



Intelligent Cervical Squamous Epithelial Cells Classification System

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Abstract. Cervical cancer is the second most common cancer among women in Malaysia. In general, clinical diagnosis of cervical squamous epithelial cells is performed by physicians through their visual inspection on Papanicolaou smear (Pap smear) slides. In certain situations, misdiagnosis and false interpretation could occur due to technical and human errors. Technical error involves low quality of smear slides, affected by unwanted noises and/or artefacts etc. Human error, on the other hand, involves inexperienced physicians, eye fatigue, heavy workload etc. These limitations commonly lead to longer diagnosis and prognosis times. Thus, intelligent cervical squamous epithelial cells classification system is introduced in order; (i) to be used as a second opinion that can assist physicians interpret those slides accurately, (ii) to improve the diagnosis accuracy especially in the cases of inexperienced physicians, by merging the benefits of ‘empirical human’ and ‘explicit machine’, (iii) to provide uninterrupted and faster diagnosis process. Development of the cervical squamous epithelial cells classification system involves four major components; data acquisition, data pre-processing, data extraction and data classification. Data acquisition converts information from Pap smear slides to digital numeric values (digital cervical cells images) that can be manipulated by computer system. Data pre-processing stage involves contrast and quality enhancement of Pap smear images as well as segmentation of regions of interest (ROI) (i.e. cervical cells’ nucleus). Data extraction concentrates on finding significant features of images, signals or other medical modalities, which commonly used by physicians during clinical diagnosis procedure. In this study, two nucleus characteristics are extracted namely chromatin pattern and nuclear membrane irregularity. These features will then be used as attributes by intelligent neural network in data classification stage in order to classify the cervical cells into normal, low-grade squamous intraepithelial lesion (LSIL) and high-grade intraepithelial lesion (HSIL). The classification of 600 cervical squamous epithelial cells achieved 95% accuracy, 94.92% sensitivity and 95.15% specificity. The proposed system is developed with the aim to assist pathologists and cytotechnologists and hence it is hoped that the incidence as well as the mortality rate due to cervical cancer in Malaysia or ASEAN countries can be reduced.