CURRENT SMOKE ALARMS
UNABLE TO WAKE MILLIONS OF HARD OF HEARING PEOPLE

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According to the July 2007 study, "Waking Effectiveness of Alarms for Adults who are Hard of Hearing," the typical audible signal used by smoke alarms failed to wake up 43 percent of tested subjects with mild to moderately severe hearing loss despite the fact that all were able to hear the 3100 Hz tone when awake. Strobe lights woke up only 27 percent of the hard of hearing subjects. In contrast, a specific audible multiple frequency signal consisting of a 520 Hz square wave [1] successfully alerted 92 percent of the subjects at the benchmark level of 75 dBA and alerted 100 percent at 95 dBA.

The study, authored by Dorothy Bruck and Ian Thomas of Victoria University, Australia, estimated at least 34.5 million people in the United States have partial hearing loss and projected that this number would increase due to the aging of the baby boomer generation.

The Hearing Loss Association of America (HLAA) has long suspected that people have died in fires because they could not hear or wake up to high-frequency smoke alarms, but government investigations of fire fatalities have not inquired into whether the victims had hearing loss. Neither audible smoke alarms nor strobelights were specifically tested with hard of hearing people during stages of deep sleep until the twenty-first century. The findings of this study indicate that millions of people with hearing loss will not be wakened from deep sleep by audiblealerts which use only one tone in the high frequencies rather than a range of frequencies beginning at approximately 500 Hz.

"This study shows there is a critical need for emergency warning systems to be redesigned or supplemented as soon as technically feasible," said Terry Ports, executive director of the Hearing Loss Association of America. "Millions of people do not and will not know that they will not wake up to the high-pitched tones used by most emergency alerts. We call upon manufacturers of emergency alerting equipment, such as smoke alarms, carbon monoxide alarms, and weather radios, to provide solutions that recognize this reality as soon as possible.

"The study evaluated the performance of six different signals for waking up hard of hearing people from deep sleep and found the 520 Hz square wave to be the most effective of all the signals. Bed and pillow shakers awoke 80 percent of the subjects at benchmark levels, awaking the majority very quickly, but did not wake up 100 percent of the subjects even at higher levels of intensity.

For people with more severe hearing loss, the authors recommended studying the effectiveness of two or more different signals, such as a 520 Hz square wave audible signal with a tactile alert and/or a strobe light.

"Even though strobe lights may not be effective by themselves at waking up hard of hearing people from deep sleep, it's important to remember that strobe lights are still needed for alerting deaf people when they are awake and are not in contact with a tactile alerting device," said Dana Mulvany, member of the Technical Panel for the research project.

"Presently, there are no known emergency alerting products on the market incorporating a range of tones
and also including a low frequency near 500 Hz,” Mulvany said. “Other research has already shown that the 520 Hz square wave is superior to the 3100 Hz tone for waking up other vulnerable populations, such as elderly people and people under the influence of alcohol. All manufacturers of emergency warning devices, including smoke alarms, carbon monoxide alarms and weather radios, should explore methods of providing variations of the 520 Hz square wave as an audible alert so that people with unknown, temporary or permanent partial hearing loss can be awakened quickly from deep sleep. Manufacturers also need to specify the frequency response of their audible alerts so that customers of all kinds can make informed decisions about their purchases.”

Brenda Battat, associate executive director of HLAA, said: “Operators of hotels, motels, college dormitories and many other facilities with sleeping areas must ensure that they provide equally effective communication access for people with hearing loss to the building alarm system, which is required by Title II and III of the Americans with Disabilities Act (ADA). Many deaf or hard of hearing guests have been provided portable alerting systems with a bed shaker, but these systems have typically not provided effective alerting when the building alarm system is triggered and have only been activated by smoke within the guest's own room, which is too late for optimal notification. We urge people with hearing loss to file complaints under the Americans with Disabilities Act if they are not provided effective alerts to the building alarm system by ADA-covered entities.”

Hearing Loss Association of America thanks the Fire Protection Research Foundation for commissioning this research study, and Drs. Bruck and Thomas for their intensive work on this study. The study is available online at:

http://www.nfpa.org

[1] A 520 Hz square wave signal contains multiple harmonics of the fundamental 520 Hz frequency, becoming a multiple-frequency signal which is thus more likely to be heard by people with sufficient hearing at one or more of the frequencies in the signal.

**RESEARCH TRENDS IN BIOMEDICAL MICROELECTRONICS**

Australia is a vast country with a land size of 7,692,024 km² and a population of just over 20 million. The majority of its population is spread along the east coast where most of the large hospitals are located. While this is true, there are many that still live in rural regions and still require access to critical healthcare infrastructure. This lack of access poses a major issue in addressing healthcare need for the rural region. Critical medical diagnostic equipment are often large, bulky and heavy and cannot be easily carried to rural regions to critically ill patients or to be used as a preventative measure for potential heart disease patients.

So how can microelectronics help? When people think of microelectronics they usually relate it to personal computers, mobile phones or other consumer products. Microelectronics is actually an enabling technology that extends far beyond merely consumer electronics. Microelectronics can provide solutions to many application areas such as communications, defence and the medical fraternity. Researchers from the Centre for Telecommunications and Microelectronics in the School of Electrical Engineering are at the forefront of cutting edge research on a number of issues that will address the needs of the medical fraternity. One of the major projects is addressing the issue of access to blood gas analysis (as part of the research team’s “personal point-of-care patient monitoring” focus).

Blood gasses are one of the vital signs monitored by medical practitioners and the test measures the amounts of oxygen and carbon dioxide, as well as the pH levels of blood. The analysis evaluates how effectively the lungs are delivering oxygen to the blood and how efficient they are at removing carbon dioxide from it. The test also indicates how well the lungs and kidneys are interacting to maintain normal blood pH and other kidney functions. Current, high accuracy, blood gas analysers are rather bulky and invasive. Non-invasive analysers (e.g. pulse oximeters) lack the same accuracy as their invasive counterparts owing to the indirect nature of their measurement technique.

The research team have proposed a solution that will enable portability without sacrificing accuracy. The solution is a marriage of microelectronics and photonics where an optical based blood gas sensor will detect raw blood gas values from a drawn blood sample. The proposed technologies to realize such a solution are Micro Electro Mechanical Systems (MEMS) and advanced microelectronic techniques. These techniques will aid in reducing power consumption as this is key if the analysers will be powered from a battery. The use of MEMS will aid in developing a sensor which is considerably smaller and more portable than the current bulky analysers. The sensor will also feature a reconfigurable bi-signal processor that computes values of partial pressure of oxygen and carbon dioxide as well as pH from the raw values obtained from the optical MEMS sensor. The algorithms to obtain these parameters are quite complex and can draw significant power for processing. To reduce the power load on the batteries, the processor being developed will also employ advanced power management techniques to ensure efficient processing. The proposed solution aims to reduce the time for analysis and also allow the practitioner to provide a quick response to the change in the conditions. The portability of the solution also allows diagnosing patients who don’t have access to the facilities and for patients being treated at home. The solution is minimally invasive hence will be more accurate than the current non-invasive solutions.

The project is undertaken by PhD students Jaideep Chandran, Nikhil Joglekar, Leila Koushaedian, David Fitiro and Anand Mohan. The project is lead by Dr. Ronny Veljanovski, Dr. Alex Stojevski Dr. Thinh Nguyen and A/Prof Aladin Zayegh in collaboration with Dr. Manoj Dorairaj from the Marian Cardiac Centre & Research Foundation in India.

**LOVE’S LOGGED OUT**

TILL software do us part: Australian computer experts have developed a program to help divorcing couples sort out who gets the kids, the car and the record collection.

The prototype program, called Family Mediator, has been built by professors at Victoria University. It asks partners to rate disputed items by giving them points on the basis of how much they want them. Each has 100 points to spend. With the aid of an “electronic decision-support system” they then trade off their wants against each other. In stalemates, the person who concedes gets extra points, reports LiveScience.

**THE JOINT IEEE INTERNATIONAL SERVICES COMPUTING (SOA) STUDENT CONTEST AWARD OF VICTORIA UNIVERSITY (AUSTRALIA) AND BEIJING JIAO-TONG UNIVERSITY (CHINA)**

Services Computing (SOA) a new multi-disciplinary field bridges the gap between business services and the next generation of Internet and IT technologies. The IEEE International Services Computing Contest launched officially in 2006 focuses on using SOA methodologies and tools to better solve significant business problems through the auspices of an international student competition. The top six winners of the contest were announced at the IEEE International Conference on Web Services (ICWS 2007) and the IEEE International Conference on Services Computing (SCC 2007) in July 2007. As well as the prize the technical papers of the winners...
IAN POTTER FOUNDATION GRANT TO KICK-START RESEARCH IN INDIGENOUS EDUCATION AND WELL-BEING

A team of researchers in the FAEHD have been successful in winning a grant for $10,000 from the Ian Potter Foundation to develop a program of research into the implications for education, health and emotional well-being for young Indigenous people who attend boarding schools away from their communities.

The idea for this project was initially developed in consultation with Worawa Aboriginal College in Healesville and teachers and community members at Yuendumu Community Education Centre in the Northern Territory.

The research team includes Tarquam McKenna, Lawry Mahon and Jill Sanguinetti from the School of Education, Adrian Fisher from the School of Psychology, and David Legge, from the School of Public Health at LaTrobe University. We are planning to raise funds for two Indigenous researchers to carry out the research: a doctoral and a postdoctoral candidate.

The Ian Potter grant will fund a consultative workshop to which Indigenous leaders and all other stakeholders will be invited. The aim of the workshop will be to discuss the complex set of issues underlying the question of boarding schools in Aboriginal education and to achieve broad consensus on the project’s aims, methodology, and industry partners.

UPCOMING GRANT OPPORTUNITIES

- ARC Federation Fellowship Scheme reflects the ARC’s commitment to support excellence in research by attracting world-class researchers and world-class research leaders to key positions, and creating new rewards and incentives for the application of their talents in Australia.

The objectives of the Federation Fellowships scheme are to:

a. attract and retain outstanding researchers of international renown;
b. build and strengthen world-class research capability in Australia;
c. expand Australia’s knowledge base by supporting ground-breaking, internationally competitive research;
d. forge strong links among researchers, industry and the international research community; and
e. support research that will result in economic, environmental, social or cultural benefits for Australia.

Open to applications from outstanding researchers of international renown, the Federation Fellowships scheme particularly encourages Proposals involving Australian and non-Australian researchers currently working overseas by providing eligible Federation Fellows with Start-up Project Funding in addition to salary and salary-related (on-cost) support.

Preference will be given to early- to mid-career researchers who will play a leadership role in building Australia’s internationally competitive research capacity.

Closing dates for applications with the Office for Research is Friday, 5 October, 2007 and with the ARC on Friday, 19 October, 2007.

Closing date for letters requesting non-use of an assessor with the Office for Research is Friday, 5 October, 2007 and with the ARC on Friday, 19 October, 2007.

• The ARC is now calling for applications under its ARC Linkage-Project Scheme for funding commencing in July 2008.

Purpose - Linkage-Projects supports research and development projects which are collaborative between higher education researchers and other parts of the national innovation system, which are undertaken to acquire new knowledge, and which involve risk or innovation.

Funding rules:


Planning to lodge an application?

If you are planning to submit an application please complete that attached Expression of Interest Proforma and submit to your Associate Dean Research and Palmina Fichera via e-mail Palmina.Fichera@vu.edu.au. If you are a named investigator on an application submitted via another institution, please tell us also.

Key Dates:

Internal Closing Date - 2 November 2007
External Closing Date - 23 November 2007

If you have any further questions, please do not hesitate to contact Ms Palmina Fichera, Grants Administration Officer in the first instance on ext 4707, or e-mail palmina.fichera@vu.edu.au

THANK YOU: To all who contributed to the content of the Research Matters bulletin.