

## Signal Processing of Product Accelerated Degradation Signals

The tendency in industry to shorten both the New Product Introduction (NPI) time and the cycle time for redesigning existing products require novel methods to estimate the reliability of the products based on a reduced testing schedule. The life prediction of new or redesigned products must rely on incomplete accelerated test data, often with a few failures or no failures at all. This makes the classical reliability metrics and reliability data analysis of little use. New methods to extract the information regarding the degradation of the product during testing must be devised and employed. The current work shows how signal processing can help to reduce the raw data and extract the vital degradation signs often buried in the dynamic signals regularly collected from the machine/product. Then, these reduced data are used to build degradation based reliability metrics for the most important failure modes and mechanisms. When assembled together using statistical models the degradation metrics provide the means to assess the new design product reliability. Examples are given using test data for two induction motor types and pertinent metric validation is presented.



## National Engineers Week

National Engineers Week was founded in 1951 by the National Society of Professional Engineers. It is always celebrated at the time of George Washington's birthday. Our nation's first president was a military engineer and a land surveyor. The mission, then and now, is to increase public awareness and appreciation for the engineering profession. This year, it is being celebrated February 20<sup>th</sup> – 26<sup>th</sup>.

This year's EWeek calendar also includes "Introduce a Girl to Engineering Day," on 24 February, when thousands of female engineers are slated to meet with pre-college girls. Visiting the girls at schools or hosting them at companies and college campuses, the volunteers are to lead hands-on activities and talk about their own experience as engineers.

More information may be found at [www.eweek.org](http://www.eweek.org).

## Attention Students: Scholarship Money for the Taking

College life for an engineering student can be grueling -- and expensive. But membership in the IEEE can help with the expenses, at least. Student members enjoy access to awards and scholarships based on a range of accomplishments, including doing well in design contests and being active in their student branches. Find out more at:

<http://www.ieee.org/portal/site/tionline/legacy/inst2005/jan05/1w.prodscholarship.xml>

## New Member Sign Up Opportunity

Beginning March 1, 2005, dues for the remainder of the year will be one half the full year amount for new members. There is still time for members to ask any associates who might consider joining the IEEE.

## Signal Processing of Product Accelerated Degradation Signals

Featuring: Dr. Dan Dragomir-Daescu

**Monday**, February 21<sup>st</sup>, 6:30 pm  
Mayo Medical Sciences Building  
(321 3<sup>rd</sup> Avenue SW, Rochester)

► Pizza at 6:30; Meeting at 7:00 ◀

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Communications, Control Systems and Signal Processing

**Dan Dragomir-Daescu** joined the Division of Engineering (DOE) in August of 2004. He came to Mayo after 2 years as a faculty member at North Dakota State University (NDSU). There, he developed computational methods for the analysis of carbon nano-structures with applications to biocompatible materials. He used molecular dynamic simulation to study the hydrogen adsorption mechanisms in carbon nano-structures. At NDSU he also taught graduate courses in Advanced Engineering Analysis and undergraduate classes in Engineering Mechanics and Modeling of Engineering Systems.

Prior to this he was a Mechanical Engineer with General Electric Global Research Center (GE-GRC). There, Dan led engineering teams in developing novel product performance and reliability testing methods as well as innovative methods and algorithms to predict product lifetime. His work contributed to reducing the product design verification testing for a series of redesigned or new design products by as much as 3-6 months with important cost savings. Dan received three awards for technical excellence for his work in signal processing of dynamic signals.

## Rochester Regional Science Fair

The Rochester Regional Science Fair is Thursday and Friday March 3<sup>rd</sup> and 4<sup>th</sup> and they are looking for science fair judges. The Rochester Regional Science Fair is a gathering of the best projects from each area High School and Middle School. I got involved last year and I like judging because it gives me a sense for what is happening in our school system as well as an opportunity to encourage participates with their projects.

The Science Fair is a national program and has much depth. Area students typically spend months applying scientific principles to an area of research which interests them. They also learn how to communicate their project and results.

If you are interested in judging, contact Karen Sabatke at [kasabatke@rochester.k12.mn.us](mailto:kasabatke@rochester.k12.mn.us). She is an instructor at Kellogg Middle School.

## Embedded Systems Conference

IEEE Members who register early for the Embedded Systems Conference, to be held 6-10 March in San Francisco, can receive as much as a 10 percent discount off the registration fee. Early registration is encouraged; the amount of the discount will change on 8 February, and 3 March. The earlier you register, the more you save. Visit: <http://www.esconline.com> and use code UX20.

## Outsourcing

Kudos to Ralph Wyndrum and Ron Hira for their contributions to a current Time Magazine story on the outflow of research from the U.S. to India and China. Here are snipped quotes. You can read the full story at the link appended below.

"I really worry about R. and D.," says Ralph Wyndrum, a former research executive at AT&T and president-elect of IEEE(-USA), a professional group for engineering. If outsourcing erodes opportunities for engineers in the U.S., he says, "then you're not going to have the innovation that gives you a competitive edge."

Giants like Intel and Microsoft are bellwethers for other technology firms, but the seeds of globalized R. and D. were planted decades earlier. "The old model of research was Bell Labs," says Ronil Hira, a professor of public policy at the Rochester Institute of Technology.

More recently, the digital revolution narrowed the focus of R. and D. to software. From cars to cell phones to toasters, "a large part of the value of a project becomes embedded in the software," Hira says.

As more U.S. companies shift more resources to India and China—even legendary Bell Labs has a research center in Bangalore—some observers are worried about what it means for the U.S. economy. With companies able to tap into the best talent all over the world, "that's a plus because it adds to innovation," Hira says. But when growth abroad is substituted for growth here, the U.S. loses the happy spillover of investing in research—all those new firms in Silicon Valley, around Austin, Texas, and along Boston's Route 128. If Bangalore and Beijing become the new cradles of innovation, is that where the next Google will be born? "If it turns out you're pushing some of the R. and D. away, it builds up the world's economy, but not your own," Hira says.

The New Idea Labs: As more firms send research to India and China, could the U.S. fall behind?

By Aravind Adiga and Jyoti Thottam

Time Magazine

Jan. 24, 2005

<http://www.time.com/time/globalbusiness/article/0,9171,1019866,00.html>



**The Institute of Electrical  
and Electronics Engineers, Inc.  
Southern Minnesota Section**

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In this recent image from NASA's Cassini spacecraft, Saturn's shadow stretches across the sunlit southern surface of its rings. Saturn's moon Janus, dwarfed by its gigantic parent, orbits just outside of the main rings and appears below them on the far left of this scene. (Jan. 28). Courtesy of JPL ([www.jpl.nasa.gov](http://www.jpl.nasa.gov)).

