Docket #: S05-327

Light Field Microscope

The Light Field Microscopy (“LFM”) is a patented system that enables rapid acquisition of images to be virtually analyzed at any time in the future from different viewpoints or focus adjustments. The LFM employs microlens and photosensor arrays to computationally capture a “light field” representation of how rays of light move through 3D space - as though the light rays are frozen in time for later evaluation. This allows future image analysis from all possible viewpoints and levels of focus within a certain range, including perspective flyarounds, 3D reconstructions, and refocused images. This eliminates the need to focus the microscope for each image capture. Overall, the LFM increases throughput and helps preserve light sensitive samples by reducing the total time and duration of light exposure. This innovative microscope system can be used for clinical pathology, biological research, or a variety of quality assurance inspections.

Stage of Research
The inventors have built a prototype that is ready for manufacturing. This also includes a complete software package.

Related Technologies:
S14-315 Enhancing the performance of the light field microscope using phase masks
S13-113 Super Resolution for Light Field Microscopy

Applications

- **Biological research**
  - high throughput imaging of multiwell plates or multiple specimens
  - imaging light sensitive samples
- **Clinical pathology** - high volume microscopy
- **Quality assurance inspections**

Advantages

- **Analysis at any time** - a captured image can be analyzed at any time in the future:
  - enables analysis by multiple technicians or at multiple locations (for example, specimens can be imaged in one lab and analyzed in another)
  - allows viewing on large screens instead of through the microscope eyepiece
- **Virtual refocusing** - microscope does not need to be refocused for each sample, because focusing can be performed on captured image
- **Multiple perspectives** - image data includes information to reconstruct all possible viewpoints, including perspective flyarounds, 3D reconstructions
- **High throughput** - images can be captured rapidly because there is no need to refocus microscope
- **Minimal illumination** - avoids damage to light-sensitive specimens
- **Range of illumination options** – brightfield (transmission), fluorescence, phase contrast, and polarized

Publications

- Marc Levoy, Ren Ng, Andrew Adams, Matthew Footer, Mark Horowitz. Light Field Microscopy ACM Transactions on Graphics 25(3), Proc. SIGGRAPH 2006. : Light Field Microscopy

Patents

- Published Application: WO2007044725
- Published Application: 20080266655

Innovators

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