

Palestras da ComSoc/POSTIT

(Distinguished Lecturer Tour)

Segunda-feira, 14 de Junho de 2010, 14h30
Anfiteatro Ea1, Torre Norte, IST, Lisboa

The Role of Communications Signal Processing in Storage Systems

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ABSTRACT

Magnetic recording is still today by far the dominant storage technology and therefore a good example to illustrate the increasingly important role of communications signal processing in storage systems. The superparamagnetic limit has already spelled out an end to the current generation of perpendicular magnetic recording on granular media, which will not be able to deliver recording densities much beyond 1 Tb/in². The next generation of magnetic recording systems will rely on new technologies, which are yet to be fully developed, that will avoid running into the superparamagnetic limit until the areal density reaches 10 Tb/in². These include bit-patterned, energy-assisted, and two-dimensional magnetic recordings. A fundamental understanding of the communications channel and the development of advanced signal processing and coding algorithms will play a major role in determining which of these three technologies will be able to deliver areal densities of 4 Tb/in² and beyond. This presentation will provide an introduction to magnetic recording systems spanning three technology generations, with an emphasis on perpendicularly magnetized media, and a preview of the state-of-the-art in signal processing and coding algorithms currently under development for future use in the next generation of hard disk drives. These algorithms include one- and two-dimensional equalizers, multi-dimensional maximum a posteriori detectors and novel low-density parity-check decoders. Although similar to algorithms used in data transmission channels, they are often more advanced in terms of performance and complexity in order to cope with a far more challenging channel.

BIO

J. R. Cruz received the B.S. degree from the University of Porto, Portugal, and the M.S. and Ph.D. degrees from the University of Houston, in 1974, 1977 and 1980, respectively, all in electrical engineering. In 1980 he joined Computer Sciences Corporation at the NASA Johnson Space Center in Houston, as an engineer and task leader performing navigation analysis for the first two Space Shuttle missions. He became a member of the research staff of Motorola in 1981, where he worked on signal processing for wireless communications. In 1982 he accepted a faculty position at the University of Oklahoma, and currently holds the Tilley Chair in Electrical Engineering, and is the Director of the Communications Signal Processing Laboratory. He is an IEEE Fellow, and a Fellow of the Radio Club of America. He is also an Editor of the IEEE Transactions on Magnetics, a former Editor-in-Chief of the IEEE Transactions on Vehicular Technology, and a member of the Board of Editors for the International Journal on Wireless Personal Communications and the ACM/Baltzer Journal on Wireless Networks. He received the 1995 Outstanding Service Award from the IEEE Vehicular Technology Society, the IEEE Third Millennium Medal, and the IEEE Stuart Meyer Memorial Award. He is a past President of the IEEE Vehicular Technology Society and an elected member of its Board of Directors. His current research interests include applications of signal processing and coding to wireless communications and data storage. He has published over 150 papers on the above and related areas and holds several patents in the area of coding and detection for digital recording systems. He was a co-recipient of the Best Paper Award at the 2007 IEEE International Conference on Communications.