ABSTRACT

Cervical cancer is one of the most severe death cause cancers in developing countries. The mortality rates of the cervical cancer are high in developing countries due to their unawareness about such cancer. This type of cancer can be cured if it is detected at an earlier stage, by detecting and removing the cancer affected regions in cervical regions. The severity of cervical cancer can be categorized into Stage I to IV based on the cell affection with its surrounding. In case of stage I, the cells in cervix region are affected and it is also called as mild stage. In case of stage II, the cells outside the cervix regions are affected and it is also called as moderate stage. In case of stage III, cancer cells are spread in the pelvis and vagina region. In case of stage IV, the cancer cells are spread into bladder or rectum region, which bleeds the blood. Stages III and IV are called as severe stage. Death is occurred in stage IV. In this thesis, the cancer can be detected at stage I and II, so that the patient can be cured at an earlier stage.

This research work proposes an efficient Fuzzy logic and Adaptive Neuro Fuzzy Inference System (ANFIS) classification method based cancer region detection and segmentation in cervical images. The thick and thin edges are detected using fuzzy logic and these detected edges are fused pixel level image fusion technique. Then, Gabor transform is applied on the fused cervical image. The texture features are extracted from the Gabor transformed image and these features are classified using ANFIS classification approach. Further, the morphological operations are used to segment the cancer regions in classified abnormal cervical image.

This thesis also proposes cervical cancer detection and segmentation workflow using Particle Swarm Optimization (PSO) algorithm based Co-Active Adaptive Neuro Fuzzy Inference System (CANFIS) method. This proposed workflow for cervical cancer detection and segmentation system uses Curvelet

transform for decomposing the source cervical image into number of sub bands and then linear feature set are derived from each decomposed sub bands. The extracted features are optimized using PSO algorithm for selecting the optimum features from the set of all features. These optimum features are then trained and classified using CANFIS classifier which classifies the cervical image into either normal case or abnormal case.

This research work also proposes two subsequent methodologies as cervical cancer detection and its diagnosis. These two stages used Convolutional Neural Networks (CNN) architecture with different number of Convolutional layers and pooling layers with various sizes of Convolutional filters. This conventional CNN architecture receives the feature matrix from the source cervical image and produces the classification results as either normal or abnormal.