Objective:
The cell segmentation is the basic technology in the automatic cytological screening system. A constant and accurate segmentation method has a great impact on the recognition of abnormal cells. Therefore, this study aims at separating cell clump and cell nucleus region, and develops an Adaptive Liquid-based Smear Cell Segmentation System (ALSCS system). The relevant results of ALSCS system are introduced.

Methods:
A total of 1966 cell images of liquid-based cytology were used in this study. The analytic sample images contained 1223 normal cells, 665 abnormal cells, and 78 invasive cancer cells. The ALSCS system segmented cell images based on the color gradient and edge, resulting in hierarchical segmentation of cytoplasmic region. The ALSCS system reduced the interference in segmentation, such as uneven staining, difference in brightness, and cellular overlap. A genetic algorithm was proposed to determine the most appropriate parameters in the each segmentation threshold.

Results:
The experiment results showed that the ALSCS system had a success segment ratio of 96.64% for all cell images. It reached an accuracy rate of 92.70% for cytoplasm segmentation, and 97.05% for nucleus segmentation.

In Table 1-2, the Recall has a value 94.52%, means the cytoplasmic segmentation has a bigger error probability, some cytoplasmic may be labeled as the background. Precision value is 92.11%, which means more background falsely labeled as cytoplasmic regions.

In Table 1-3, the Recall value has 98.43%, means the nucleus are almost segmentation correctly. We can know the nucleus segmentation is better than the cytoplasmic segmentation, and the cytoplasmic result will almost above all the nucleus region.

Conclusion:
In this study, we develop the ALSCS system applicable in the cell image segmentation of liquid-based samples. The utility of ALSCS system in invasive cancer cells has a suboptimal outcome, due to the greater variations in tumor cells and smear background. The ALSCS system appears to be a promising component technology in the developing automatic cancer recognition system.