

Pulse Code Modulation Example

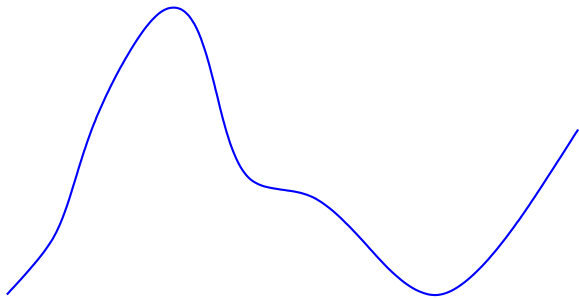
ITS323: Introduction to Data Communications

Sirindhorn International Institute of Technology
Thammasat University

Prepared by Steven Gordon on 8 June 2011
ITS323Y11S1H07, Steve/Courses/ITS323/Lectures/sampling.tex, r1805

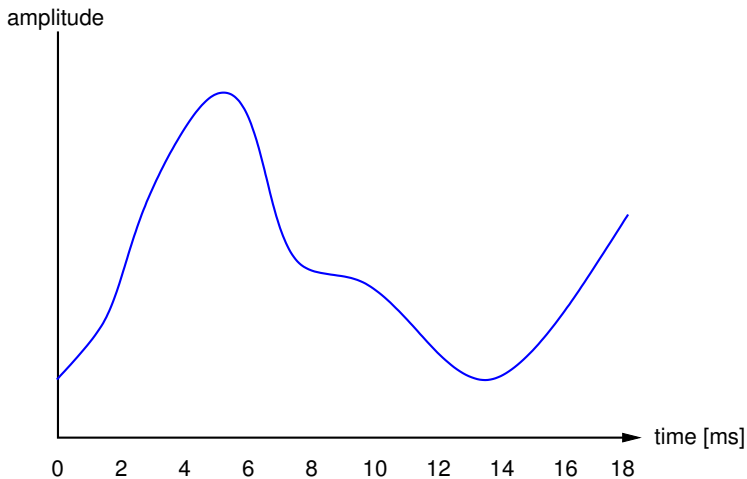
Input Analog Data

PCM Example



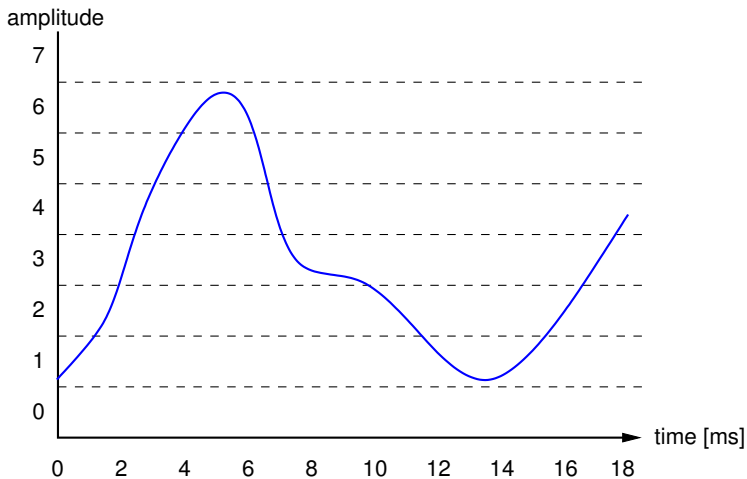
Input Analog Data

PCM Example



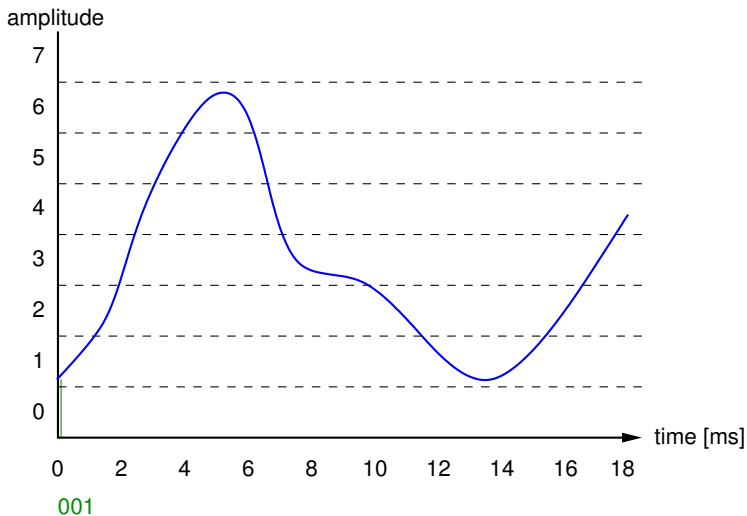
Case 1: 4ms Sampling Interval; 8 Levels

PCM Example



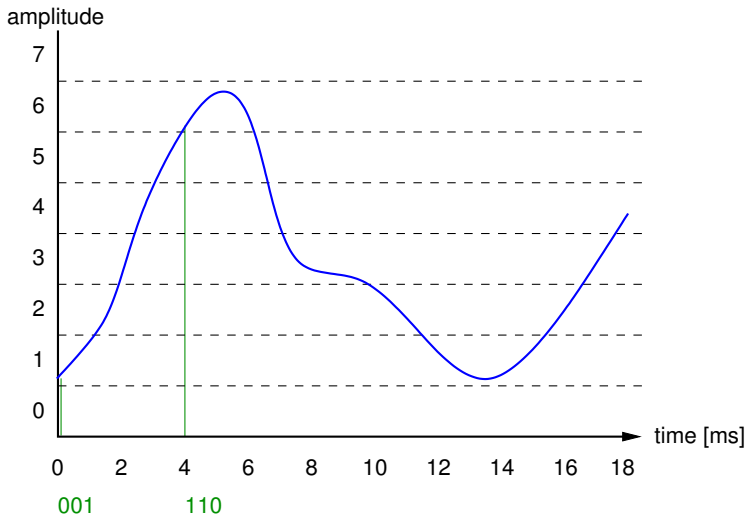
Case 1: 4ms Sampling Interval; 8 Levels

PCM Example



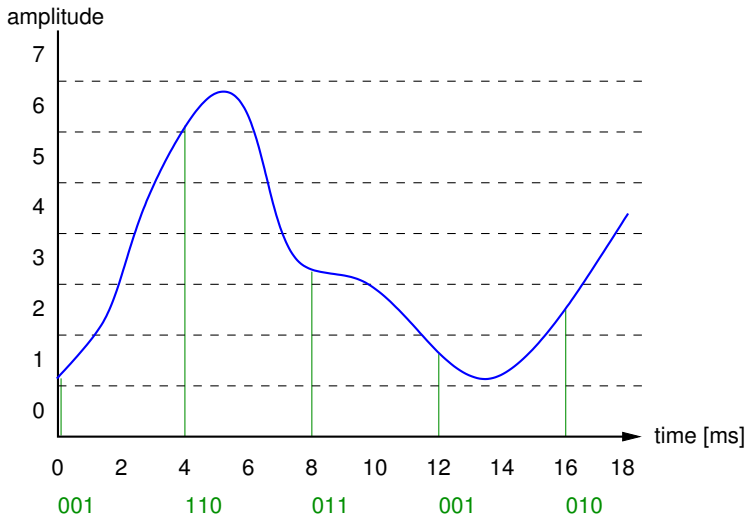
Case 1: 4ms Sampling Interval; 8 Levels

PCM Example

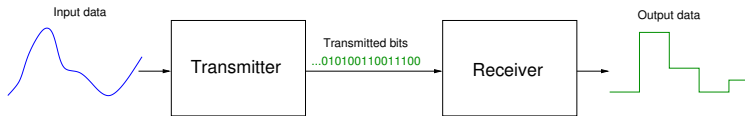


Case 1: 4ms Sampling Interval; 8 Levels

PCM Example



Case 1: Transmitting the Data

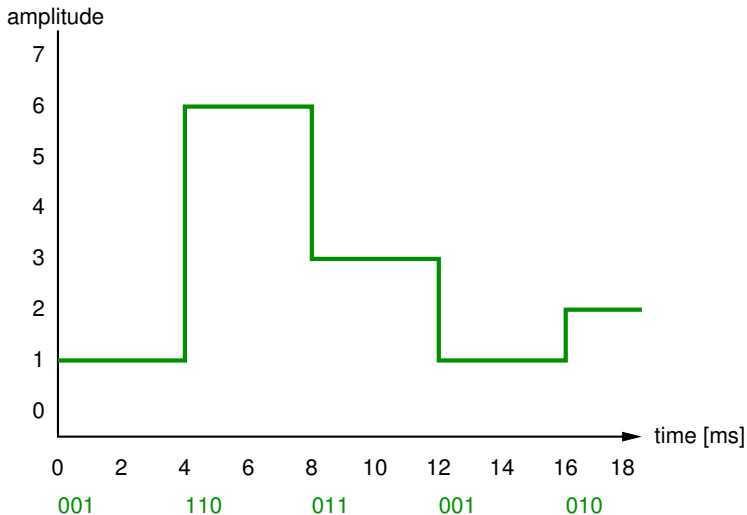


What Data Rate Is Required?

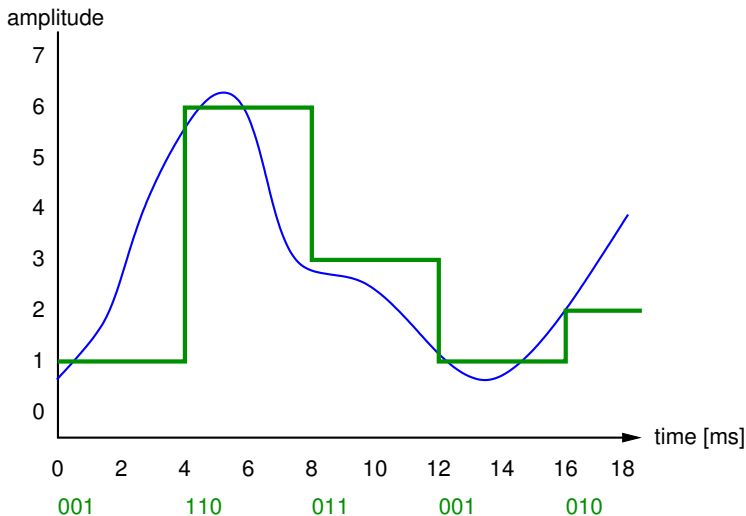
- ▶ 1 sample every 4ms
- ▶ 3 bits per sample
- ▶ 3 bits per 4ms = 750 bps

Case 1: Reproduced Data at Destination

PCM Example

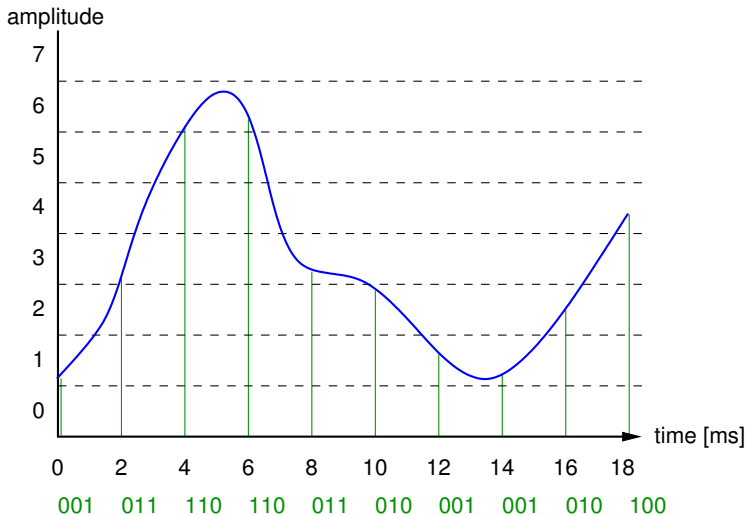


Case 1: Comparing Source and Destination Data



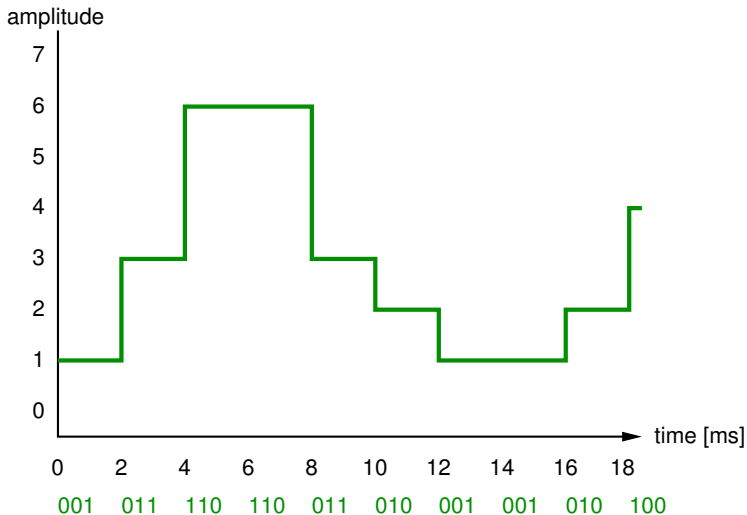
Case 2: 2ms Sampling Interval; 8 Levels

PCM Example

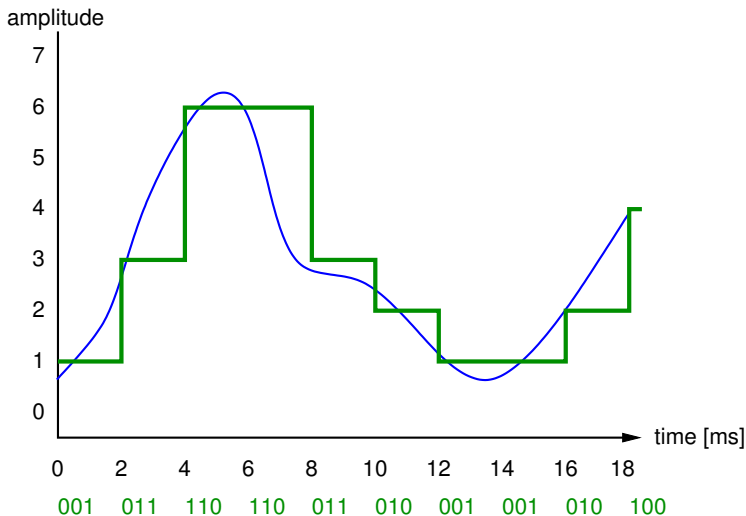


Case 2: Reproduced Data at Destination

PCM Example

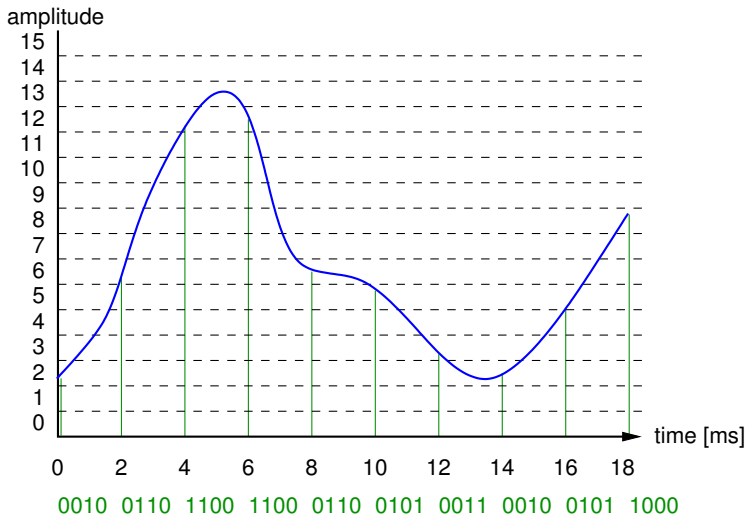


Case 2: Comparing Source and Destination Data



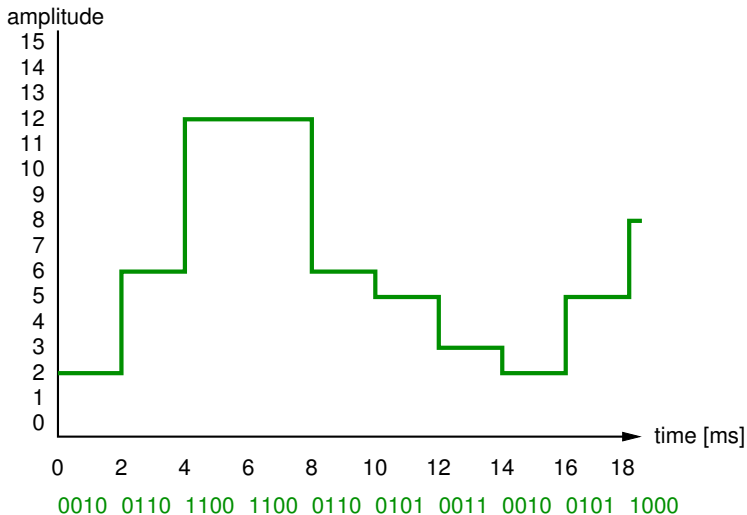
Case 3: 2ms Sampling Interval; 16 Levels

PCM Example



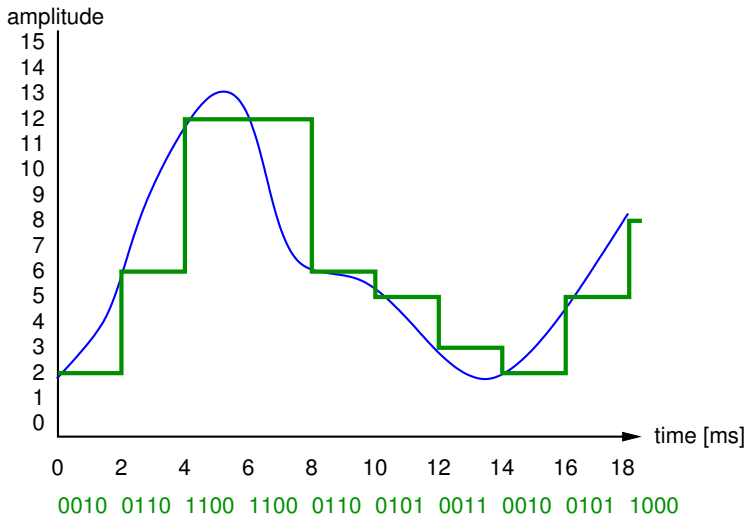
Case 3: Reproduced Data at Destination

PCM Example



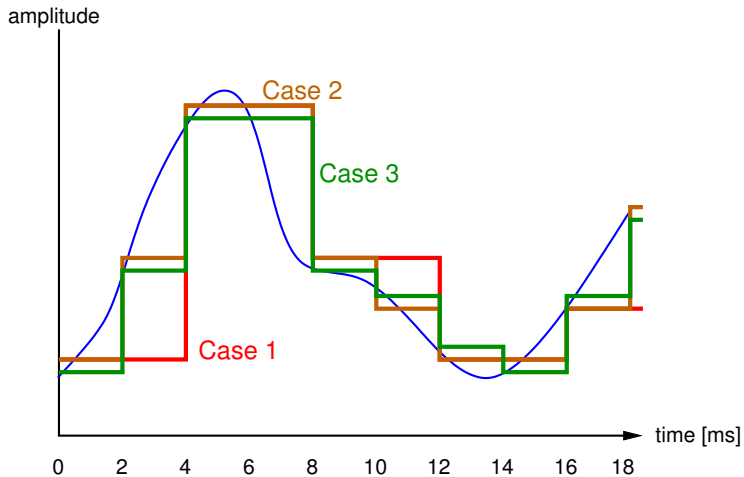
Case 3: Comparing Source and Destination Data

PCM Example



Comparing All Cases

PCM Example



Tradeoffs

Accuracy of Reproduced Data at Receiver

- ▶ Increasing sampling and/or levels; increased accuracy
- ▶ Case 3 (and 2) are more accurate representation of original data than Case 1

Transmission Data Rate Requirements

- ▶ Increasing sampling and/or levels; increased data rate required to transmit bits
- ▶ Case 1: 750 b/s required
- ▶ Case 2: 1500 b/s required
- ▶ Case 3: 2000 b/s required