39th IEEE Vehicular Technology Conference Awards Lunch

Recognition of Excellent Job. From the left: Frank Thatcher (Chairman for VTS '89 Conference), Dean Maynard (Volunteer Worker for the entire three day conference), George McClure (VTS President and Chairman for '90 Conference in Florida).

See "Reminiscences of VTC" page 9.
President's Message

George McClure
President
IEEE Vehicular Technology Society

The high level of interest in vehicular technology was evident at our very successful annual conference this year in San Francisco. The attendance exceeded expectations, with over 400 registered. Our thanks go to Frank Thatcher and his committee for a fine professionally-produced conference.

Digital cellular system standards and developments were the focus of a well-attended evening session, organized by Dr. Bill Lee. The international panel of speakers gave us insights into the plans to rapidly bring this new generation mobile telephone service to market and thus relieve capacity limitations that are already limiting ability to meet demand in major markets. Definition of standards is to be complete by this year.

Vehicle Navigation and Information Systems represent another emerging technology area. The VNS '80 conference, to be held in Toronto on September 12-15, will explore the field fully with reports on current developments. A day of tutorial seminars before the conference will be offered as well. It is expected that VNS will become a regular bi-annual conference, just as CONVERGENCE has in the vehicle electronics area.

There is interest both in Europe and Japan in hosting a future vehicular technology conference. This may take the form of a technical specialty conference, such as VNS, or of a regional broad-based conference organized along the lines of our annual conference. Your advice, comments, and recommendations will be helpful here. Please send me a note with your thoughts on this.

The VTS Board of Governors unanimously approved the formation of a new award for the best prepublication paper published each year in the Transactions. To be known as the Neal Shepherd Award, this recognition includes a certificate and $500 to the author(s) who also will be eligible for the regular papers-of-the-year award program. Curates of the February 1988 special issue of the Transactions on 900 MHz propagation, that Neal Shepherd organized before his death, are still available from the Piscataway Service Center.

Jack Neubauer, who for many years ably served your Society on the standards and awards committees, passed away this year. His contributions will be sorely missed.

The full report on the Board of Governors meeting in San Francisco is presented in this Newsletter. You will note there that many chapters do not participate in the chapter-of-the-year competition, simply by failing to send a copy of their L-31 meeting report form to the Chapters chairman. VTS now has 29 chapters, including 18 joint chapters with other societies. Of the 29, 23 are in the United States, 4 in Canada, one in Sweden, and one in Japan. Your Society is interested in maintaining strong links with its chapters. Please keep the Chapters chairman updated on changes in chapter officers, activities, or problems.

Now is the time to begin planning those papers to be presented at the 1990 Vehicular Technology Conference in Orlando, Florida. See the Call for Papers elsewhere in this issue.

George McClure
1790 Sibley Lane
Winter Park, Fl. 32789-3847 USA

August 1989

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Editor's Notes

August 1989

A. Kent Johnson
Newsletter Editor

Our recently completed Annual Conference in San Francisco was a huge success and Frank Thatcher and his committee deserve a big vote of thanks from all of us. We are fortunate to have several features from the conference in this issue of the newsletter. We especially thank those who provided the photographs and Al Langer for his comprehensive summary of the conference events. The panel sessions were a big success and we have included a brief summary of the Digital Panel elsewhere.

The San Francisco conference generated great enthusiasm for the upcoming conference in Orlando, Florida. That conference will be held from May 7-9, 1990 in the Crowne Plaza-Holiday Inn in Orlando. You will find a call for papers for that conference elsewhere in this newsletter. Start making your plans for another great conference in another great city.

In this issue of the newsletter, we mark the passing of our colleague Jack Neubauer. Excerpts from his obituary are duplicated elsewhere in this newsletter.

IEEE Vehicular Technology Newsletter is published quarterly by the Vehicular Technology Society of The Institute of Electrical and Electronics Engineers, Inc. at 3 Park Avenue, New York, NY 10016. IEEE is an equal opportunity employer, and does not discriminate on the basis of race, gender, religion, age, sexual orientation, disability, veteran status, or any other protected status. Send editorial and advertising submissions to IEEE Vehicular Technology Newsletter, IEEE, 445 Hoes Lane, Piscataway, NJ 08855.

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August 1989

Board of Directors Report
James M. Sears
VTS Secretary

MINUTES OF THE IEEE VTS BOARD OF GOVERNORS MEETING

The IEEE VTS Board of Governors met on April 29, 1989 at the Sir Francis Drake Hotel in San Francisco, California. The meeting was called to order at 2:00 PM.

The following were in attendance:

John S. Boehmer
J. J. Cruz
Anthony Daniels
Robert French
Arthur Goldsmith
David Goodman
R. A. Isberg
C. R. Jackson
W. C. Y. Lee
Fred Link
Roger Maddox
Robert A. Marsolo
George McClure
Sam McCoochery
Stu Meyer
Hugh Reekie
Evans Richards
Giorgio Rissoni
Jesse Richards
Jim Sears
Thomas P. Stanley
John Taryn
Fred Thatcher
Ray Trout
Jay Underdown

POLLS CALL

The preceding page contains the following:

August 1989

records. The 1990 publications budget has been increased to $101.7 thousand. The 1990 publications budget has been increased to $101.7 thousand. The 1990 publications budget has been increased to $101.7 thousand. The 1990 publications budget has been increased to $101.7 thousand.

Rogers' new move, Art Goldsmith secured that the board accept the treasurer's report. The vote was unanimous in favor.

PUBLICATIONS

Bill Lee, publications chairman, reported that at a special session of the Transactions on "Highway Electronics" will be featured this fall. J. J. Cruz reported that about 20 new papers have been received this year and are in the review process. Giorgio Rissoni reported that the backlog of paper reviews for the past year is now complete. Seven papers have been selected for publication, Hugh Reekie suggested that some of the papers could be included in the VTS transactions. Bill Lee will follow up on this possibility.

Bill Lee moved and David Goodman seconded that the General Highway Administration's request for 2,000 copies, bulk sale, of the upcoming Highway Electronics special issue be granted at a price of $3.00 each. (This is a 150 page issue.) The vote was unanimous in favor.

Four Transactions issues are planned this year, including the two special issues. 194 pages are budgeted for the four issues.

Papers on transportation including the upcoming special issues are planned.

Highway Electronics (November 89)
Digital Cellular (Late 89-Early 90)
Message and Information Systems (1990)
Non-Cellular Communications (1990)

Kent Johnson requested that Newsletter Chairman returned for the August issue be submitted before June 9th.

CONFERENCES AND MEETINGS


Linda Sue Boehmer reported that the conference had record attendance up 25 percent over 1988 conference. Financial results are not yet complete.

1989 VTS Conference, Sept. 12-14, Toronto

Bob French reported that plans were on schedule and will be nailed in mid-May. The President was requested to appoint a 20-person committee to meet with Rye Case, VTS'89 Chairman, concerning the conference.

The Toronto section has declined to sponsor VTS '91. However, they will consider future sponsorship. The Southeast Michigan chapter has expressed interest in the 1991 sponsorship. Bob will contact Mark Kepple regarding the conference.

VWS 1990

Bob French suggested that both Europe and Japan be considered for a possible conference site.

44th VTC, 1994 - No report

Convergence Conferences

From previous minutes, the following dates have been set for upcoming Convergence conferences:

Conference Dates

43rd VTC, 1993 - No report

44th VTC, 1994 - No report

IEEE Vehicular Technology Society Newsletter

GEORGE F. MCCUTRY
ROGER MADDEN
BERTRAND ST. LOUIS

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IEEE Vehicular Technology Society Newsletter
Committee Reports

Land Transportation

Linda Sue Boeheer reported that new officers are now in a designated list was supplied to the secretary. Membership mailing list has also been updated.

Constitution and Bylaws

Roger reported that the new Constitution should be out in approximately six weeks.

Membership

Ray Trott reported that the VTS membership brochure has been updated and that copies are available at the conference. An ad is also being prepared for a future copy of the student magazine "Potentials". Linda Sue Boeheer proposed that the membership brochure should be clarified to include interest areas in automotive technology, communications, land-mobile transportation, and vehicular navigation. The Technical Interest Profile was suggested as a better place to target members. Ray is to follow up this option with Mel Oken at a later date.

Ray was requested to also track the retention of graduating seniors and propose methods to encourage their remaining in IEEE.

Publicity - No report was available for the meeting.

CIP Representative

Stu Meyer represents VTS on the CICP committee. At present there is high interest in the FCC regarding high-definition television.

USAR Engineering Rep.

Arthur Goldsmith resigned as USAR representative due to his recent election as Division IV director. Dr. Thomas Stanley of FCC Chief Engineer was appointed to serve as the future USAR representative.

Noble Fellowship

Sam McConoughy reported that applications have been received and selections made for Fellow Member grade in 1989. Fellow Goldsmith recommended that a uniform policy be established regarding nominees. If nominations are accepted world wide, Motorola will require a full time person to man the program. The matter was referred back to committee for a recommendation. A replacement for Jack Ellemeister is needed to interface with Motorola regarding administering this annual fellowship.

Transportation Electronics Fellowship

In a letter from Bob Fenton, both the Noble and Transportation Electronics Fellowships require resolution of at least two issues if opened world wide. One issue is management expense and the other is fair evaluation of applicants coming from different scholastic standards. These issues were other concerns reported in depth at a future board meeting.

Chapter Activities

Stu Meyer reported that Frank Thatcher will be presenting the Chapter of the Year Award during Tuesday awards luncheon. There are still only a few chapters filling out their reports to participate in this award selection. Stu also reported that Philadelphia is interested in reforming a VTS chapter.

Standards

Jessie Russell stated that material is in the process of being transferred from the previous chairman. Stu Meyer is assigning with the transfer from Jack Neuberger, deceased. Standards activity is on the upswing.

Awards

Stu Meyer has been appointed Awards chairperson in place of Jack Neuberger. Roger Madden recommended that $500.00 should usually be provided for the Neal Shephard Award for papers. Ray is to follow up this option with Mel Oken at a later date.

The Newsletter Editor was asked to highlight the Neal Shepherd Award. A letter will also be written by the President to Mrs. Shepherd in appreciation for Neal's service to the industry.

A plaque award has been prepared for John Galanti in appreciation for his service as Chairman of ASAE at including TAB. The Board recommended to Arthur Goldsmith that a similar award be included at headquarters to assist societies.

It was reported that Sam McConoughy is running for IEEE Division III director post.

Director Travel

Roger Madden recommended that all 15 selected board members be authorized reimbursement for one day lodging, meals, and round trip air fare at the most economical rate to attend Director's meetings, if expenses can be justified. Each director is required to request funds for the trip. Directors on the conference program, expenses for the complete term, and directors' meeting are to be covered by the $500.00 limit is to be removed. Conference registration fees are not included. This will be re-evaluated annually. Seconded by Sam McConoughy and unanimously approved.

Joint Technical Advisory Committee (JTAC)

Stu Meyer proposed the reinstatement of JTAC which was terminated in the late 1960's. James Ball was suggested as committee chairman. Upon consideration of the proposal, the committee, the President appointed Stu Meyer, Jessie Russell, and Sam McConoughy to review the alternatives and report at the next board meeting.

New Chapter Formation

Item #5 in the President's report reflects changes needed to comply with IEEE 406.3 policies regarding new chapter formations. Sam McConoughy moved that item #5 in the report be approved as written. John Galanti seconded and approved unanimously.

Chapter Improvements

A motion was made by Stu Meyer that up to $300.00 be made available to VTS Chapters for membership promotion activities. Motion was seconded by Arthur Goldsmith and unanimously approved.

Job Descriptions

The President requested that each elected board member submit a job description of their responsibilities. This will be used as the basis for compiling a list of job descriptions for future board members.

Recognition of Conference Workers

After much discussion as to how to show appreciation at conventions, it was agreed that this should be handled by the convention chairman and any expense incurred should be treated as a conference expense.

Jack Neuberger Award Proposal

Roger Madden was asked to make a proposal at the next directors meeting for an appropriate recognition for Jack. Stu Meyer will also present a plaque to his wife in honor of Jack's services. Kent Johnson will include an article in the "in Memoriam" section of the Newsletter.

The Board expressed their regrets over Jack's death and deep appreciation for the many years of service he rendered to IEEE-VTS.

Next Meeting

The next board meeting is scheduled for 9:00 AM Thursday, 11 June, at the Hyatt Regency Edward Hotel, 37 King St. East, in Toronto. The meeting will follow the VTS Conference September 12th and 13th.

Adjournment

The meeting was adjourned at 7PM.

Respectfully submitted,

Jim Sears, secretary
Chapter News

Gasper Messina
Chapter News Editor

Meetings
Washington, D.C. (Joint VTS/Land Transportation Committee)
Subject: Future of Light Rail in Maryland
By: Mr. Paul J. Wiedefeld
Maryland DOT
Maryland DOT Headquarters, BWI
Held: April 11, 1989
Attendance: 36 (14 guests)

Gasper Messina
Editor and Chapter Activities Chairman
9800 Marquette Drive
Bethesda, Maryland 20817

John R. Neubauer

Many of us lost a close friend and colleague with the passing of John R. Neubauer on April 5, 1989. Over the years, Jack has been very active in the Vehicular Technology Society serving at one time as Chairman of the Vehicular Technology Group before we became a Society. We quote below, excerpts from his obituary as published in a local New Jersey newspaper.

"John R. Neubauer, a retired RCA engineer and an active member of the Haddon Heights Baptist Church, will be remembered as a man who devoted his life to showing others the relationship of science to the Bible.

"John R. Neubauer died April 5, 1989 after a lengthy illness at Cooper Hospital-University Medical Center, Camden. He was 74.

"A graduate of Colorado University and Colorado A & M College, Mr. Neubauer worked in radio and communications in the Midwest for more than 15 years.

"During World War II, he served as a civilian instructor in the Signal Corps and later as chief radio operator with the Army Domestic Air Transport Service.

"In 1948, Mr. Neubauer came to New Jersey to join RCA's Communications Engineering Section and was soon made supervisor of the New Communications Systems unit.

"Serving more than 20 years as Engineering Project Director, he supervised communications for the Minuteman Weapon System and developed the "man pack radio" system, which was used by the astronauts to communicate with the earth station when they were 250,000 miles away in space.

"Granted two patents, Mr. Neubauer achieved many other accomplishments in the field of radio and communications.

"Upon his retirement in 1972, Mr. Neubauer was licensed by the states of Pennsylvania and New Jersey as a Professional Engineer and Consultant.

"During these years he was widely sought as a consultant in the fields of transportation and security, mobile radio and analysis and systems design.

"Mr. Neubauer often gave lectures to college and service organizations. He wrote articles for many communications publications and was featured in Encyclopedia Americana International Edition regarding special applications of radio.

"Mr. Neubauer was also a member of the Institute of Electrical and Electronic Engineers, National Society of Professional Engineers, American Institute of Aeronautics and Astronautics, Radio Club of America, American Association for the Advancement of Science and New Jersey Society of Professional Engineers.

"Besides his professional duties, Mr. Neubauer will be remembered by his family and friends as a devout Christian.

"Serving as past regional chairman of the Christian Businessmen's Committee and later at Pier 39. On Tuesday, they had a bus tour to Muir Woods and Sausalito, where they lunch at various quaint restaurants, and the delightful return trip was on a trans-bay ferry boat. We received many favorable comments about the spouse and guest program.

"At the Awards Luncheon on Tuesday, Dr. Kamilo Feliciano received his Fellow Certificate. Shu Meyer, VTS Awards Chairman, presented a plaque to Tim Galantin in recognition of the successful 5th VTS Technical Conference in Philadelphia last year.

"George McClure, VTS President, announced the establishment of the Foundation, where they lunch for the best paper on radio wave propagation in memory of Neal H. Shepherd. He also reported that funds from Convergence (the large technical conference jointly sponsored by VTS and the Society of Automotive Engineers) plus other sources will be used for new scholarships.

"The luncheon was held in the large conference room with room lights, projection facilities and changing the "topic being presented" sign at the entrances to the room. A large percentage of the papers from fifty one schools had been judged and the students were present.

"The lunch was sponsored by Motorola, Inc., announced that the 1989 Dan Noble Fellowship had been awarded to Stephen P. Emcott, an Honors Student at MIT.

"On Tuesday evening, a panel discussion of applications, technology and standards for premises area and personal radio communications was very well attended. The panel was organized and chaired by Dr. James M. Rybinski, President of LACE, Inc., Petaluma, CA. The panelists were Dr. David J. Goodman, Rutgers University; Dr. Louis P. Shu, AT&T Bell Labs; Philip Porter, Bell Communications Research and Michael Callendar, British Columbia Telephone Co.

"The Chairman described the concepts and the various concerns about how premises area radio might be used. The panelists and the audience discussed applications, the technology and proposed standards. Personal radios operating with less than ten milliwatts power will be used. The premises area radio networks will be in large offices, factories, warehouses, etc. The networks could be arranged as micro or pico cells using high microwave frequencies.

The big event on Wednesday was the Students Luncheon which featured four prominent speakers discussing cellular technology and anticipated future developments. The speakers were: Jesse Russell, AT&T; James Mikulski, Motorola, Inc.; Dr. David Goodman, Rutgers University and Harold Horton, GTE Mobilephone.

"Dr. Goodman suggested the student's program to Frank Thacher, Chairman of VTC '89, who appointed Jim Lang and John Powell to meet with faculty advisors and IEEE Student Chapters and invite them to the conference. Fifty six percent of the 48 registered students were undergraduates from nearby schools and the balance were from schools in the USA, Europe and other regions. In exchange for free registration and the luncheon, students assisted the Session Chairpersons with room lights, projection facilities and changing the "topic being presented" sign at the entrances to the room. A large percentage of the papers from fifty one schools had been judged and the students were present and the appropriate contacts at IEEE student chapters.

"During the afternoon, approximately fifty students rode a BART train through the tunnel under the San Francisco Bay to Oakland where they visited Cellular One's Mobile Telephone Switching Office (MTSO). Brian Montgomery showed them the Ericsson equipment and described the system. They also visited the BART Central Control which Greg Austin described. They then returned to San Francisco and rode the MUNI subway to visit the San Francisco
Municipal Railway's Control Center:
A celebration cocktail party and "very San Francisco" crab cioppino dinner was enjoyed by the VTS '89 Committee and VTS Officers, spouses and guests. It had been a very good technical conference, our principal regret was that we didn't anticipate the demand for Conference Records. We had 800 printed and sold out on the first day! We had hoped for an attendance of 350 to 400 and we had a garage full of past conference records that IEEE Service Center had sent to us to sell. If any of you want to sell your VTS 39th Conference Record, send a note to Frank Thatcher Associates, Inc., Suite 612, 564 Market Street, San Francisco, CA 94104.

Miss Polly Estabrook, graduate student at Stanford University, was session leader for Satellite Mobile Systems II and also presented a paper about her work at the Jet Propulsion Laboratory.

Dr. William (Bill) C. Y. Lee was Chairman of the very well attended panel discussion, "What Are the Major Concerns in Future Digital Cellular?"

Tom Holden, U.C., Davis; Janice Liu and Agnes Yee, City College of San Francisco; Prof. Ted Rappaport and Scott Saldel, Virginia Polytechnic Institute and State University; Harry Bims, Peter Okrah and Rob Ziegler, Stanford University.

Ernst Bonek, Chairman, IEEE Austria Section; Mike Faulkner, Lecturer, Footscray Institute of Technology, Australia; Mats Torkelson and Johnny Svenesson, The Lund University, Sweden; Atsushi Fujimoto, Iwatani Electric Co., Ltd., Japan; Edwin Boongaling and Casale Ilagan, Frank Thatcher Associates; Reymal Reyes, San Francisco State University.

Wayne Conley, Parviz Yegani, Purdue University; Kumar Sivarajan, Calif. Institute of Technology; Saragawathy Gurunathan, Univ. of Calif., Davis; Dr. Rano Marsheliner, Prof. Electrical Engineering, San Francisco State University; Jiashi Yang and Yangpeng Guo, Univ. of Calif., Davis; Chantelle Cooper, City College of San Francisco.

John Powell, VTS Student's Program Committee; Greg Heinzinger and Paul Jacobs, University of California, Berkeley; Maher Fasheh, Vandana Kaul, Marta L'Italian and Harjit Dhillon of San Jose State University.

Robert Mazzola, Vehicular Technology Liaison; Dr. Takashi Suijo, Chairman of IEEE VTS Chapter in Tokyo; George McClure, VTS President; Evan Richards, VTS Conference Coordinator.

Dr. Kamilo Fehler, Session Leader, adjusting microphone for G. Madhusudhanan Rao, Andhra University, Visakhapatam, India.

Digital cellular panelists, Bill Lee, PacTel Cellular, Chairman; Jan Uddenfalt, Ericsson, "The Components View"; and Richard Levine, Northern Telecom, "The Operations/Maintenance View."

Digital cellular panelists, Jesse Russell, AT&T, "The System View"; Dave Sattler, Motorola, "The Transition View"; and Peter Nurse, Novatel, "The Standards View."
DIGITAL CELLULAR PANEL
VTS CONFERENCE

The U.S. Digital Cellular system is developing at a fast pace. This system is targeted for completion by the end of 1990. At this stage of development, many concerns have been brought up. At the recent VTS conference in San Francisco, a digital cellular panel addressed some of those concerns. We here include a list of the panelists and a brief summary (submitted by the panel member) of their remarks:

Chairman: Dr. William C.Y. Lee
Panelists: Discussion:
William C.Y. Lee (PaCTel Cellular) From the USER'S View
Jesse Russell (AT&T) From the SYSTEM View (Including ISDN)
Jan Uddenfeldt (Ericsson) From the COMPONENTS View
Peter W. Nurse (Novatel) From the STANDARDS View
Dave Sattler (Motorola) From the TRANSITION View
Richard Levine (Northern Tel) From the OPERATIONS and MAINTENANCE View

FROM THE USER'S VIEW - William C.Y. Lee
- Operators and end-users
- Big-market operators and small-market operators
- Hill-area markets and flat-area markets
- Mobile users and portable users
- Cell-site equipment and mobile/portable equipment
- Voice users and data users
- Heavy users and light users
- Law enforcement, business and private users

USER PERFORMANCE REQUIREMENTS
(CITA SUB-COMMITTEE FOR ADVANCED RADIO TECHNOLOGIES)
- 2nd generation life span 1990-1998
- Need a capacity of 10 times by 1998
- C/I = 12 dB
- Availability - The end of 1990
- Quality Performance
  Voice Band: Voice - Same or better than analog, using subjective test
  Data = 1.2 kbps, BER = 10^-4
  Data Band: R = 1.2 kbps, BER = 10^-4
  Audio Delay - less than 100 ms
  Dual-mode mobile units
  Interface to ISDN
  Delay spread = 20 µs for equalizers

FEATURES
- Alphanumeric display of data
- Voice activated control
- Incoming number display
- Priority access
- Extension phone service
- Lighter portable units
- Encryption
- Vehicle location services
- Fraud control
- Imaging service

THE USER'S WISHES
- Please all operators with design parameters
- A workable system with spectral efficiency
- Low cost
- Meet the availability date

FROM THE SYSTEM VIEW (INCLUDING ISDN) - JESSE RUSSELL
Mr. Russell focused his remarks on the keys to the future evolution of cellular telecommunication networks worldwide based on spectrum segregation, digital cellular technology, and uniform end-user network access standard. He emphasized inoperability between digital cellular networks, and the digital telecommunications network was the key. He also focused on a uniform network interface for the land based and cellular network end-users. The concept proposed by Mr. Russell was based on the ISDN user to network interface for the digital telecommunication networks and cellular ISDN for the future digital cellular telecommunication networks.

FROM THE COMPONENTS VIEW - JAN UDDENFELDT
The complexity of digital cellular for the Pan European GSM and the North-American TIA standard was discussed. It was stressed that a digital system can be made very complex, especially the digital signal processing (DSP). Dual mode handportables are feasible provided that DSP complexity is controlled.

FROM THE STANDARDS VIEW - PETER W. NURSE
Peter Nurse outlined the participation of the FCC, the CITA and the TIA in the activities towards a Standard for Digital Cellular in the U.S. The FCC has released the rules governing cellular radio in their document 87-390 which paves the way for the introduction of digital technology in the public cellular service. Both the CITA and the TIA are working closely to ensure that a Standard is in place by year end 1989, which will govern the operation of dual-mode subscriber equipment, the first step in the ongoing transition from analogue to digital technology.
Transportation Systems

Bob McNab
Transportation Systems Editor

High technology makes automatic equipment identification available

Optical waveguide bar code readers on vehicles, packages, pallets, etc., to identify them automatically and uniquely. Many reasons are given for these optical systems alone, but suffice it to say that management support for the system where several departments of a company were involved was a key failure--to get everyone behind the program. The system worked, but the optical systems were not maintained. Dirty labels reduced accurate reading considerably. Now, thanks to technological advances, the current systems work well in reverse, that is, the tag can be read on the roadside and the reader on a moving vehicle. In this arrangement, the vehicle location can be accurately tracked on a distance basis.

Track defects located

In a single railroad with several miles of track, it can accurately track defects because the system provides for identifying an object and/or its location. With tags on vehicles, pallets, containers, trailers, etc., AVI provides:

- Identity or description of object on which tag is mounted
- Date
- Location
- Direction of travel
- Description of contents
- Health of motive power unit or vehicle and/or contents

With tags mounted on a traveled way--airport runway, highway, railroad or rapid transit-right-of-way, and readers on the moving airplane, vehicle such as bus, train, truck, etc., or track vehicle location accurately and in real time.

In one application, a rapid transit train carried a reader which read tags in an approach to a station automatically triggered station announcements aboard the train. Since each platform sign alerted waiting passengers of the train's approach, several applications come to mind:

- Vehicle management on which AVI identifies and tracks vehicles for more efficient dispatching, providing accurate scheduling, refueling, trip recording, etc.
- Weighing applications in which AVI readers at weigh-in-motion scales save existing lines and provide accurate identification and weight data. AVI can be interfaced with computer scales records in the management information systems.
- For terminal and train passage of specific vehicles for express and toll road control. AVI can log trailers, containers and in out to identify and monitor them. Also the AVI system can help in directing the tractor operations on correct parking spaces. For intermodal terminals, AVI has abundant applications. For railroad switching, AVI provides monitoring and control. Also, AVI can be automatically obtained from AVI identification code back to the reader feedback signal of 902 MHz amplitude-modulated carrier signal. When the tag returns signal is detected by the reader's receiver, the microprocessor assembles the signal to identify the carrier output signal to provide a sustained power source for the tag.

With the reader, the transmitter generates a pseudo-noise-modulated 902 MHz carrier that power the tag. This carrier is radiated toward the tag by a directional antenna, interrogation pulses are received by the tag and are passed through a tuned circuit which issues an output only to the signal generated by the reader.

Within the tag, the carrier signal is rectified to provide a dc power source which generates the modulation signal for the harmonic generator. The tag transmitter its programed identification code back to the reader feedback signal of 902 MHz amplitude-modulated carrier signal.

While American President Lines is equipped with AVI tags of which permit AARs and others to look into the details of vehicle identification system as receiving attention in other countries elsewhere.

One of the three systems is the Identifier, automatic vehicle identification manufactured by General Railway Signal Co.

August 1989

IEEE Vehicular Technology Society Newsletter

A hand-held AVI tag and knowing the vehicle he is driving. Hand-held tags can be used for temporary access, for persons or vehicles.

There are at least three of these automatic equipment identification (AEI) or automatic vehicle identification (AVI) systems now available. All have been tested by various users. The Association of American Railroads has adopted the standard AEI protocol by the International Standards Organization. The two other systems are the present system tags (Atech, Vapah and CBR) to be used at different frequencies, thus ISO does not recognize the need for more than one supplier.

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**AVI Systems**

**Two basic units are used in the GRS AVI system:**

1. The tag which is the programmable identification device, and
2. The reader which is the micro-processor controlled equipment and process and report the identification code programmed into the tag. Operation is shown in Figure 1.

FIGURE 1

Digital output signal is passed through a hardware decoder which formats the identification data for use by the microprocessor. Finally, the microprocessor checks the receiver output signal and under software control passes it on to a receiving device through the Data In/Out port.

IEEE Vehicular Technology Society Newsletter

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While American President Lines is equipped with AVI tags of which permit AARs and others to look into the details of vehicle identification system as receiving attention in other countries elsewhere. The American national railways has ordered the GRS AVI system for keeping track of equipment stored in yards valued at $8.7 million calls for furnishing 2,500 readers and several thousands of tags.

An interesting airport vehicle control and revenue enhancement system is in place at San Francisco's international airport. The microprocessor can relieve the congestion created by the continuing sweep on airport travel and curbs the traffic through the airport. Solution was to have each vehicle carry a GRS AVI tag on the roof of the vehicle and the airport has readers at entrances and exists where the vehicles enter/leave the airport. Instead of a flat fee per month, these fees are $5 per trip. From $50-100 per month, the fee is now $50-100 per trip. Although the fee is expected to be raised next year to $1, all concerned believe the system can be making more efficient use of vehicles and have more reliance on traffic congestion. The AVI system is likely to a PC AVI system in the future.

In another application sponsored by the Oregon Department of Transportation, one in which the AVI system is equipped with the GRS AVI tags and a reader located at weigh-in-motion scale is the identification of the vehicle and its weight. The system benefits, according to the system include:

- Reduce time trucks spend at weigh stations,
- Increase the weight scale at up to 35 mph. If they are under weight, the driver gets a green light and a proper weight is recorded. If the vehicle is over weight and light and must be weighed on a regular scale.
- Route trucks more efficiently.
- Route truckers more efficiently.
- Provides a cross check on drivers' mileage and identity.

The tag contains information about the identity of the vehicle, its number of axles and their distance apart, mark classification, etc., hooked to the
"electronic reader", information is developed about the speed of the vehicle, location and direction. In another Oregon installation, the readers or interrogators cover all highway lanes on an interstate highway and record speed of all vehicles passing. This gives a check on those meeting the speed limits of the highway.

ARE/AVT applications limitless. Call it what you will, but as some transportation experts or students of the flow of vehicles will say, if you can identify an object at a specific location and at a specific time, you can control movement of the object.

In addition to the "ground borne" systems mentioned in this article, there are at least two "satellite" systems in operation-- Rockwell International's ARS (Advanced Railroad Electronics System) and Railstar Control Technology's system. Rockwell uses the Navstar satellites while Railstar uses geostationary satellites (see VTS Newsletter for May 1989). In these satellite systems the vehicle identification is transmitted to the satellite, and thence to a ground station.

Discussion about which system--satellite or ground system is better is really fruitless--each has its own application advantages and disadvantages. But one thing is sure--object identification is here and technology makes automatic identification an economical and efficient way to operate, especially if the object moves.

**TRAIN MANAGEMENT INFORMATION SYSTEM**

Develops Detailed Data Base on Operations

**Terminal Applications**
Bandwidth-efficient codes can be used to improve the performance of digital transmission on bandwidth-limited channels such as the telephone channel and band-limited satellite channels. An important class of error-correcting codes that are used on such channels is the Reed-Solomon (RS) codes, which are linear block codes that can correct a fixed number of errors.


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An analysis of bit error rate (BER) in a binary digital FM system with postdetection diversity is presented. Expressions for the average BER due to additive white Gaussian noise (AWGN) and due to multipath fading are derived. Calculated BER results are shown for the average BER due to the random occurrence of a multipath fading channel. The results are shown to be in good agreement with published BER data in the literature.


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This paper seeks to present a unified analysis of the performance of binary phase shift keying under static and mobile operating conditions, and to delineate the tradeoffs in channel coding and subcarrier coherence. A new parameter is introduced that is shown to be a useful reference can eliminate the irreducible error rate phenomenon, with a minimum sacrifice in BER performance over an ideal BPSK system.


As part of the research mission of the NSF Engineering Research Center for Intelligent Manufacturing Systems, measurement, characterization, and modeling of indoor factory radio channels at frequencies greater than 1 GHz, and that fading characteristics can be used to provide a basis for designing reliable narrow-band indoor radio systems. The work has been completed and the results have been published in an AGW control. Widespread measurements reveal that commercially available technology currently limits data rates to on the order of 150 kbps in most indoor environments. In order to address the needs of current wireless communication systems, it is necessary to develop new techniques that can be used in indoor environments. Two promising approaches are the use of multiple antennas and the use of spread spectrum technology.


Quadraphase quadrature phase-shift keying (QPSK) is a new spectrally efficient modulation scheme that utilizes available signal space dimensions in a more efficient way than two-dimensional schemes such as BPSK and MSK. It uses two data shaping pulses and two carriers, which are quadrature phase-shift keying, to create a four-dimensional signal space and increases the transmission rate by a factor of two over QPSK and MSK. This improvement in bandwidth efficiency is similar to the improvement brought by QPSK over BPSK. The QPSK signal has a bandwidth penalty, but this penalty depends on the choice of pulse pair.

"Padel Electrical Skin Noise of baseband data pulses, the E_b/N_0 requirement for P_e = 10^-5 is approximately 1.6 dB higher than that of BPSK. Without additional constraints, QPSK does not maintain constant envelope. However, a simple block encoding provides a constant envelope. This coded signal provides a constant envelope and reduces the system's TCM efficiency. Like BPSK, QPSK systems can self-clock and self-synchronizing ability.

An optimum class of pulse shapes for use in QPSK is proposed. The system performance achieves the Nyquist rate of 2 bits/s/Hz using a baseband modulator. The system's performance is similar to that of BPSK, but the system's performance is superior at the same rate but at the cost of three more quantization, and hence, more bit energy expenditure.


A cellular mobile telephone system with load-sharing facility, which enables subscribers to move from one base station to another for free radio channels in more than one cell, is described. This system has been developed to meet the need for improved channel efficiency and channel utilization. Results show that the system can accommodate up to 10% overhead for channel allocation techniques, which can be achieved. The system is based on a model of the local traffic, with a position tracking system for the base station to track the position of the mobile unit. A position tracking system for the local traffic, with a position tracking system for the base station to track the position of the mobile unit.
Professional Activities

Frank E. Lord
Professional Activities Editor

When the Deutsch and Shea Index Is at 100, We're in Trouble

Even though the Deutsch and Shea Index has been promulgated since 1961, its significance is not widely understood. Robert A. Riven (P), a past member of the Board of Directors, who is currently serving on the IEEE USA Manpower Committee, has been developing methods of forecasting engineering unemployment rates. One of his methods involves a correlation with this index. His presentation which follows not only includes timely information on the present and near future unemployment problem, but some valuable observations on interpreting the Deutsch and Shea Index.

The Deutsch and Shea Index (also called the High Technology Recruitment Index of HTRI) is a useful predictor of engineering unemployment. Correlation of the bureau of labor statistics engineering unemployment with the index from 6 month previous is now 0.678. The small sample size in the BLS engineering unemployment leads to rather noisy data with a standard deviation of 0.65. Averaging that data would lead to a lower standard deviation, but it would lose its value as a leading indicator. The present correlation leads to the following relationship:

\[ \text{FENUM} = 5.416 + 0.0281 \times \text{DSHAINIX} \]

Where FENUM = the forecast percentage level of engineering unemployment 2 quarters hence.

DSHAINIX = present value of the HTRI

"Misunderstanding of the meaning of the Deutsch and Shea Index is unfortunately widespread due to their having chosen 100 as their starting value and allowing the inference that 100 is "normal." In fact, when the index is at 100 we are discounting a significant number of engineers.

"Reviewing the expression, it is obvious that zero unemployment theoretically would occur when the index is at 92. Historically, the full employment period from 1966 to 1969 had an average unemployment rate of 0.6%. Practical full employment is thus at an index value of 164. When the index value is at 100 as at the present, unemployment should be registering 2.6%, a value that usually indicates significant dislocation.

"In the first quarter of 1983 we had an unemployment value of 3.8% and a 2 quarters previous index value of 89. A crude analysis of the effect on new graduates indicates that an extra 15% of the class of 1983 were permanently lost from the profession. While that is only about 10,000 engineers, it is significant.

"During that same recession, engineering employment did not grow. The average gross rate of engineering employment during the 80's is 4.7 million per year. Total dislocation during that year was thus in the 50,000 range with 10,000 of those being new graduates that have not reentered as of 1989.

"Summarizing then, a Deutsch and Shea Index at 100 or below indicates serious dislocation. Full employment is at a level of 162 on the index. The highest level of demand was experienced in 1980 with an index of 146 and an unemployment level of 1.2%. Figure 1 shows FENUM, the forecast unemployment from the above expression. There is no need to show the index since FENUM is linearly related by the above expression."

INTERIOR ELECTRONICS -- THE HOTTEST FIELD IN AUTOMOTIVE ELECTRONICS

Interior electronics is the hottest, and most profitable, field in automotive electronics [1]. For example, future climate control systems, under development at Delco Electronics, will feature up to four occupied zones. Body temperatures of each of up to four occupants will be individually measured via infrared sensors, and a comfort level (temperature) associated with each occupant will be "learned." Thereafter, by means of closed loop control, each of four different climate-control zones will be automatically maintained at separate, individually selected, comfort levels [1].

Lots of new things are coming in audio systems. Delco Electronics is developing audio systems that "quiet" the car interior using anti-noise (noise cancellation) methods described previously in this Newsletter [2]. Microphones in seatbacks detect offending noise, and through the use of existing audio system speakers, an inverse audio wave is created that cancels the noisy sound at occupant ear-level. Noise silencing created by this system is said to be dramatic [1]. Moreover, the combination of compact disc with digital signal processing and ambient control creates "concert hall sound," accurate in every reverberated acoustic detail, inside an automobile [1].

Not to be outdone, Toyota announced a new top-of-the-line communication system that for $1,638 includes: AM/FM/CD/cassette deck/DAT/Tuner/cellular phone/ videotape cassette features [3]. Then there's Pioneer's installation of a 2440-watt, 24-speaker, $10,000, ultimate sound system in a $295,000 Porsche Gemballa -- only available in Japan [4].

(I don't know about you, but I'm getting a headache just thinking about a 2440-watt stereo in my Porsche -- I imagine my 13-year old son blowing out the speakers with his Def Leppard and Poison CDs. Who buys this stuff anyhow? One answer: people with the mind-set of a 13-year old).

Delco Electronics Digital-Signal-Processing Ambience Control CD Audio System [1]

Toyota/Mitsubishi $1,638 In-Car Entertainment/Communication System Schematic Diagram [3]

6 MONTH FORECAST OF ENGINEERING UNEMPLOYMENT

- Actual Unemployment
- Predicted Unemployment

- Actual Unemployment
- Predicted Unemployment

TIME IN YEARS AND QUARTERS


2 2.5 3 3.5 4

PERCENT UNEMPLOYMENT

20
"Smart" cars running on "smart" highways will whisk drivers (or should I say passengers, since everyone would simply be a passenger) between cities at hundreds of miles per hour and then stop on local streets [5]. "Smart" highway systems include road sensors and other equipment to guide authorities and drivers in an effort to keep traffic flowing smoothly and safely. Spurred by ever-worsening traffic congestion, systems are now being tested in California, Europe, and Japan. "Smart" cars and highways could become a reality within 25 years.

Such dream transportation will be enormously expensive. Huge investments will have to made in four major areas [5]: (1) vehicular electronic navigation systems, (2) large-scale traffic control centers, (3) two-way communications between vehicles and control centers, and (4) reliable road sensors to detect traffic speed and flow.

As a first step in proving out the "smart" car concept, and in part of California's Program For Advanced Technology for the Highway (PATH); radar "platooning" or "station-keeping" of vehicles on a San Diego freeway will commence this coming September [5]. On special lanes (the inside car-pool lanes), forward-looking radars will electronically lock onto platoon-member vehicles ahead, and maintain a constant speed and safe vehicle spacing. The goal of PATH, directed by the University of California, Berkeley, is to improve traffic flow and safety by eliminating stop-and-go congestion.

Other related types of systems, particularly those for vehicular Collision Avoidance (C-A), have also recently been in the news [6-8]. Basic C-A systems simply provide an alarm signal that a collision is coming, whereas advanced C-A systems also apply braking [6,7]. The fundamental problem with all systems is false alarms. For example, acoustic signals are sensitive to wind, optical sensors are blinded in fog and by dust/dawn sunlight conditions, and radar picks up return signals from non-hazardous objects. Even if only the basic C-A alarm warning function were provided, it is thought that the alarm in some cases would only add stress and would paralyze some drivers into inaction when heading into an accident [6]. Therefore, considerably more development work remains to be done in this area of automotive electronics.

This Drawing of the Future 'Smart' Vehicle/Highway Shows No Traffic On the Freeway [5]
(Phot, obviously a Visionary, Made Future Traffic Almost Nonexistent)

NEW ITEMS

After compact disc, will come the "silicon recorder" with near instantaneous random access. The recorder will have a 4-gigabyte RAM capacity, will provide equal quality and playing time to a current CD, and will be available before the year 2000, so says Meitaro Makalina, a senior Sony executive [9].

Smart tires are coming, where electronic chips will be built in and will draw power via rf coupling, and will transmit back tire pressure and temperature information [10]. Tire pressure will be "adjusted within milliseconds for varying road conditions." For example, upon hitting a pothole, the tire air pressure would be released instantly to cushion the blow. A moment later, when back on smooth pavement, a pneumatic system in the center of the wheel would re-inflate the tire back to normal pressure. Air pressure would be reduced on snow for better traction, and increased at highway speeds for better economy. Smart tires will be integrated with Anti-lock Braking Systems and with active suspension systems [10].

Smart headlights consist of clusters of optical fibers, each terminated with a 0.5-inch diameter lens. Light focus transmitted through the optical fibers, and light is supplied by a central remote light source. A composite (ensemble) light beam is programmed to provide either high or low intensity, in addition to a fog beam—all without special fia-

ments. Electronically controlled shutters distribute light to the fibers depending on the

light setting selected by the driver [11]. Fiber optic lighting will also offer space savings over conventional lamps.

"Another EMF Incident."— Remember the cover of Interference Control Technology's latest catalog (about 6 months ago), showing an alarming illustration of a car in mid-air careening through a guard rail and going over a cliff? NTEA states further that EMF is a well known source of potential problems, so auto manufacturers do a good job of designing to avoid problems. [12].


REFERENCES

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