

AN OVERVIEW OF SIGNAL PROCESSING IN ASTRONOMY

S. R. Kulkarni

Astronomy Department
California Institute of Technology
Pasadena, CA 91125

ABSTRACT

Signal processing is extensively used in astronomy for spectroscopy and synthetic imaging. Signals from celestial sources are stochastic in nature and weak compared to local sources of noise. Thus the emphasis is on improving the signal-to-noise-ratio. This necessitates the use of large bandwidths and real time processing of the signal. Considerable practical gain is obtained by using 1- or 2-bit sampling.

Traditionally spectrometers are based on correlators. However recently FFT engines have become popular. Pulsar signals are chirped by propagation through the dispersive interstellar medium. A variety of innovative processing ideas including time domain filtering have been used in this field. Two major trends may change the landscape altogether. (1) High bandwidth taperecording of the signal, followed by the use of supercomputers to analyze the data. (2) Fully digital interferometers with the ability to form multiple beams as well as adaptive beams to deal with man made interference.

