

Shelter From The Storm

Massachusetts Institute of Technology



Using the Growth and Decay Storm Tracker algorithm developed by researchers at Massachusetts Institute of Technology's Lincoln Laboratory, StormVision® software helps develop forecasts pinpointed to individuals' exact GPS coordinates.

It strikes ground 25 million times a year in the U.S. alone. It can be five times hotter than the surface of the sun, and just one strike can generate a billion volts of electricity. Causing hundreds of casualties every year and capable of shutting down a New Mexico microchip-making plant or a New Bedford fishing vessel with equal aplomb, lightning is a natural-born killer second only to floods in the death toll it exacts.

Thanks to technology transfer—Marilyn Wolfson, Ph.D., and a team of Massachusetts Institute of Technology researchers developed the Growth and Decay Storm Tracker algorithm used in WeatherData Corp.'s StormVision® software—people and institutions can now prepare for, instead of just react to, dangerous electrical storms.

Pushing the Envelope

It's not just lives that are at stake, but dollars as well. Thirty-four percent of all businesses suffer costly lightning-

related power outages every year. The airline industry, with its tight scheduling requirements and imperative of passenger safety, is an especially vulnerable segment of the \$4 trillion of U.S. economy subject to severe-weather hazards such as lightning. Compounding this vulnerability to nature was a roiling pot of contention in the late 1990s over who was to blame for historically high delays. The public blamed the airlines, the airlines blamed the Federal Aviation Administration and everyone agreed that more accurate forecasts were needed.

Consulting with air traffic controllers and commercial airlines, Wolfson and a group of researchers at MIT's Lincoln Laboratory found that convective, or electrical, line storms were the principal cause of delays. Line storms are one of two types of convective storms; the other being air-mass storms. Air-mass storms are small-scale, diffuse, and random in occurrence. But line storms—forced by frontal boundaries between warm and cold, or dry and moist air — are larger and more predictable. Working with FAA funding, Wolfson and her team developed a ground-breaking convective weather forecasting tool, the Growth and Decay Tracker, to address this problem.

“*To understand the Growth and Decay Tracker algorithm, it is helpful to look at the model of storm prediction it superceded.*”

For the past several decades, conventional forecasters have predicted the path of line storms by extrapolating from the collection of the air-mass cells within them. However, Wolfson says the envelope, or edges, of the storm are a much more accurate predictor of the storm's path than the air-mass cells themselves. This is because the moving storm envelope, forced by a frontal boundary, causes new storm cells to grow while old ones decay as it travels. Hence the Growth and Decay Tracker, aptly named, is a much more reliable basis for predicting convective weather than earlier models.

The Growth and Decay Tracker, tested extensively at U.S. airports between 1998 and 2002, maintains its accuracy out to one to two hours and has proven as much as 50 percent more accurate in predicting line storms than conventional models. In the age of destructive storms such as hurricanes Rita and Katrina — and in a personal and business world where every minute counts — the Growth and Decay Tracker did not come a minute too soon. Continuing the process of technology transfer with a license from the MIT Technology Licensing Office, WeatherData of Wichita, Kansas, then developed a patented software called StormVision®, available only from WeatherData, which is part of the forecasting products and services this 38-person company offers to business and institutional clients.

Manage and Mitigate, Stay Competitive

“Discoveries like Wolfson's allow us to predict weather with greater and greater accuracy,” says Mike Smith, chief executive officer of WeatherData. “We are at the point now where it is very rare that a completely unforecasted event affects our clients. However, there is still work to be done. We would like to be able have the 30-minute accuracy we have now out to four hours. So, there are opportunities for the academic and private sectors to partner and maximize their respective strengths. This technology allows people and business to manage and mitigate operations, rather than just react to the weather. It allows them to be truly proactive.”

What's the big deal about a few lightning bolts? In the Industrial Age, when manufacturing meant gargantuan lathes and bulky die-casts machining out heavy metal parts, operations continued as usual despite the weather. In today's business world of clean rooms and microprocessors, however, a few minutes warning can make all the difference.

The case of Swedish mobile phone manufacturer Ericsson, now axiomatic in business circles for the need to be proactive rather than reactive in regard to weather management, illustrates the point. In March 2000, lightning struck an Albuquerque, New Mexico, manufacturing plant that supplied Ericsson with cell phone microchips. Soot from the

ensuing fire, which lasted a mere 10 minutes, contaminated the plant's clean room. Ericsson, unable to quickly find another microchip supplier, recorded a \$2 billion dollar loss in 2000, and has yet to recover. With better contingency planning, and increased lead-time and accuracy made possible by StormVision®, this accident could have been avoided.

Ericsson's lesson did not fall on deaf ears. High-profile clients such as GM, Toyota and Daimler-Chrysler now contract with WeatherData, which uses Storm Vision and other technologies to give its clients customized, up-to-the-minute forecasts. Clients receive cellular phone or pager alerts when severe weather — particularly lightning and tornados — is headed for their GPS coordinates.

"It helps us protect our employees," says Les De Bora, GM's security manager for service parts operations. "It gives us added security. We take shelter when we truly need to but don't have to take it needlessly." Shutting down the assembly line because of severe weather can easily cost an automaker hundreds of thousands of dollars. StormVision® helps make sure these closures happen only when necessary.

On another playing field across the country, athletic departments find StormVision® to be a lifesaver. "It's a great weight taken off our shoulders," says Rhonda Kelly, assistant athletic director for Florida State University. FSU receives cellular phone or pager alerts from WeatherData if a severe storm touches down within 15 miles. "Fifteen minutes more of practice is a big deal in NCAA athletics," says Kelly. "It allows us to keep practicing and stay competitive."

In the Final Analysis

From the great Armistice Day storm of November 1940, which left duck hunters clinging to frozen cattails on the upper Mississippi River, to the August 2005 flooding in New Orleans in the wake of Hurricane Katrina, Mother Nature shows no signs of abating. The argument can even be made that because of changes in the natural world, weather has become more severe. All the more reason people and businesses need to stay ahead of the storm.

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