INDUSTRY: MEDICAL DEVICES

L&T Technology Services develops a novel algorithm providing pathologists a fast and accurate solution for diagnosing cancer

CLIENT PROFILE

The gamut of pathologists engaged in diagnosing cancer.

BUSINESS CHALLENGE

Today, cancer constitutes a major health problem. Approximately one out of every two men and one out of every three women get cancer at some point during their lifetime. Fortunately, recent advances in medicine have significantly increased the possibility of curing cancer. However, this primarily depends upon the early diagnosis and the selection of the treatment, as per the malignancy level of the disease. Therefore, the timely detection of cancer, distinguishing of the cancerous structures from the benign and healthy ones, and identification of the malignancy level is critical.

Currently, due to lack of automated techniques, it takes four to five days for a pathologist to diagnose the sample of a cancer patient. The conventional workflow for diagnosis involves tissue processing, sectioning, and staining of the specimen for the generation of a slide. The slides are then examined by the pathologists under a microscope and the IHC (Immunohistochemistry) report is generated which is then reviewed and corrected. This is a time-consuming process that involves a large amount of manual labor and human error. This is where 'digital pathology' comes to the rescue.

OUR SOLUTION

L&T Technology Services put together a team along with a pathologist from a medical university and came up with a solution which assists the pathologist in preparing the IHC report.

The team developed an automatic image processing algorithm for partitioning and characterizing microscopic structures (cancer cells) on immuno-histological stained slides from breast cancer tissue and also quantifying the stain intensity of the sample, to generate an IHC report.

Approach

The step-wise approach adopted was as follows:

- Understanding the clinician's requirement
- Standard data preparation
- Seed detection technique for obtaining the total cell count
- Segmentation of boundaries of the cells
- Classification of cells using a simple linear classifier
- Creation of the IHC report

The proposed image analysis method has been tested on a set of ER and PR stained breast tissue image samples.

Tools & Technologies

- MATLAB, OPENCV
- Techniques like background subtraction, seed detection, boundary detection, linear classification

BENEFITS DELIVERED

- The current software is the first of its kind with a revolutionized workflow for diagnosis which includes digital slide scanning, file management, distribution to pathologist, auto analysis algorithms, correction from pathologists, digital comparison and conflict resolution, disease history, drug effectiveness study.
- The proposed image analysis method has been tested on a set of ER and PR stained breast tissue image samples and have achieved an average precision up to 95.27% and average recall of up to 93.37%.
- Apart from cancer diagnosis, the algorithm can also be used for studying the biomarker expression on the sample.

ABOUT OUR IMAGE PROCESSING PRACTICE

The Image Processing Practice at L&T Technology Services caters to areas like Life Science, Microscopic Image Analysis, Medical Imaging, Security & Surveillance, and Automotive Vision Systems. The Practice is in close collaboration with institutions for extensive research.

The Practice has a number of developments to its credit. It has developed a patented solution called Extended Depth of Field (EDOF) for extending the shallow depth of field limitation in optical devices such as the microscope. It has also developed a patented tool named e-Patholizer which has a revolutionized workflow for diagnosis and includes: IHC report generation digital slide scanning, file management, distribution to pathologist, auto analysis algorithms, correction from pathologists, digital comparison and conflict resolution, disease history, and drug effectiveness study. In the security and surveillance area, the applications developed are video content analyzer, human detection and tracking, and moving object detection. The Practice has also developed various vision-based ADAS optimized algorithms for the automotive sector; applications developed cover: lane detection, traffic sign recognition, pedestrian detection and navigation assist. The Practice also has few other imaging patents under their belt.