

**Semi-automatic Graphical Annotation Using Ellipses
in Cervigram Survey**

by

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ABSTRACT

The current practice of indexing cervicographic images only by patient information is not useful for research requiring content-based image retrieval. This thesis proposes and develops a web-based 20-questions application for textually annotating cervigrams, which acts as a survey. Participants view an instructional image sequence and provide answers to a set of YES/NO questions on five chosen cervigrams. Image annotations are based on these responses. This application aims to distribute this task to interested laypersons who have access to the internet. Implementation of the survey will provide a reference for future research in cervicographic related fields.

Two versions of an intuitive ellipse annotation tool were developed to describe patterns of significant cell and tissue growth in cervigrams by five parameters (centroid location, major and minor-axis lengths, and orientation). A total of 36 online evaluations were administered to compare the speed and accuracy of each tool to an existing alternative called OpenOffice Draw 3.1. The results showed that the neither of the developed tools had an advantage over the other, but that both were faster than the OpenOffice Draw 3.1 tool. Using 50 automatically segmented images and their corresponding ground truths, one set of experiments showed that, under an area constraint, the best method to fit an ellipse to a shape was by matching second moments. Using this ellipse-fitting method, another set of experiments compared automated, interactive, and strictly manual methods of graphical annotation. The experiments for the automated methods used the same two sets of 50 images. The interactive and fully manual methods were tested on 3 different subjects. In the experiments, all user interactions were logged and analyzed for timing, consistency, and accuracy. The comparison yielded inconclusive results as to which method is more accurate. However, averaged over all subjects, the semi-automatic annotation process was 80% faster than the fully manual one.