



Southern Minnesota Section Newsletter

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Signal Processing

by Scott Dahl

Signal processing is an immense and diverse field. There are perhaps 50,000 engineers who regard signal processing as their speciality and hundreds of thousands more whose work involves signal processing. It is a field that did not exist 50 years ago, and it remains mysterious or quite unknown to most people, even though many of its tasks -- such as analog-to-digital conversion, error-correction coding, speech synthesis and image compression -- are familiar even to laymen in our communications- and computer-dominated world.

Before attempting a definition of signal processing in general, let's take a look at an everyday device, the compact-disk player, whose performance depends upon several types of signal processing. To understand the CD player, consider first the acoustic phonograph. In playback mode, the motion of the groove under the phonograph needle causes a vibration that is converted into an electrical pulse which controls a loudspeaker.

The basic operation of a CD player is almost as simple. In playback mode, a laser beam tracks a spiral path of pits which represent 1's and 0's. When there are height changes, the beam is not reflected, but attenuated. A light sensor detects the reflection, producing an electrical pulse train of 1's and 0's comprising 16-bit samples of the soundtrack, which was recorded at 44,100 samples per second. CD players provide better sound than conventional record players: increased bandwidth, flatter frequency-response curve, greater dynamic range and better channel separation. The CD player utilizes sophisticated signal processing to perform tasks that could not have been done 25 or even 10 years ago.

At the end of the 20th century, signal processing is a vital technology in many areas: communications, information processing, consumer electronics, control systems, radar and sonar, medical diagnosis, seismology and scientific instrumentation. In addition to the wide range of application areas, there is a wide range of signal processing tasks. Example include: removing echos from telephone connections, scrambling cellular-phone conversations, controlling the suspensions of automobiles to respond to road conditions, enabling satellite imaging systems to resolve tiny objects, and making internal organs stand out in CAT scans.

The wide variety – and economic significance – of signal-processing issues that have arisen in recent decades underscores the fact that ours is the Information Age. Our IEEE section has established a joint chapter of the Communications and Signal Processing societies in order to promote the technical understanding of such issues.

Communications & Signal Processing Joint Chapter Meeting

Hal Otteson, Ph.D.

Signal Processing

Monday, December 6, 7:00 pm
Mayo Medical Sciences Building
(321 3rd Avenue SW, Rochester)

☞ Pizza & socializing at 6:30 pm ☜

Hal Ottesen is president of Tutorial Technology, Inc., which specializes in tutorial teaching and consulting in digital signal processing, digital servo control and fuzzy logic. Dr. Otteson is currently engaged in consulting and teaching in the disk drive area, in servo control for medical applications, and in patent litigation and analysis. For the past 10 years he has been an adjunct professor at the Mayo Graduate School, where he was selected "Teacher of the Year" for 1999.

For 32 years Dr. Ottesen worked for IBM, in San Jose, Boulder, Boca Raton and Rochester. He retired from IBM in 1994 as a Senior Technical Staff Member. Most of his work at IBM involved advanced technology and disk-drive development, and he presented many internal IBM tutorial classes in disk drive technology to development personnel in Rochester, San Jose, Hursley (England) and Fujisawa (Japan).

He received an Outstanding Technical Achievement Award for developing the world's first all-digital embedded servo actuator control, for the IBM 9332, an 8-inch disk drive shipped in 1986. During this advanced work and later IBM consulting work Dr. Ottesen accumulated 57 issued US patents, with more than 30 US patent applications pending, as well as 34 inventions published internally. He became a member of IBM Academy of Technology in 1991. In 1997 he received his 20th-level Invention Achievement Award from IBM.

Dr. Ottesen received his B.Sc. (with honors), M.Sc., and Ph.D., all in Electrical Engineering, from the University of Colorado in 1961, 1962 and 1968, respectively.



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