

A First Course in Digital Communications

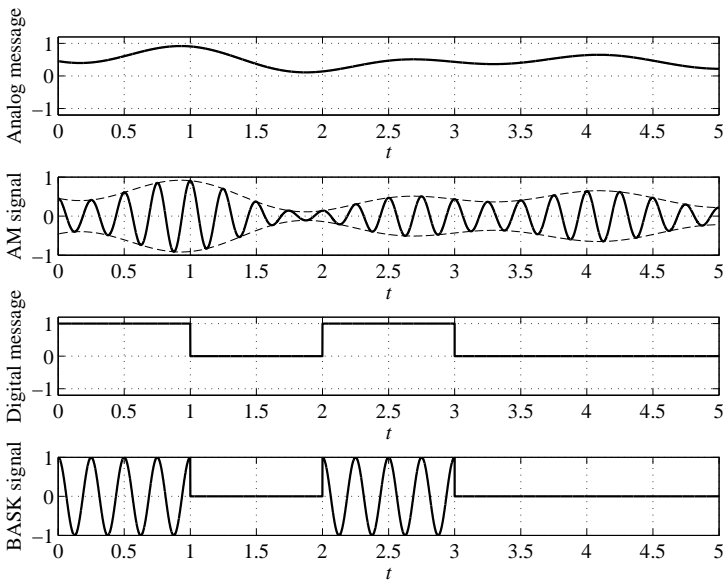
Ha H. Nguyen and E. Shwedyk



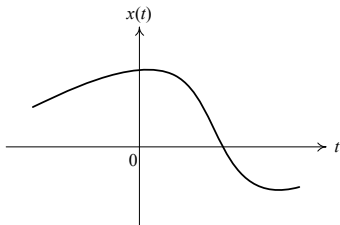
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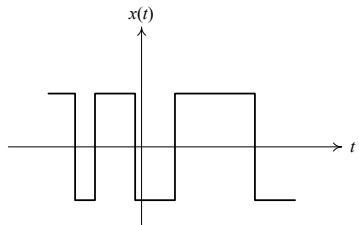
Analog and Digital Amplitude Modulations



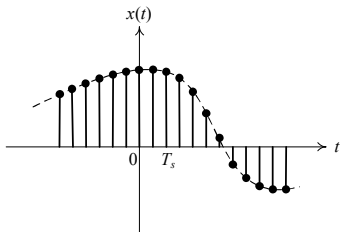
What is Digital Communication?



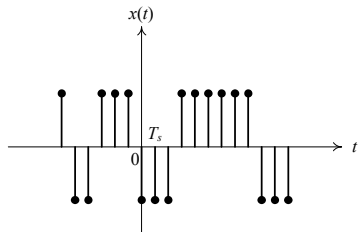
(a)



(b)

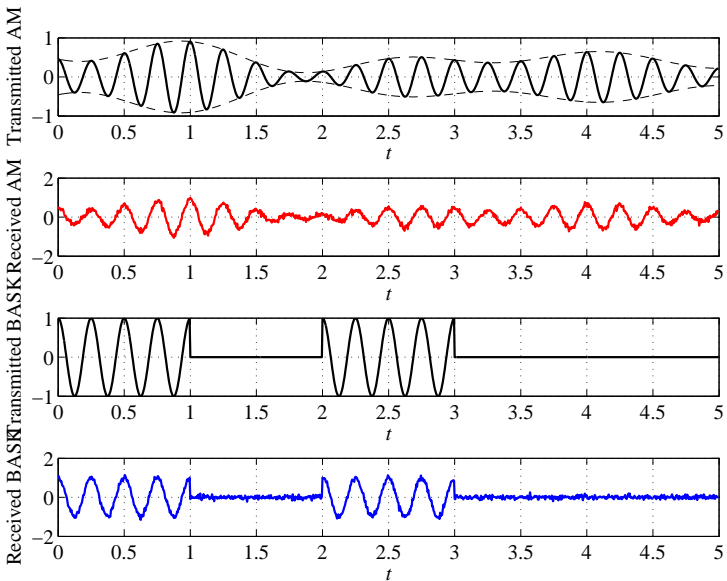


(c)

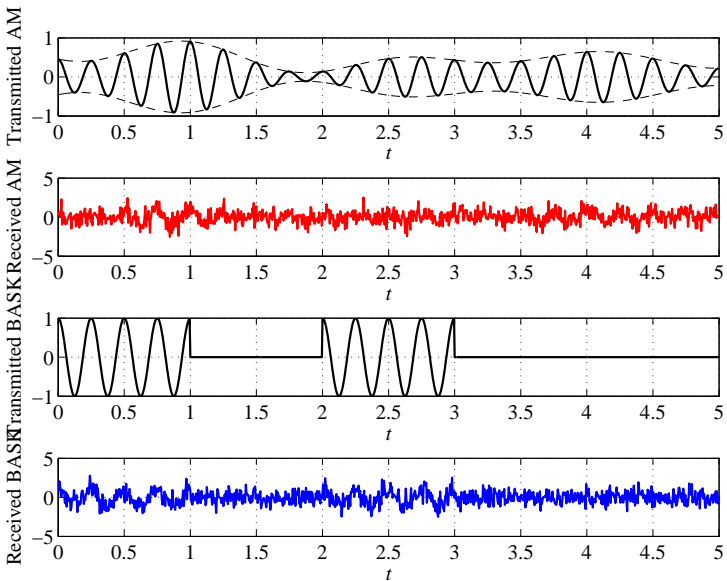


(d)

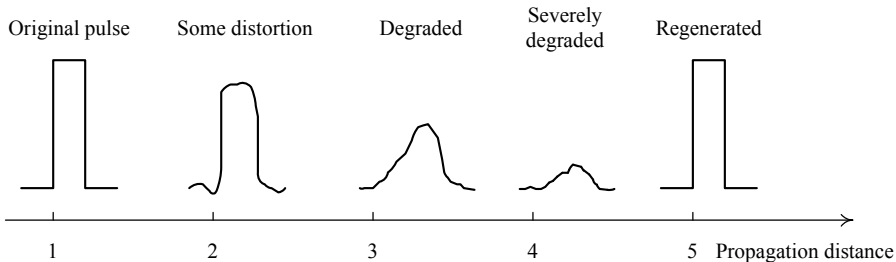
Why Digital Communications?



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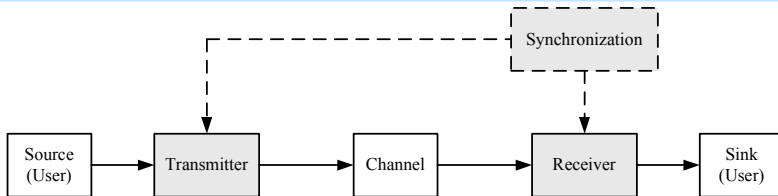


Regenerative Repeater in Digital Communications

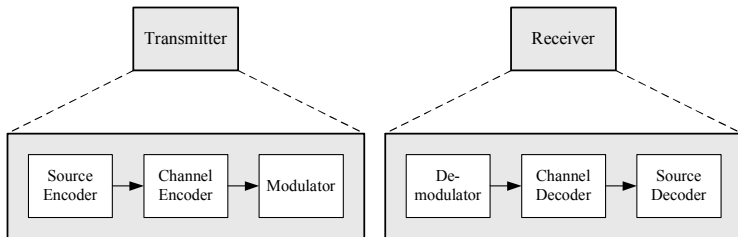


- Digital communications: Transmitted signals belong to a finite set of waveforms → The distorted signal can be recovered to its ideal shape, hence removing all the noise.
- Analog communications: Transmitted signals are analog waveforms, which can take infinite variety of shapes → Once the analog signal is distorted, the distortion cannot be removed.

Block Diagram of a Communication System



(a)



(b)

Note: "Synchronization" block is only present in a digital system.

Digital vs. Analog

Advantages:

- Digital signals are much easier to be regenerated.
- Digital circuits are less subject to distortion and interference.
- Digital circuits are more reliable and can be produced at a lower cost than analog circuits.
- It is more flexible to implement digital hardware than analog hardware.
- Digital signals are beneficial from digital signal processing (DSP) techniques.

Disadvantages:

- Heavy signal processing.
- Synchronization is crucial.
- Larger transmission bandwidth.
- Non-graceful degradation.