Technology Opportunity
Glenn Research Center • Cleveland • Ohio
Technology Transfer & Partnership Office
TOP3–00175

A Compact Microscope Imaging System (CMIS) With Intelligent Controls

Technology

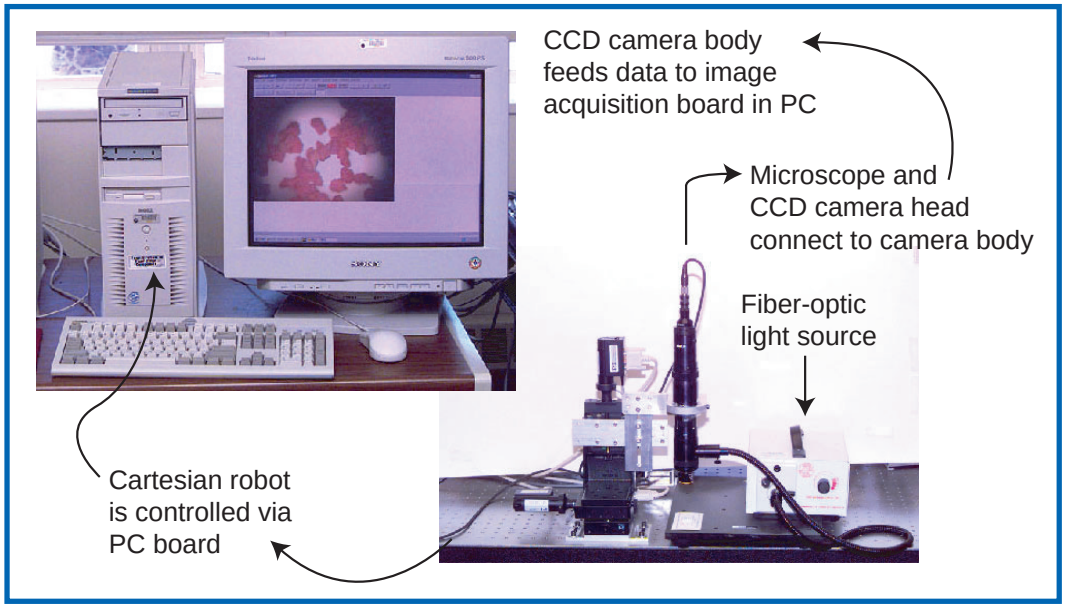
The National Aeronautics and Space Administration (NASA) seeks to transfer technology for a completely autonomous compact microscope system with intelligent controls.

Benefits

- Utilizes commercial off-the-shelf hardware and adaptive neural network machine vision algorithms to produce a turn-key automated system
- Represents a unique approach to the industrial, medical, and scientific community by integrating a machine vision technique with an instrumentation and control technique
- Performs tasks in biomedical research, materials science, in-line process inspection, and space science usually reserved for conventional microscopes
- Provides the ability to detect and track microscopic changes in cells and surfaces as well as metrics on feature extraction and object identification
- Monitors quality control where human visualization of the surface is difficult

Commercial Applications

- Automated inline inspection of precision parts
- Biomedical imaging
- Fingerprint identification
- Remote examination of soil/water samples
- Automated blood/cell analysis
- Microscopy
  - Details of flow around bubbles or particles
  - Crystal growth patterns
  - Patch clamping
  - Cell movement and tracking



Automated CMIS setup.

Technology Description

The CMIS with intelligent controls is a diagnostic microscope analysis tool with intelligent controls. This miniature machine vision system combines intelligent image processing with remote control capabilities usually reserved for conventional microscopes. The CMIS can be used insitu with a minimum amount of user intervention. It incorporates the ability to autofocus on a microscope sample, automatically scan an image, and perform machine vision analysis on multiple samples simultaneously. The hardware requires less room than conventional microscopes and experiments can be conducted without the need for constant monitoring. The system can run, control, and analyze microscope experiments automatically and remotely.

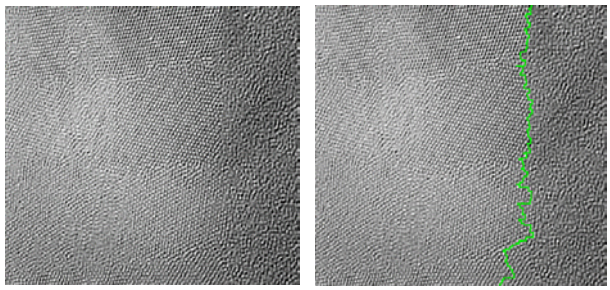
To date, there is no system available that combines all of the features and techniques incorporated into the compact microscope imaging system with intelligent controls.

The main machine vision techniques utilized in the CMIS include:

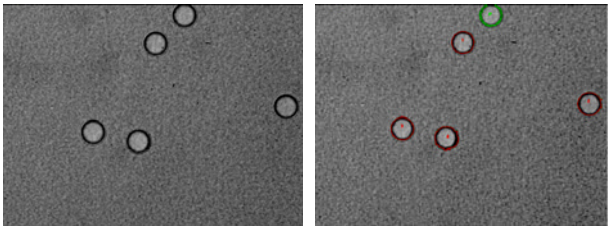
Adaptive thresholding enables optimally, determining the best contrasting method for image processing

Autofocus can focus on a sample automatically utilizing a Cartesian robot system

Auto-imaging scanning enables the microscope to scan left, right, up, down, back, and forth within a sample in order to find the object of interest



Automatic interface detection tracking.



Biological cell identification and classification.

Object identification and classification can find, classify, and label objects in a predetermined area of interest

Motion detection can observe and quantify the movement of objects in a predetermined area of interest

Transition mapping can detect small transitions between groups of cells used for microscope experiments such as order/disorder, large objects/small objects, light/dark regions, and movement/nonmovement. Helpful in determining the exact transition location of the quasi-zone, which is between two phases in a microscope image

Options for Commercialization

NASA has filed a patent application for this technology and is seeking industrial partners to commercialize the system. Technical assistance for application of the technology and system is available from NASA technical and commercialization staff. If your company is interested in licensing this technology, please contact us.

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References

LEW–17484–1

Key Words

Compact/automated microscope
Microscopy
Biomedical applications
Cell identification
Inline process inspection