
ADAPTIVE SIGNAL PROCESSING

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Three examples will now be presented which are representative of applications of adaptive modeling techniques to practical problems. The first application is to communications, the second application to a problem in geophysics, and the third is to the design of digital filters.

ADAPTIVE MODELING OF A MULTIPATH COMMUNICATION CHANNEL

The reader is probably familiar with the “multipath” type of communication problem illustrated in Figure 9.5. It is a problem in which the transmitted information takes more than one path to the receiver, thus producing interference and echoes in the received signal. To see and appreciate how adaptive modeling is used to identify the paths (i.e., the impulse response in Figure 9.5), we will first describe briefly a “spread-spectrum” technique [1, 13] for sending binary signals reliably in a high-noise, multipath environment.

In spread-spectrum communications each information bit, either a ONE or a ZERO, is transmitted as a string of coded bits. The ONE bit may be represented by a particular string which, for example, may be 32 bits long. The ZERO bit would be represented by a different 32-bit string. For detection, the receiver tries to correlate the strings, which are decoded as ONES or ZEROS, depending on correlation maxima. The ONE and ZERO codes are “pseudorandom” and are designed as well as possible to be mutually orthogonal and individually to have autocorrelations that

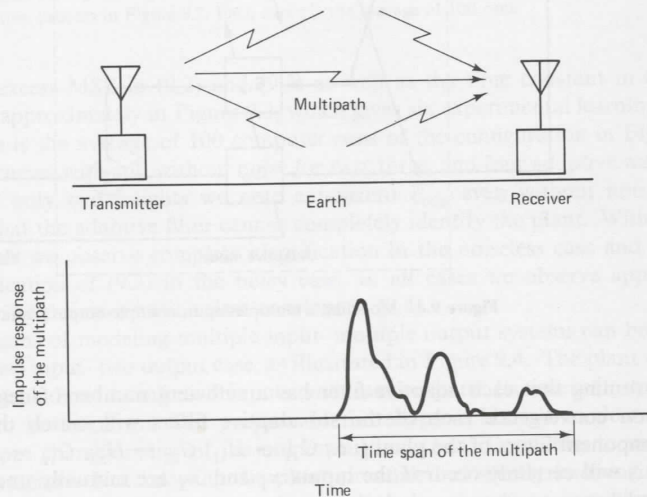


Figure 9.5 Typical dispersive channel and its impulse response.