

INDUSTRY: MEDICAL DEVICES

L&T Technology Services helps leading Microscopes manufacturer redesign and launch its microscopy software with optimized and high performance imaging algorithms

CLIENT PROFILE

The client is one of the leading manufacturers of Microscopes; their product-line comprises super resolution microscopes, confocal microscopes, sophisticated microscopy software.

BUSINESS CHALLENGE

In optical microscopes, a common limitation is that it is usually impossible to image large 3-D specimens entirely in focus. This renders it difficult for the user to observe and analyze specimens. The solution for this will be optically sectioning the specimen; the in-focus information at the specimen's surface can be acquired for each section, which will then be processed to obtain a single in-focus image.

The client was using a 3rd party solution to overcome the shallow depth of field. The time taken take to process large microscopic images was expensive.

Based on the solution offered by L&T Technology Services which gave a high quality result and was around five times faster than the solution the client was using, they invited us to develop a similar algorithm.

OUR SOLUTION

The team at L&T Technology Services came up with a solution to overcome the shallow depth of field that gave better and faster output.

'Focus stacking' also known as 'focus blending' is a digital image processing technique which combines multiple images taken at different focal distances to give a resulting image with a greater depth of field (DOF) than any of the individual source images.

Approach

The step-wise approach adopted was as follows:

- Images captured at different focal depths with varying Z levels
- Image alignment or registration
- Pre-processing and background subtraction
- Focus measurement
- Composite image and depth map generation
- 3D reconstruction

The reconstructed 3D model of the subject is essential for an entomologist to observe and analyze very small specimens. This also finds application in detecting faults in screws, bolts, etc. in the manufacturing industries.

The upgraded version of the EDOF (Extended Depth of Field) application gives flexibility to the user by displaying the focused image while the stacks are being captured which is called the LIVE EDOF.

Tools & Technologies

- Matlab, C++, Qt, Open CV
- Techniques like complex wavelet decomposition, image fusion, depth from focus, and automatic image registration

BENEFITS DELIVERED

- Automated image alignment and illumination correction.
- Robust focus measure.
- Tested on diverse optical microscopy data sets at different resolutions covering various application areas, namely entomologists, industrial inspection purposes, etc.
- Effective solution for cross-legged problem and background blotchiness.

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.