Abstract

There has been remarkable progress in sampled-data control theory in the last decade and a half. The main accomplishment here is that there exists a digital (discrete-time) control law that takes the intersample behavior into account and makes the overall analog (continuous-time) performance optimal, in the sense of H-infinity norm. The same hybrid nature of designing a digital filter for analog signals is also prevalent in digital signal processing. A crucial observation is that the perfect band-limiting hypothesis, widely accepted in the signal processing literature, is often inadequate for many practical situations. In practice, the original analog signals (sounds, images, etc.) are neither fully band-limited nor even close to be band-limited in the current processing standards. This is the problem of interpolating high-frequency components, which in turn is that of recovering the intersample behavior. Sampled-data control theory provides an optimal platform for such problems. This talk provides a new problem formulation, design procedure, and various applications in sound processing/compression and image processing.