



Sensors

Data-driven System Makes Prediction Look Simple

An integrated statistics-based monitoring system predicts failures before they happen.

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Spend a couple of minutes tossing dice and observing the combinations, and you'll soon find yourself bored silly and searching for the remote. Spend an entire day tossing the dice and tabulating the results, however, and you just might start to see an interesting pattern emerge. That is roughly what statistical theory is based upon, only with high-performance computers tossing the dice and freeing up your time for higher pursuits.

Migma Systems, Inc. (Walpole, MA), has applied statistical algorithms to observe and monitor automated processes, using accumulated data from disparate sensors to formulate predictions about a system's behavior. Under Phase I and II SBIRs from MDA, in advanced signal processing and in the Airborne Laser (ABL) program, Migma devised a system to predict failures in the ABL composite vessel and developed a Computerized Maintenance Management System (CMMS) that could be applied to virtually any type of industrial process. The online, real-time monitoring system learns the characteristics of the process and detects equipment faults as they occur, while identifying the faulty components. Early detection of equipment failure can help manufacturers avoid costly shutdowns that can occur as multiple glitches build up at multiple points in a process.

Migma offers two systems, EquipTutamen™ and GasTutamen™, both of which operate on similar principles, but with slightly different spins. EquipTutamen is designed to monitor industrial equipment, using either the physical plant's own sensors or Migma's installed wireless sensors. The sensors report continuously to a powered wireless receiver and an industrial-grade computer, which in turn provides a graphical interface that is compatible with commonly used operating systems. The monitoring system can keep track of more than 100 sensors at the same time and provides data such as a




▲ The GasTutamen spectroscopy system monitors the air for the presence of methane, under a variety of weather conditions. Migma's algorithms make it possible to dramatically reduce system costs associated with expensive and complex platforms.

performance degradation index, informing the operator of equipment health and estimated times to failure for faulty components. Migma's system can provide remote monitoring through both secured wired and wireless networks, allowing plant managers some off-site flexibility. The relatively low cost per monitoring node rounds out the suite of features.

GasTutamen was created with the nation's 2 million miles of natural gas pipeline in mind, vulnerable to breaches and corrosion, and posing dangers to utility workers and citizens in surrounding communities. Natural gas, which is colorless and odorless, can be observed through

active means such as by laser illumination or through passive detection. Active detection techniques are reliable but expensive, while passive techniques are lesser on both counts. Migma's approach to gas detection takes advantage of natural sunlight and the absorption spectra of methane, as well as pattern-recognition techniques to enhance the probability of methane detection and reduce the incidence of false alarms. GasTutamen offers the reliability of expensive laser systems without the laser, and it functions regardless of weather conditions.

Migma's technology has many applications beyond industrial systems, including assessing baggage/passenger risk combinations in airport security. The company is actively seeking investors and venture capital and is also interested in identifying customers willing to beta-test its prognostic tools. 

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