

A look at 2002



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A look back at 2002 shows a palette of satisfying results and events, but also a slight feeling of concern about the future. The year that passed was a good year for the department but on the horizon several difficulties are emerging which need to be tackled.

First of all, the department has a strong research program with 24 separate projects running. In addition, the associated Centre for Speech Technology conducts an extensive research program and develops demonstrators of novel technology. The financial situation for the department is satisfactory. The result for 2002 was +2.5 MSEK, giving an accumulated capital of 6.2 MSEK (about 15% of the turnover). The financial picture may change quickly, however, as we are strongly dependent on external funding, in particular from the European Commission. We have been remarkably

successful within the Fifth European Framework Programme for research. According to the official statistics, we hold a top rank among the departments at KTH in attracting European funding per researcher (second place in the main research program). The coming Sixth Framework Programme (FP6) operates with much larger projects and constellations of partners, and is so far an unknown quantity. The ongoing formation of alliances of research groups for the proposals within FP6 during 2003 is of vital importance for the department.

The financial situation for the Swedish research agencies is not as strong as before due to the changes in the stock markets. Much of their accessible yield is tied up by previous commitments during the profitable years. The tale of seven good years followed by seven bad seems not to be literally true, at least not with regard to

research funding. Rather, the long-term trend is more of a continuously sharpened competition for the available money, with superimposed modulations due to the cycles in the state of the financial markets. The current backlash for the telecommunication industry has turned much deeper and will last longer than expected, both in Sweden and internationally. This turn of the events will naturally influence the conditions for the future support to our research.

Forgetting about economic matters, past and future, it is assuring to observe that our research activity is strategically positioned in a field with very promising conditions for development. We are exploring the basic conditions for human communication with sounds – speech and music – and developing demonstrators of emerging technology. It is very reasonable to assume that the human voice will become the main communication channel for control of devices of all kinds; robots, computers, cars, and many more. Besides the actual information in your spoken sentences, also your mood (as reflected in our voice) will be detected and used by the machines. Everyone knows that a sad person needs to be treated differently than a happy, and machines will also learn to respond accordingly, in action, and in the spoken dialogue with you. Speaker identification and verification will be refined and regularly used in banking and other situations where personal identification is necessary. Naturally, voice communication will be supported by vision in many applications. Still, a picture often tells more than a thousand words.

Hearing aids is a field which unfortunately is of interest to an increased number of people. Our acoustical environment has changed over the last century but not our hearing. An increasing number of spontaneous questions from students about the mechanisms of hearing turns out to have its origin in tinnitus and other hearing problems. Hearing impairment in young people seems often to be caused by bad consciousness about the risks in everyday life, in particular exposure to loud music. Half a minute close to a discotheque loudspeaker may be fatal to the rest of one's life. The inflation in loudness in rock music is also reflected in symphony orchestras. Orchestra members at exposed positions now use ear plugs regularly. The main worry for working injuries among young orchestra musicians is no longer pains in arms and back, but permanent hearing loss.

It will take at least a decade before actual repair work can be made in the inner ear (cochlea), or efficient audio-electrical cochlea implants have been developed and are in regular use.

Advanced external hearing aids are therefore of vital importance to an increasing number of people, old and young. The modeling of the signal processing in the ear, which is a core field of research in our hearing technology group, is basic for the development of more efficient hearing aids. The ideal future hearing aid will adapt to the patient's needs and the current environment automatically.

A musical instrument which automatically adapts to the skills of the player exemplifies another long-term research theme. Such an instrument is forgiving to the beginner by offering easy fingering, assistance in playing in tune, correction of the loudness, clean attacks of all notes, and more. All these nice features are accomplished at the expense of a limited control of the individual notes, but that's just the point. As the player becomes more advanced the detailed control of the sounds is automatically successively left over to the player. In many traditional acoustical instruments like the trumpet and violin, many control difficulties need to be reasonably mastered before a single enjoyable note can be produced. Not surprisingly, the 'take-off time' for these instruments is several years.

The 'adaptive instrument' may never be realized, at least not commercially, but the studies needed to approach this visionary instrument cover several of the most central aspects of music acoustics, bridging the physics of the instruments and music performance. A lack of understanding of the biomechanical control of musical instruments and the mapping of the player's gestures to the properties of the sounds, are currently bottlenecks in the development of synthesizers and computer-controlled music.

Long-term goals may easily seem to be never-in-reach visions only. Ten years ago the idea of automatic generation of concise, written minutes from a meeting seemed very distant, being clearly visionary. Admittedly it is a task which sometimes may seem impassable also for an experienced human secretary. However, today project plans are being formed how to approach this formidable task.

Being a university department, we should not hesitate to participate in visionary projects and look even further ahead. Among other things it will help us in formulating the remaining unanswered questions within the basic issues. It is important to remember that even today, sound generation and perception processes in speech and music are far from fully understood.

Several new courses in the undergraduate programs have been launched during the year, including Auditory Perception, Audio Technology, and Music Communication and Technology. More teaching at KTH gives us a better contact with a larger number of students, which is most valuable for the recruitment of research students. Besides it gives a welcome contribution to the incomes.

The department will move to new facilities on the KTH campus during 2004. The plans for the

reconstruction of our new building, originally raised as a physics laboratory in 1948, are under preparation. Further, changes in the organization of the departments at KTH are currently being discussed and our department is also involved. The trend during the last years is a merging of existing departments into larger units. It is true that changes of all kinds often are perceived as irritating and laborious before and during the course of the process. However, once completed they may open up new possibilities and give fresh impulses to the work. The department is looking forward to the years to come with confidence.

Read more about the research and teaching at the department on the following pages, and meet us also for current news, scientific articles, and upcoming events at <http://www.speech.kth.se>.

