



# VIRGINIA MOUNTAIN SECTION NEWSLETTER

**IEEE Region 3, Council 9, Section 65**

**April 2001**

**Meeting: Thursday, April 19**

## ANNUAL STUDENT PAPER CONTEST

Four contestants, two each from VMI and VA Tech, will speak at this year's event.

Topics are:

### **Women in Engineering**

#### **Megan Smith**

The talk will not attempt an all-inclusive view of the history, or even the current situation, of women in engineering, but will concentrate on what is being done now to insure that there is not a critical shortage of them in the future. I will discuss relevant activities at both the pre-college and college level.

It is important to interest females in math and science, demystify engineering, and keep them retained in engineering once they reach the college level. Programs such as Girl Scouts, Discover Engineering, WISE Program, Mentornet, and Introduce a Girl to Engineering Day, all have great potential. The report will also include recommendations for faculty members and ways for those in industry to get involved.

### **Regular Symmetric Networks of Degrees 2,3, and 4**

#### **Haingonirina Ramarosan**

The ring network is a widely used topology providing some survivability characteristics in the presence of failed links. Indeed, in the zero failure condition, there are two paths from a given node to every node. However, when the number of nodes is large, this topology leads to very long route lengths, and high concentration of traffic. Consequently, it is of interest to consider networks with higher degree of connectivity to reduce both the maximum and average

route lengths. A network is said to be regular symmetric of degree  $m$  ( $RS_m$ ) if there are  $m$  links from each node, and all nodes have identical environments. This paper considers  $RS_3$  and  $RS_4$  networks, and compares their properties with the  $RS_2$  ring network.

### **RF Front End for Space-Time Coding Test Bed**

#### **Carl Beaudette**

Wireless communication is an integral part of modern society, and research continues to improve reliability in the face of interference and fading. In an effort to facilitate space-time coding 1,2 (STC) experiments, the Mobile and Portable Radio Group has initiated the Virginia Tech Space-Time Advanced Radio (VT-STAR) project.

This paper details the design and methodology of the RF front end of a transmitter and receiver, each with two antennas, to be used in the implementation of new coding algorithms.

### **Web-Controlled Robotic Arm**

#### **Jacob Carpenter and Brian Jackson**

Robotic arms with good maneuverability can be applied in several fields where humans cannot function due to extreme conditions. Some of these applications are in the fields of space exploration, environments with harmful gases such as accident sites or volcanoes, deep underwater observation, and areas of extreme cold or heat.

A typical mechanical arm may incorporate five or more servos for positioning and function operations. A most interesting challenge is the design of a gripper, like a human hand, to pick up objects.

### **Reservations**

Date: Thursday April 19, 2001  
Social: 6:30 PM  
Dinner: 7:00 PM  
Talk: 8:00 PM  
Cost: Member or Guest \$12.00  
Student \$ 7.00

#### **Clarion Hotel Roanoke Airport**

2727 Ferndale Drive NW  
I581 Exit 3 Hershberger Rd West  
1st Rt. onto Ferncliff Ave.,  
2nd Rt. onto Ferndale Drive.

Reserve by **5 PM Monday** April 16

Call **Howard Moses (540) 953-5069**  
or e-mail:

<mailto:MMoses@ieee.org>

Leave a message specifying number of attendees.

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## VMS Activities

### Meeting Report March 15, 2001

Stephen Edwards' presentation on the Java language truly zeroed in on the question in its title "What's It Good For?"

Breaking that down to logical parts, he addressed in order:

- What is it?
- What is new and different?
- How does it relate to the web?
- For what is it good – and bad ?
- Is it worth learning?

Answering these questions involved removing and clarifying the hype that has grown up around the language, e.g. a pure object oriented language, suitable for any task, that runs freely on any platform.

Java came into perspective when he pointed out that it runs on any platform, provided you have an appropriate Java Virtual Machine (JVM) installed on your machine, and you observe a few restrictions about libraries, native features, and numerical precision. After that Java is not unlike most languages, very good for some things, awkward for others. Simpler, or different, than some because its pointers are "hidden" from the coder and object handling is modestly easier.

Is it worth learning? As I see it now, sure, if you like a bag full of tricks (best languages) at your disposal. However, if your work involves a variety of tasks, you should at least look at Java for your applications.

...*editor*

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### Computer/Control/Industrial Electronics Chapter



#### March Meeting

The March Meeting the VMS Computer/Control/IE chapter was held from 5-7PM Tuesday March 6, 2001 at the GE Industrial Systems plant in Salem, VA.

The speaker was Mr. Sandy Gurian of GE. Mr. Gurian's presentation was titled "Fun with Root Locus". About 21 people attended the presentation.

Mr. Gurian started with a brief overview of the Root Locus technique and then showed the fun he had addressing several performance issues in drive systems for metal rolling mills with the technique. This technique was originally developed by GE engineer W.R. Evans in 1948.

The first issue had to do with shaft torsional resonance. This resonance tends to be excited during start-up and shut-down operation when the torque ripple frequencies of the electronic drive pass through the torsional resonance frequency. The excited resonance can cause high stresses on both the system and the system operators. This resonance is usually ignored during initial drive system modeling. By using a two-mass spring-coupled model, the effects of these dynamics were added, and the impact on the root loci were then studied. Interesting results were shown to exist when the load to motor inertia ratio was high. Controller parameters were determined that led to adequate damping of the resonances.

A central control issue of rolling mills is time delay. Thickness gauging sensors have to be placed downstream of the rollers that determine the thickness, and there is always a significant delay between the time the strip passes through the rollers and when it is gauged for thickness. Mr. Gurian showed how the Root Locus technique could be used to define a quantity he dubbed the Significant Time Lag (STL). Since it is generally desired that controllers move the closed-loop poles away from the imaginary axis, STL is defined as the deadtime that can be added to the linear system before the departure angle of the root trajectory is 90 degrees, and therefore, parallel to the imaginary axis. Any further time delay and the pole trajectories will head toward the right-half plane. To study this efficiently, Mr. Gurian used a Pade approximation for the exponential time delay term; this is a rational approximation which allows convenient use of MATLAB's RLOCUS command. It is the continuous-time equivalent of the discrete-time all-pass filter. Once the value of STL is known, it can be used to calculate delay margins and drive the value of cross-over frequencies used in the outer control loops for robustness.

The last issue discussed was the effect of backlash in the drivetrain. Using a reference from two other GE engineers of the '50s, Chestnut and Mayer, which showed that backlash can be viewed as varying the torsional constant, Mr. Gurian showed how treating the effective torsional constant as a Root Locus parameter could qualitatively demonstrate how the closed-loop poles were perturbed by backlash. The modeled effects were in agreement with empirical data that had been acquired from systems in the field.

During and after the presentation, questions and discussion made for a stimulating and enlightening meeting.

#### And Don't Forget

The First ACM /IEEE-CS Joint Conference on Digital Libraries will be held June 24-28, 2001 at Hotel Roanoke and Conference Center, Roanoke, VA. There will be an exciting program of papers, panels, demos, workshops, and tutorials. Before the conference there will be trips to explore the scenery and history of Southwest Virginia. The National Science Foundation will fund a workshop on June 28 to bring together researchers it funds regarding digital libraries, covering both technology and support for users in a wide variety of content areas and media types.

The conference is looking for volunteers to help make this the outstanding digital libraries event of the year. There is need regarding trips, local arrangements, registration, and other aspects of the conference. Please contact the general chair, Ed Fox,

fox@vt.edu,  
540-231-5113

if you have any questions or can help!

For further details, please see

<http://www.jcdl.org>

...*Dave Geer, Chapter Chair*

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### VOLUNTEERS NEEDED FOR NATIONAL SCOUT JAMBOREE

Volunteers are needed to staff booths and serve as Electricity and Electronics merit badge instructors at the 15th National Scout Jamboree to be held 23 July - 1 August 2001 at Ft. A. P. Hill, Virginia, U.S.A. While individuals can volunteer for just one day, at least a two-day commitment is preferred.

The following volunteers are needed per day:

#### **Electricity Merit Badge**

10 technical hands-on project instructors per day

#### **Electronics Merit Badge**

18 technical instructors

2 Career Counselors

2 Registrars

2 Test Graders

#### **To Volunteer and Register**

Sign Up Now at

<http://www.emeritbadges.com>.

Register prior to 1 June 2001.

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### **FIRST Robotics Team 401: A Collaborative Partnership**



By **Alex Hanish & Hugh Hockett** Virginia Tech Computer Engineering Sophomores

On March 8-10, 67 teams of high school students and their university and industry mentors gathered at Virginia Commonwealth University to participate in the NASA Langley FIRST Robotics Regional Competition. This was the ten-year anniversary for FIRST, a program designed to inspire high school students to appreciate science and technology. Judging by the great enthusiasm found in the jam-packed basketball arena of the VCU Siegel Center, FIRST certainly succeeded in their goals for the event.

Another group that found success at the event was Team 401 Hokie G.U.A.R.D. (Gladiators of the Ultra-Advanced Robotics Division), which managed to place 2<sup>nd</sup> overall in the final matches of the competition. The team returned home with silver medals and the finalist trophy. The

team, comprised of Montgomery County Public School students with Virginia Tech students and faculty as well as local engineers serving as mentors, used the full six weeks to design and build their robot. The team strategy led to a compact design for their robot, which was a challenge for the students and mentors. The results of their efforts certainly look impressive, with a variety of electronic, pneumatic, and mechanical components visible through the clear Lexan body. The design earned respect from the other teams, and Team 401 was the #1 draft pick for the final round of competition.

In early April, the team will travel to Orlando, Florida for the national competition at the Epcot Center, where they hope for further inspiration and success. IEEE is a national sponsor of the FIRST Robotics program, and Team 401 thanks the Virginia Mountain Section for their financial contribution and support.

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#### **Tried the New! Services?**

Go to:

<http://www.ewh.ieee.org/r3/virginia-mountain/>

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- Pick your method of Newsletter delivery.
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mailto: [address-changes@ieee.org](mailto:address-changes@ieee.org)

...*editor*

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#### **IEEE Accelerated Stress Testing Tutorial CD-ROM Now Available**

Accelerated Stress Testing, an IEEE Educational Activities joint CD-ROM is now available.

This tutorial provides fundamentals for reliability and test engineers and is supported by case studies from four expert practitioners and a panel discussion about practical implementation issues. The learner is able to access the following sections:

H. Anthony Chan, AT & T Labs, covers stress testing at the design, component and test levels as well as problems at the customer level. Charles Felkins, Storage Techniques, describes the components of highly accelerated life test and highly accelerated stress screening. Paul Parker, Lucent Technologies, Texas, covers test equipment for power monitoring, thermal/vibration equipment and environmental analysis accessories. Anthony Oates, Lucent Technologies, Florida, includes discussions of circuit reliability models, early failure rate characterizations, IC wearout failure mode and package/assembly failure model. Panel discussion covering the most frequently asked questions, including comments on professional development and customer relations.

The single CD-ROM, gives full access to the four power point presentations and the panel discussion. The transcript provides extra support for users with non-English as their primary language.

Software Requirements: Windows 95, 98, NT or 2000; Internet Explorer 4.0 (or higher), or Netscape Navigator 4.0 (or higher); Windows Media Player 6.1 (or higher), or RealPlayer G2, version 6.0.5.27 (or higher) Hardware Requirements: Pentium 200 MHz processor; 32 MB RAM; Windows compatible sound card; 4x CD-ROM drive (for CD-ROM delivery)

EC 133:1 CD ROM, PC compatible only, \$700 member; \$875 non-member. HV 7061: 3 videotapes & presentation notes; same price, NTSC only.

The CD-ROM and video set can be ordered from the IEEE Customer Service Department, 445 Hoes Lane, PO Box 1331, Piscataway, NJ 08855-1331, USA; by e-mail: [customer-service@ieee.org](mailto:customer-service@ieee.org); by phone: 1.800.678.4333; and on the Web at <http://shop.ieee.org/store/> For further information on Education Activities check out our Website

<http://www.ieee.org/organizations/eab/index.htm>

## 2000-2001 MEETING SCHEDULE

DATE	SPEAKER/TOPIC	MEETING PLACE
September 21 <b>Spouses' Night</b>	Kenneth R. Laker 1999 IEEE Past President 21st Century IEEE The Exemplary Global Engineering Society	Clarion Hotel Roanoke
October 19	James C. Squire Department of Electrical Engineering, VMI Engineering in Clinical Research: A Case Study	Clarion Hotel Roanoke
November 16	David L. Livingston Department of Electrical Engineering, VMI An Introductory Overview of Computational Intelligence	Clarion Hotel Roanoke
January 18	Nancy A. Vorona Virginia Center for Innovative Technology The Electronics Industry in Virginia- Poised for the Future	Clarion Hotel Roanoke
February 15	George J. Blonar Carilion Biomedical Institute Overview of the Institute Activities	Clarion Hotel Roanoke
March 15 *	Steven Edwards Computer Science Department, VT Java Update *	Clarion Hotel Roanoke
April 19	Student Project Night	Clarion Hotel Roanoke
May 17	Plant Tour	TBD

\* A Web Site "Name Your Topic" Request

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