present a method to automate the vesicle detection in transmission electron microscopy images of urine by using Hough transform. Single vesicles are used to optimize the detection of the algorithm on single vesicles. With the knowledge of detecting single vesicles, multiple vesicles are detected simultaneously with the algorithm. The radii and positions of vesicles is determined by taking multiple Hough transforms of a single image for a constant Hough radii. From the three dimensional local maxima accumulator space that we make, we extract the information of radii and positions of the vesicles in the image. The performance is validated by 4 images, manually analysed by two independent researchers. The algorithm has an positive predictive value of 76 ± 2% and an sensitivity of 67 ± 7%. In conclusion: Hough transform is a good technique to detect vesicles in TEM images, although the algorithm still needs some minor improvements.