

# Pulse Code Modulation Example

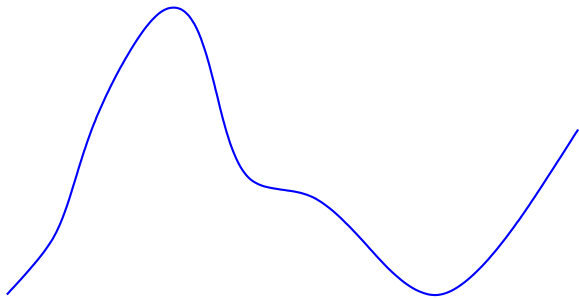
ITS323: Introduction to Data Communications

Sirindhorn International Institute of Technology  
Thammasat University

Prepared by Steven Gordon on 23 May 2012  
ITS323Y12S1H07, Steve/Courses/2012/s1/its323/lectures/sampling.tex, r2336

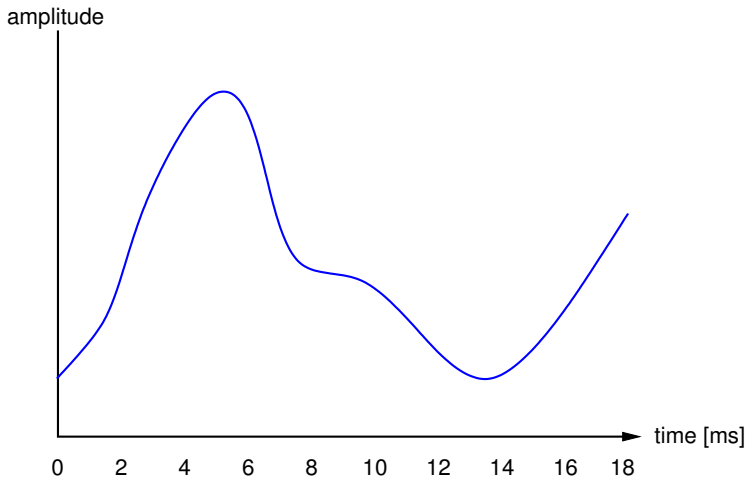
# Input Analog Data

PCM Example



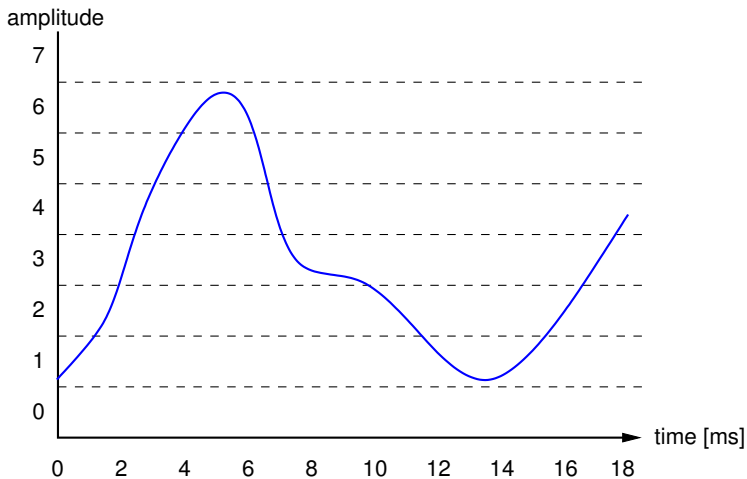
# Input Analog Data

PCM Example



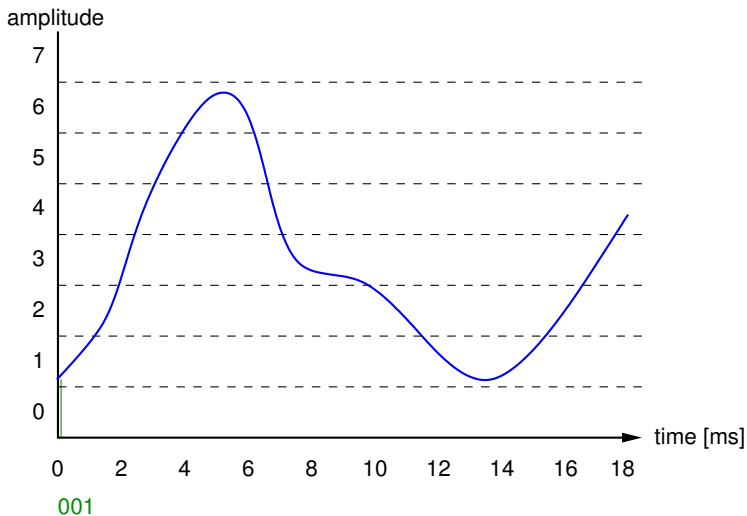
## Case 1: 4ms Sampling Interval; 8 Levels

PCM Example



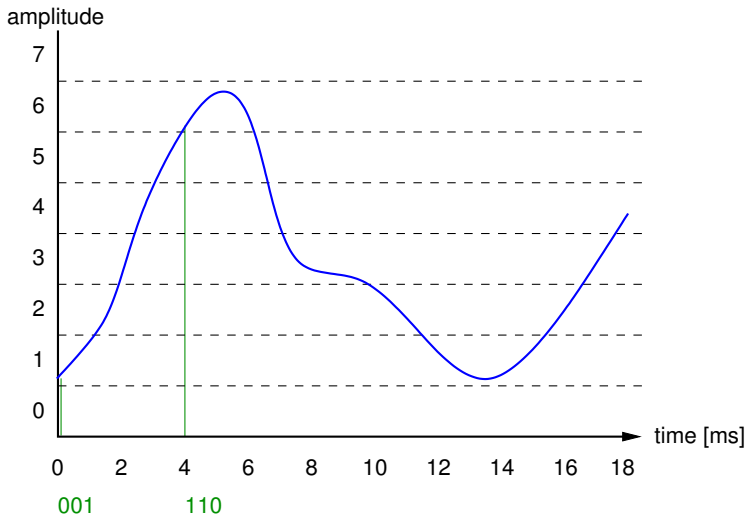
## Case 1: 4ms Sampling Interval; 8 Levels

PCM Example



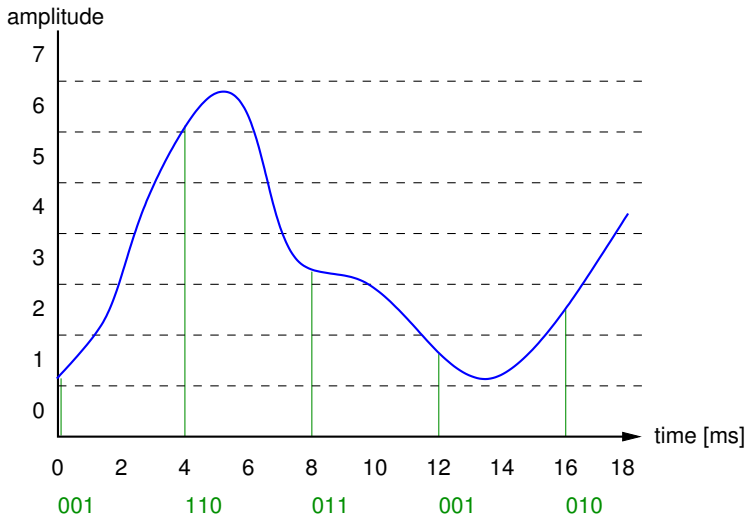
## Case 1: 4ms Sampling Interval; 8 Levels

PCM Example

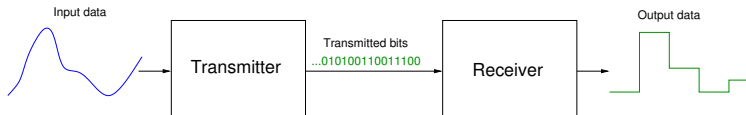


## Case 1: 4ms Sampling Interval; 8 Levels

PCM Example



# Case 1: Transmitting the Data



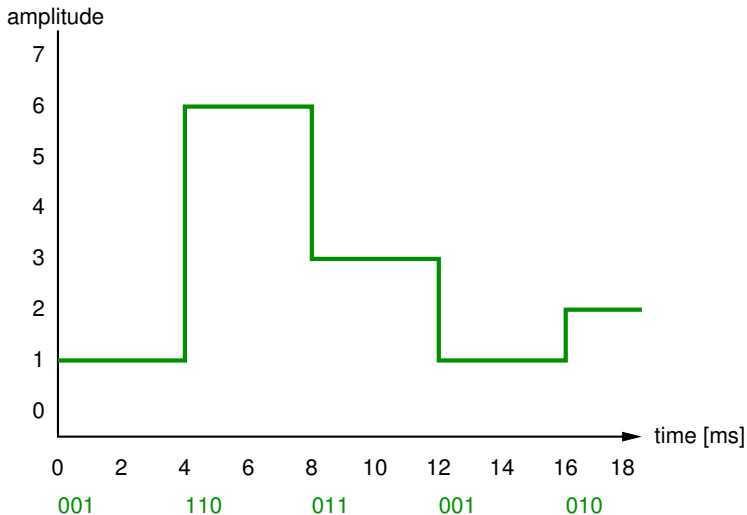
## What Data Rate Is Required?

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

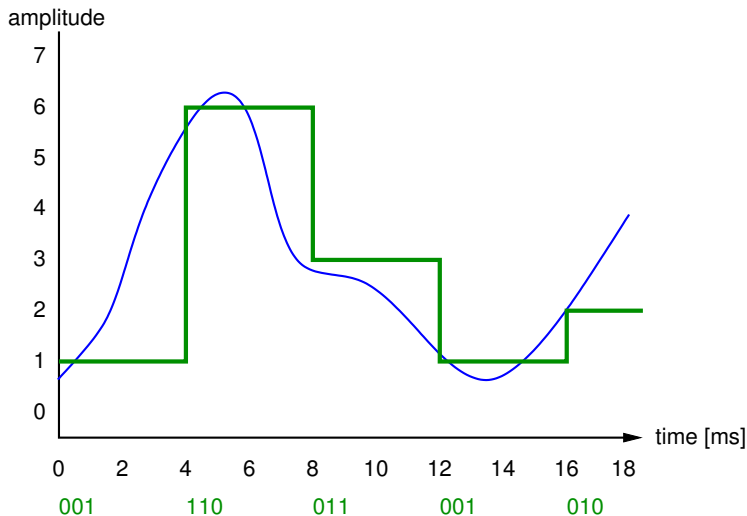


## Case 1: Reproduced Data at Destination

PCM Example

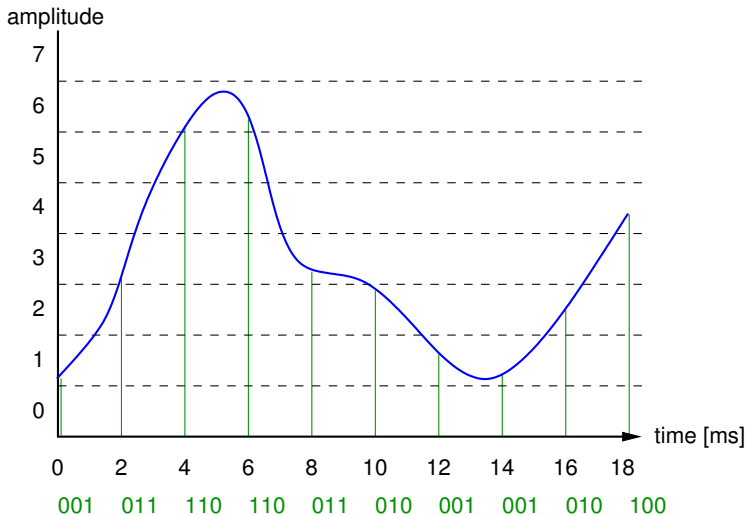


## Case 1: Comparing Source and Destination Data



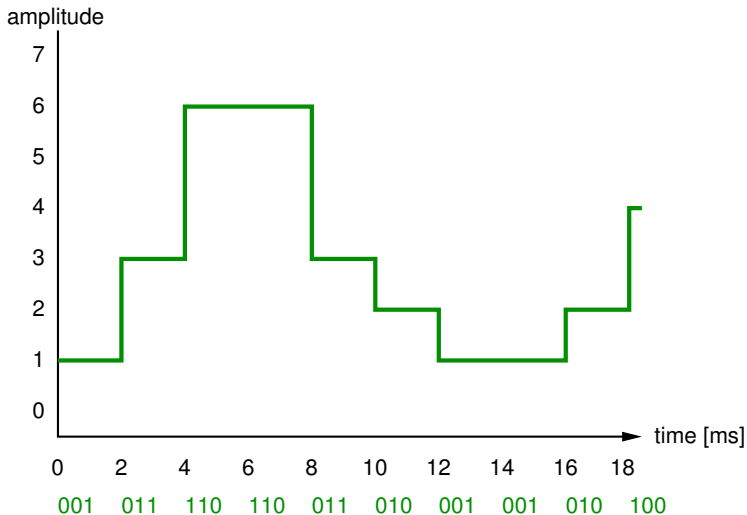
## Case 2: 2ms Sampling Interval; 8 Levels

PCM Example

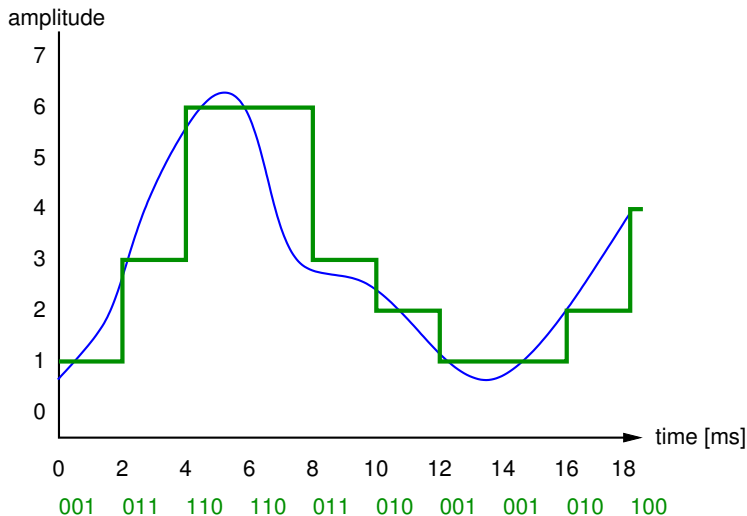


## Case 2: Reproduced Data at Destination

PCM Example

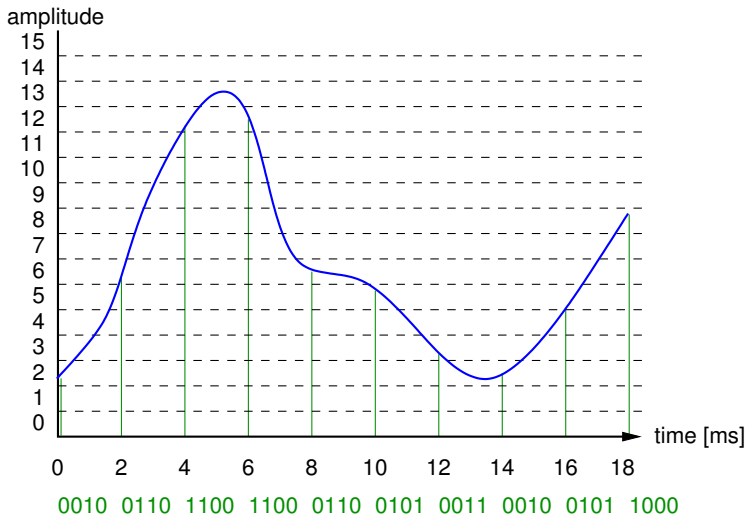


## Case 2: Comparing Source and Destination Data



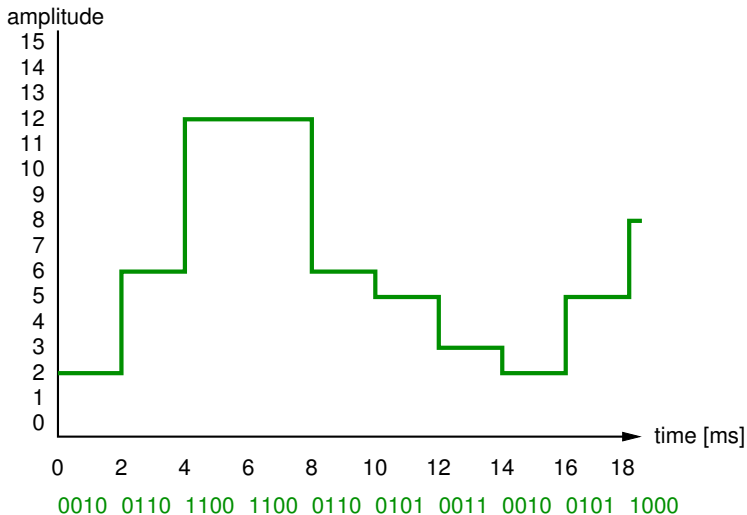
## Case 3: 2ms Sampling Interval; 16 Levels

PCM Example



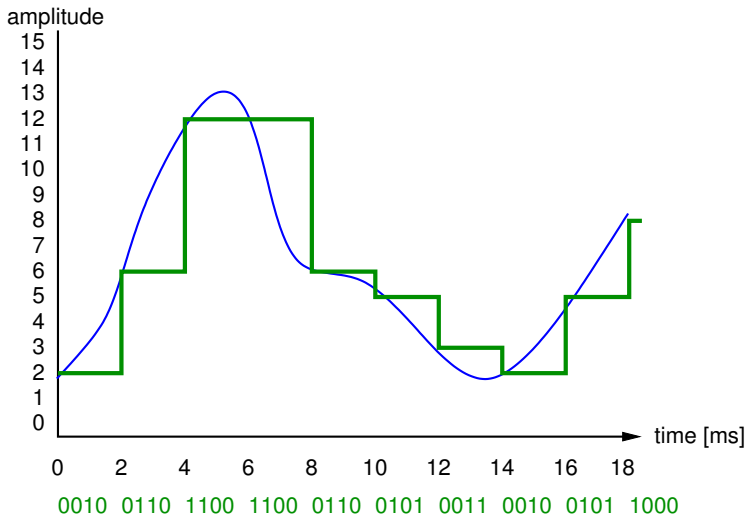
## Case 3: Reproduced Data at Destination

PCM Example



## Case 3: Comparing Source and Destination Data

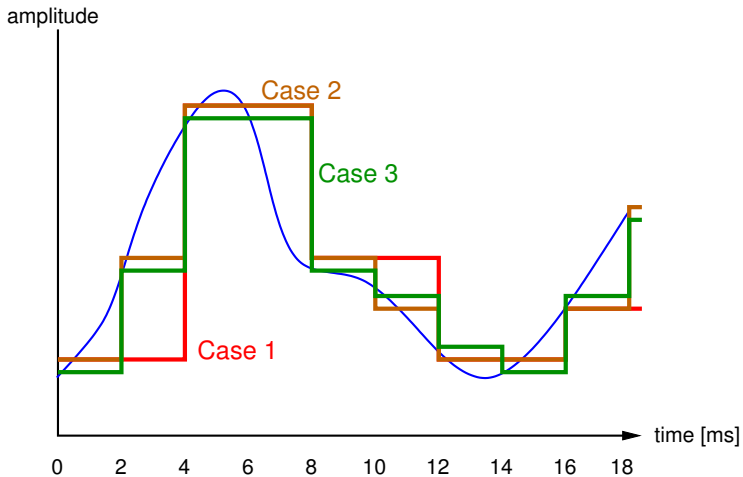
PCM Example





## 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