

Automatic analysis of Pap smears

Background

The Papanicolaou test is the primary screening test for cervical cancer. It involves the microscopic examination of cells sampled from in and around the cervix. It is a labour-intensive complex process. Careful screening is a time-consuming task, even for a very-well-trained cytologist. Fatigue, lack of concentration, habituation, and inexperience are all factors that can lead to false interpretations. In principle automated screening—using a robotic microscope and computer—can address this problem.

Project description

In this project you are given a stack of digitised images of a single microscope field-of-view (see Figure 1) of a Pap smear. Each image represents a different z-axis position; i.e. focal position. The project has two parts.

Part 1

You are to develop/implement algorithms for

1. Identifying the best all-in-focus image in the stack; and
2. Creating an extended-depth-of-field image from the entire stack.

In the first case the algorithm should determine which of the images contains the best overall collection of focussed cells. In the second case the algorithm should combine information from each image in the stack to create an extended-depth-of-field (EDF) image in which all of the cells are in focus.

Part 2

You are to develop/implement algorithms for

1. Automatically segmenting all of the cell nuclei; and
2. Segmenting only the nuclei of free-lying cells (see Figure 2).

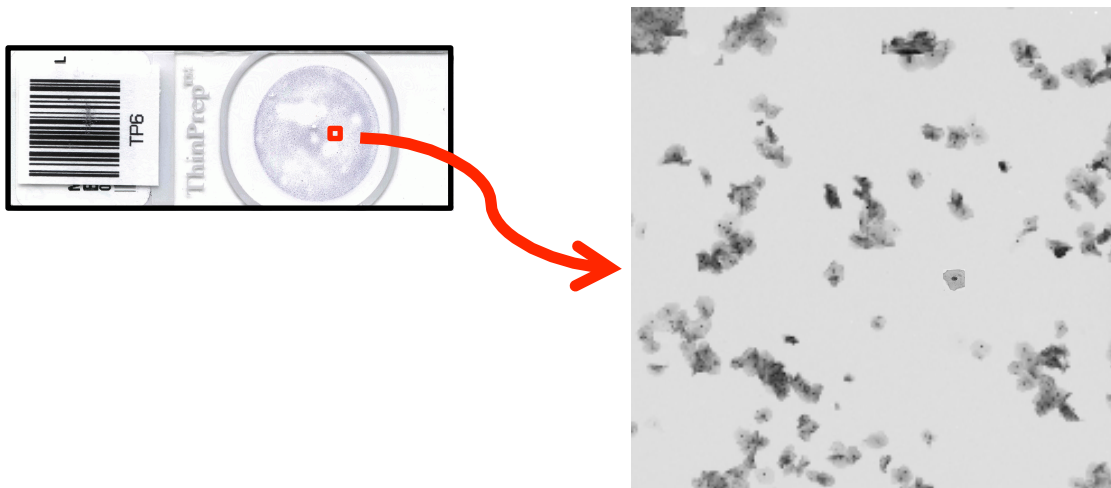


Figure 1: Digitised microscope field-of-view (taken at one particular focal plane).

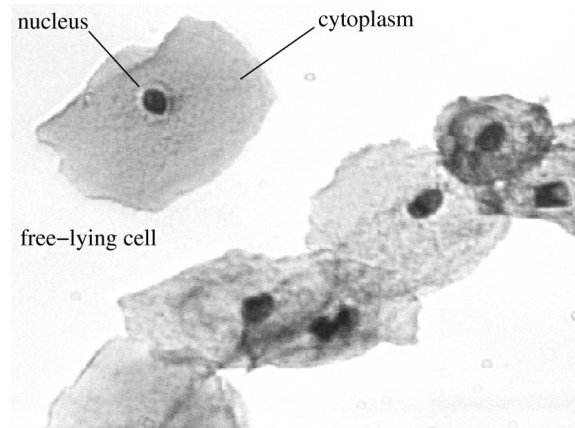


Figure 2: Example of a free-lying cell.

Contact

Andrew Mehnert

Andrew.Mehnert@chalmers.se