3aEAb5. Intelligibility improvement of cellular phone speech in a noisy environment. Mutsumi Saito (Fujitsu Kyushu Digital Technol. Ltd., 3-22-8, Hakata-Ekimae, Hakata-ku, Fukuoka, 812-0011 Japan, saito@qdt.ts.fujitsu.co.jp), Kimitoshi Fukudome, and Takashi Tsumura (Kyushu Inst. of Design, Fukuoka, 815-8540 Japan)

In a noisy environment cellular phone users often have difficulties in hearing far-end speech because the ambient noise disturbs the user's understanding of the conversation. To improve speech intelligibility in noise, speech enhancement is a feasible solution. In this paper the effects of two speech enhancement methods, multiband amplitude compression and formant enhancement, are reported. The multiband amplitude compression is a typical method for hearing aids that divides speech signal into some frequency bands and conducts amplitude compression independently. On the other hand, the formant enhancement is an LPC analysis-synthesis technique that provides for formant frequency shaping. The performances of these methods on the speech intelligibility were evaluated in the simulated real-world noise circumstances. Recorded noise sounds were presented from loudspeakers in a soundproof room and the speech samples were reproduced from real cellular phone handset which was fixed on the subject's head. VCV (vowel–consonant–vowel sequence) units were used as test speech samples. The results show that multiband amplitude compression makes significant improvement in speech intelligibility and does not degrade the subjective impression of speech.

3aEAb6. Design and development of a parametric sounder for sodar. Mukesh Chandra and B. S. Gera (Natl. Physical Lab., Dr. K. S. Krishnan Marg, New Delhi 110012, India)

Sodar is an acoustic remote sensing technique for monitoring the atmospheric boundary layer. Conventional sodar uses a parabolic dish with a transducer at its focus to transmit acoustic burst at 2 kHz. System performance depends upon the antenna directivity and transducer sensitivity which in turn are functions of the dish diameter and operational frequency. To achieve directional beam with nearly zero sidelobes, even at lower frequencies, a parametric sounder has been designed and developed. The parametric acoustic signal is realized by nonlinear interaction of two high-power ultrasonic waves of frequencies in the vicinity of 20 kHz and of acoustic pressure of 140 dB (approx.). The directional and propagation characteristics of the resulting audio signal have been studied to ensure parametric nature of the virtual source. The resulting audio beam is narrow with a semi beam-angle of less than 3 deg at 3-dB down points. The directional pattern shows the absence of side-lobes. The transmitting system is capable of sending a coded signal in any desired direction. The performance of the new and inexpensive parametric sounding system for sodar application has been evaluated and discussed in the light of comparative observation.

WEDNESDAY MORNING, 3 NOVEMBER 1999   GRANT–HARDING ROOM, 9:55 A.M. TO 12:00 NOON

Session 3aED

Education in Acoustics: The Use of Multimedia in Acoustics Education

P. K. Raju, Chair

Mechanical Engineering Department, Auburn University, Ross 201, Auburn, Alabama 36849-5341

Chair's Introduction—9:55

Invited Papers

10:00

3aED1. Penn State World Campus courses in noise control engineering. Courtney B. Burroughs (Grad. Prog. in Acoust., The Penn State Univ., State College, PA 16802)

One of the first offerings in the Penn State World Campus is a series of four graduate-level courses in noise control engineering. These courses use computer-based technology to deliver the courses to students at a distance. Therefore students can take the courses from any location on a very flexible schedule, making the courses available to students who are committed to a career and/or family. Course material is sent to students on CD-ROM and interactions between students and with faculty are conducted via an e-mail server. Computer technology permits illustrative animations in the text. Assignment involves interactive animations and virtual experiments. Students collaboate on realistic noise control projects which involve measurements and analyses conducted using virtual instruments. Descriptions of the courses, the multimedia used to develop and deliver the courses, and the interactions between students and faculty are presented.

10:30

3aED2. Animations for teaching more advanced acoustics topics. Daniel A. Russell (Sci. and Math Dept., Kettering Univ., Flint, MI 48504, drussell@kettering.edu)

Computers and the World Wide Web are quickly replacing traditional methods of presenting animations of acoustic-wave phenomena in the classroom. A previous paper [V. W. Sparrow and D. A. Russell, J. Acoust. Soc. Am. **103**, 2987 (1998)] outlined how MATHEMATICA could be used to generate animations which can be converted to QUICKTIME movies or animated GIF images for insertion into HTML documents. The mathematical prowess of a program like MATHEMATICA allows for animating more complex wave phenomena while ensuring that the physics and mathematics are correct. At the same time, primitive graphical capabilities allow for visually pleasing results. This paper is an extension of previous work and will include a gallery of new animations which have been used in a senior-level acoustics course for engineering and physics majors. Animations will include some theoretical (sound fields of complex sources, particle motion in waves, and multiple-dof vibrating systems) as well as some experimental (modes of vibration of acoustic and electric guitars) animations. Some hints of MATHEMATICA tricks to generate animations will be shared, as well as methods for producing animated GIF files.

3a WED. AM

3aED3. A multi-media courseware that applies vibration theories to real-world problems. P. K. Raju and Chetan Sankar (Auburn Univ., AL 36849, pkraju@eng.auburn.edu)

Many engineering students lack the breadth of knowledge and skills that are fundamental to the practice of their profession. There is now a growing realization among educators of the need to put a greater emphasis on imparting higher-level cognitive skills. The learning experience must move from lecture as a dominant mode to include a significant level of active learning approaches. In order to fulfill these needs, written case studies were developed and used to bring real-world problems into engineering classrooms. New multi-media information technologies provide access to vast information sources, support safe discovery-based educational experiences, and more aggressively support peer-to-peer education. Studies report that the nonlinear systems associated with multimedia technologies are superior to linear paper-based systems in improving problem solving skills and increasing user satisfaction. Therefore, the written case studies were enhanced by adding video, audio, photographs, and competency material to create a CD-ROM so that the students are provided a rich set of materials that describes a real-world engineering problem involving control of excessive vibration in a power plant. Testing of this CD-ROM in vibration courses has shown that students applied the theories of vibration and rotordynamics in solving this real-world problem. [Work supported by NSF DUE #9752353.]

Contributed Papers

11:30

3aED4. Teaching acoustics courses on the Internet. Paul A. Wheeler (Utah State Univ., UMC-4120, Logan, UT 84322)

This paper describes a general education course in acoustics taught over the internet. This makes the course available to colleges and universities not currently teaching courses in acoustics. The paper discusses challenges faced in offering on-line courses, such as homework, labs, and exams. This course uses a software package called WEBCT, which provides an administrative backbone for the course. The backbone includes: web navigation, exam base, threaded discussions, and tools to track students. Exam questions include formula-based questions for which each student receives a different input variable which is automatically calculated and compared to the student's answer. One difficulty in creating a web-based course is providing a hands-on lab experience. Traditional labs were converted into web activities and home activities. Web activities use the internet to supplement information found in the text. Home activities allow students to perform experiments at home which are later submitted through the web. All submissions and grading is done on the web, including homework, exams, web and home activities. The course works well for handling the large number of students commonly found in general education courses while providing access to nonconventional students taking the course through distance education.

11:45

3aED5. Development of computer-based interactivities in hearing science. Patrick M. Zurek and Nathaniel I. Durlach (Sensimetrics Corp., 48 Grove St., Somerville, MA 02144)

Work is underway to develop a CD-ROM collection of interactivities to supplement undergraduate and graduate instruction in hearing science. No attempt is made to provide complete coverage of hearing science in a stand-alone course. Rather, the approach emphasizes and exploits those features that can make multimedia computer-based presentation so valuable as a teaching adjunct: animation, audio output, and interactivity. With these capabilities, moving graphical images can represent physical or conceptual objects to help convey ideas and relationships that are difficult to illustrate with static images. In addition, the student is given extensive opportunity to hear the stimuli and experience the relevant psychoacoustic phenomena directly. Most important, in the current approach, unlike what can be achieved simply with prerecorded materials, students are given sufficient control over the signals, parameters, and procedures, to conduct a wide variety of experiments. To a significant degree, the materials provide each student with a personal laboratory. The CD-ROM now being developed, which includes interactivities in basic auditory anatomy, physiology, and perception, will be useful both for classroom demonstrations by an instructor and for work by individual students. [Work supported by NIDCD.]