# Researchers develop GenoSIGHT software for 'smart' microscopes

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Synthetic biologists at the Virginia Bioinformatics Institute are at Virginia Tech pioneering new ways to overcome old problems in imaging cells.

Using a new software called GenoSIGHT, scientists were able to design a "smart" microscope capable of collecting time-lapse images of cells that would otherwise have been difficult to capture.

"GenoSIGHT has been one of the most useful software programs we've developed," said Jean Peccoud, a professor at the institute. "We now routinely perform in a day experiments that used to take the best part of a week. One of GenoSIGHT's most popular features is that it sends the operator a text message when an experiment is failing because the cells have died, for instance. This makes it possible to quickly reload the system instead of wasting a day collecting useless data."

It is important to measure precisely how cells function and change the expression of certain genes over time when they are exposed to a drug. GenoSIGHT allows operators to program a microscope to change imaging conditions based on the activity of the cells themselves, researchers say.

Ordinarily, operators would spend a lot of time trying to find suitable conditions in a series of hit-or-miss experiments that may fail to properly observe the cellular response.

"GenoSIGHT analyzes images in real time, right after they were captured," said David Ball, lead developer of GenoSIGHT. "Information extracted from images can be used to automatically select the best fields of view, change the time between two image captures, or switch growth medium."

"Such advances in model-driven data acquisition will help scientists understand a variety of cellular functions, as well as how and when certain functions may go wrong, sparking diseases like cancer," said John Tyson, a university distinguished professor of biological sciences. "It has proved instrumental in our systems biology project to understand the network controlling cell division. It will also be useful in synthetic biology to characterize the function of BioBricks and other biological parts."

GenoSIGHT was described in a recent PLoS ONE article. It was released open source under the Apache 2.0 license. The source code is available from SourceForge.

**More information:** Ball DA, Lux MW, Adames NR, Peccoud J (2014) "Adaptive Imaging Cytometry to Estimate Parameters of Gene Networks Models in Systems and Synthetic Biology." *PLoS ONE* 9(9): e107087. DOI: 10.1371/journal.pone.0107087

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