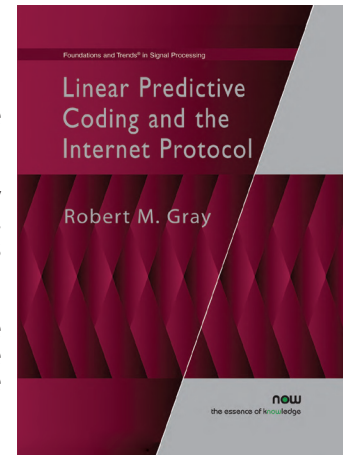


Just Published

Linear Predictive Coding and the Internet Protocol



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In December 1974 the first realtime conversation on the ARPAnet took place between Culler-Harrison Incorporated in Goleta, California, and MIT Lincoln Laboratory in Lexington, Massachusetts. This was the first successful application of realtime digital speech communication over a packet network and an early milestone in the explosion of realtime signal processing of speech, audio, images, and video that we all take for granted today. It could be considered as the first voice over Internet Protocol (VoIP), except that the Internet Protocol (IP) had not yet been established. In fact, the interest in realtime signal processing had an indirect, but major, impact on the development of IP. This is the story of the development of linear predictive coded (LPC) speech and how it came to be used in the first successful packet speech experiments. Several related stories are recounted as well.

The history is preceded by a tutorial on linear prediction methods which incorporates a variety of views to provide context for the stories. This part is a technical survey of the fundamental ideas of linear prediction that are important for speech processing, but the development departs from traditional treatments and takes advantage of several shortcuts, simplifications, and unifications that come with years of hindsight. In particular, some of the key results are proved using short and simple techniques that are not as well known as they should be, and it also addresses some of the common assumptions made when modeling random signals. The reader interested only in the history and already familiar with or uninterested in the technical details of linear prediction and speech may skip Part I entirely.

Contents:

Preface; Part I: Linear Prediction and Speech: 1. Prediction 2: Optimal Prediction 3: Linear Prediction 4: Autoregressive Modeling 5: Maximum Likelihood 6: Maximum Entropy 7: Minimum Distance and Spectral Flattening 8: Linear Predictive Coding. Part II: History: LPC and IP Introduction: 9: 1966: On-Line Signal Processing and Statistical Speech Coding 10: 1967: Maximum Entropy and APC 11: 1968: SCRL, the Burg Algorithm, IMPs, and CHI 12: 1969: SCRL, PARCOR, LPC, and ARPAnet 13: 1970-1971: Early LPC Hardware and SUR 14: 1972: Early Efforts towards Packet Speech 15: 1973: USC/ISI and NSC 16: 1974: TCP, NVP, and Success 17: 1975: PRnet, TSP, Markelisms, quantization, and residual/voice-excited LP 18: 1976: Packet Speech Conferencing, Speak & Spell 19: 1977: STI, STU, Packet Speech Patent, IP Separation, and MELP 20: 1978: IP, PRnet, and Speak & Spell 21: 1979: Satellite Networks 22: 1981: NVP II and Residual Codebook Excitation 23: 1982: Voice through the Internet 24: Epilogue. Acknowledgements. References. Index

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