Computational Cytometer Based On Magnetically-Modulated Coherent Imaging And Deep Learning

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INVENTORS

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OTHER INFORMATION

KEYWORDS

rare cells, circulating cancer cells, cytometer, detection, metastasis diagnosis, artificial intelligence software

CATEGORIZED AS

- **Medical**
  - Disease: Cancer
  - Disease: Infectious Diseases
  - Research Tools
  - Software
- **Sensors & Instrumentation**
  - Medical

RELATED CASES

2019-950-0

SUMMARY

UCLA researchers in the Department of Electrical & Computer Engineering have designed and built a computational cytometer capable of detecting rare cells at low concentration in whole blood samples. This technique and instrumentation can be used for cancer metastasis detection, immune response characterization and many other biomedical applications.

BACKGROUND

Rare cell detection aims to identify low-abundant cells within a large population of background cells. Typically, to get a sufficient number of these rare cells, the processing of large volumes of biological sample are required. The direct detection of rare cells from whole blood requires the processing of large amounts of patient blood, which is both unrealistic and time-consuming. Highly specific labeling methods are often used to improve sample purification/enrichment in order to facilitate rapid detection and processing but these techniques are very expensive, with current commercial products reaching up to $800,000. A cost-effective and high-throughput rare cell detection technique to improve the diagnosis and treatment of diseases, including various cancers, are required.

INNOVATION

UCLA researchers have designed and built a computation cytometer to automatically detect rare cells of interest based on their spatiotemporal features in three dimensions. The researchers have successfully built a high-throughput, compact and cost-effective prototype for detecting MCF7 cancer cells spiked in whole blood samples. The prototype had a limit of detection (LoD) of 10 cells per mL of whole blood, which could be further improved through multiplexing parallel imaging channels within the same instrument. This compact, cost-effective and high-throughput computational cytometer can potentially be used for rare cell detection and quantification in bodily fluids for a variety of biomedical applications.

APPLICATIONS

- Disease diagnostics
- Evaluation of disease progression
- Cancer metastasis early diagnosis
- Immune response characterization

ADVANTAGES

- High-throughput
- Low detection limit
- Cost-effective
- Tunable

STATE OF DEVELOPMENT

A portable prototype computation cytometer has been built for detecting MCF7 cancer cells spiked in whole blood samples. The prototype has a limit of detection (LoD) of 10 cells per mL of whole blood, which could be further improved through multiplexing parallel imaging channels within the same instrument.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	20220260481	08/22/2022	2019-950

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Automated Semen Analysis Using Holographic Imaging
- Low-Cost And Portable Uv Holographic Microscope For High-Contrast Protein Crystal Imaging
- Extended Depth-Of-Field In Holographic Image Reconstruction Using Deep Learning-Based Auto-Focusing And Phase-Recovery
- Detection and Spatial Mapping of Mercury Contamination in Water Samples Using a Smart-Phone
- Lensfree Tomographic Imaging

- Single Molecule Imaging and Sizing of DNA on a Cell Phone
- Cross-Modality Deep Learning Brings Bright-Field Microscopy Contrast To Holography
- Microscopic Color Imaging And Calibration
- Quantification Of Plant Chlorophyll Content Using Google Glass
- Rapid, Portable And Cost-Effective Yeast Cell Viability And Concentration Analysis Using Lensfree On-Chip Microscopy And Machine Learning
- Holographic Opto-Fluidic Microscopy
- Design Of Task-Specific Optical Systems Using Broadband Diffractive Neural Networks
- Ultra-Large Field-of-View Fluorescent Imaging Using a Flatbed Scanner
- Revolutionizing Micro-Array Technologies: A Microscopy Method and System Incorporating Nanofeatures
- Tunable Vapor-Condensed Nano-Lenses

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