



The UJ Centre for Telecommunications



The UJ Centre for Telecommunications and The Information Theory Society Chapter of the SA IEEE Section cordially invites you to a colloquium with presentations by a pioneer of the compact disc, Prof. Kees A. Schouhamer Immink (Turing Machines Inc, Rotterdam, The Netherlands).

Date:	6 June 2014 (Friday)
Time:	13:00 – 16:00
Venue:	School of Tourism and Hospitality, The Kerzner Building, University of Johannesburg, Bunting Road Campus (see map on last page)
RSVP Date:	3 June 2014
Contact:	Wendy Smith 011 559 4743 or wendys@uj.ac.za or tgswart@uj.ac.za

Programme:

Time	Activity	
13:00 – 14:00	Lunch	
14:00 – 14:45	Kees A. Schouhamer Immink	Invited Lecture 1
14:45 – 15:15	Short break	
15:15 – 16:00	Kees A. Schouhamer Immink	Invited Lecture 2

Biography: Kees A. Schouhamer Immink

Dr Kees Schouhamer Immink, president and founder of Turing Machines Inc a Dutch-based research and consulting firm that monitors global trends in science and technology. He is, since 1995, an adjunct professor at the Institute for Experimental Mathematics, University of Essen, Essen, Germany, and affiliated with the NanYang Technological University, Singapore, as a Visiting Professor.

For more than three decades, Kees Schouhamer Immink has played a central role in research of digital recording products. Many aspects of recording systems have gained from his creativity, including, notably, coding technology, electronics, servo design and performance, playing behavior, system control and protection. He has been instrumental in the design and development of a wide variety of digital consumer-type video, audio, and data recorders such as LaserVision videodisc, Compact Disc (CD), CD-ROM, Compact Disc Video (CD-V), R-DAT, Video CD, Digital Compact Cassette (DCC), Digital Video Recorder (DV), DVD, Super Audio CD (SACD), DVD-Audio, and BluRay Disc. His research resulted in four books, more than 100 articles, and over 1000 foreign patents.

Immink has served in officer and board positions for a number of technical societies, government and academic organizations - including the Audio Engineering Society, IEEE, Society of Motion Picture and Television Engineers, and several universities. He is a Fellow of the IEEE, IEE, AES, SMPTE, an Academician of the Royal Netherlands Academy of Sciences (KNAW), a foreign associate of the US National Academy of Engineering (NAE), and an honorary member of the Netherlands Electronics and Radio Society (NERG).

Immink received several tributes that summarize the impact of his contributions to the digital audio and video revolution. Among the accolades received are the Edison Medal for a career of creative contributions to the technologies of digital video, audio, and data recording, and an individual Technology Emmy award by the National Academy of Television Arts and Sciences (NATAS). Beatrix, Queen of the Netherlands bestowed him a knighthood in 2000.

Title: The Story of Optical Recording Discs
Abstract:

The introduction of the Compact Disc (CD) marked the beginning of the shift from analog to digital sound and video technology, the 'digital revolution'. From its origins as a music format, CD has grown to encompass data storage applications, giving birth to the CD-ROM and the CD-R, ideal media for the low-cost dissemination and archiving of massive amounts of data. The low price, the robust disc, and the simple intuitive control of this user-friendly product made it open to all levels of society. In the late 20th century, optical media such as the CD, DVD, and Blu-Ray accounted for a strong economic and technological impulse to the music and movie industry. Publishing using optical media has become very widespread because of its ease of use and low cost of producing large quantities of original copies.

In the mid 70s, the first attempts were made to store digital data on the analog video laserdisc. The engineers were facing a challenging task never undertaken before, namely the merging of two technologies: the contactless read-out by a laser and the digital coding/decoding and digital processing. Due to everyday handling damage, such as dust, fingerprints, and tiny scratches on the disc, read errors are introduced. Also the servo's following the tracks are prone to malfunctioning, and may skip tracks or get stuck. Without well-designed digital coding technology, optical discs would be extremely error prone and sensitive to track loss, and would remain a laboratory toy.

The speaker will discuss the engineering challenges and the solutions that made three generations of optical media a great technological and commercial success.

Title: How to deal with channels with unknown gain and offset?
Abstract:

In practical storage and communication systems it is usually found that noise is an important issue but that also other important physical factors may hamper the reliability of transmission or storage systems. Specifically, unknown gain and offset may deteriorate the quality of the transmission. *Fading* and *multi-path* distortion in wireless channels are well known. In optical disc recording, the signal strength (gain) and signal offset depend on the reflective index of the disc surface and the dimensions of the written features. Fingerprints on the disc may result in rapid gain and offset variations of the retrieved signal. Reading errors in solid-state (Flash) memories may originate from low memory endurance, by which a drift of charge levels in aging memory cells may cause programming and read errors.

The effect of channel mismatch is usually solved in the prior art by a) the application of automatic offset and gain control or by b) using *training* patterns that are multiplexed with the user data in order to 'teach' the data detection circuitry the momentary values of the channel's characteristics such as impulse response, gain, and offset. Then the receiver may measure the amplitude of the retrieved reference symbols, and subsequently normalize the amplitudes of the

symbols of the retrieved codeword before applying threshold or maximum likelihood detection. In case of rapidly varying gain or offset, however, the prior art methods will fail, and detector performance will degrade.

The author will discuss various high-rate coding methods whose detection performance is completely independent of gain and offset, or in other words the proposed coding and detection system have the virtue of *intrinsically resistance* to offset and gain mismatch. Implementation issues will be discussed.

Map to UJ School of Tourism and Hospitality

