EEE 360 Communications Systems I

Lecture Presentation 14

Aykut HOCANIN

Dept. of Electrical and Electronic Engineering
Eastern Mediterranean University

☞ Pulse Time Modulation: PWM and PPM: *Section 3.11*

Pulse Time Modulation (PTM) is a class of signaling techniques that encodes the sample values of an analog signal onto the time axis of a digital signal. There are two main types of PTM:

- ➢ Pulse Width Modulation (PWM)
  PWM is also called Pulse Duration Modulation (PDM). Sample values of the analog waveform are used to determine the width of the pulse signal. Either instantaneous or natural sampling may be used.
- ➢ Pulse Position Modulation (PPM)
  In PPM, the analog sample values determine the position of a narrow pulse relative to the clocking time. PPM may be obtained from PWM by using a monostable multivibrator circuit.

The PWM or PPM signals are converted back to the corresponding analog signal by a receiving system.

- ➢ The PWM signal is used to start and stop the integration of an integrator; the integrator is reset to zero and integration is begun when the PWM

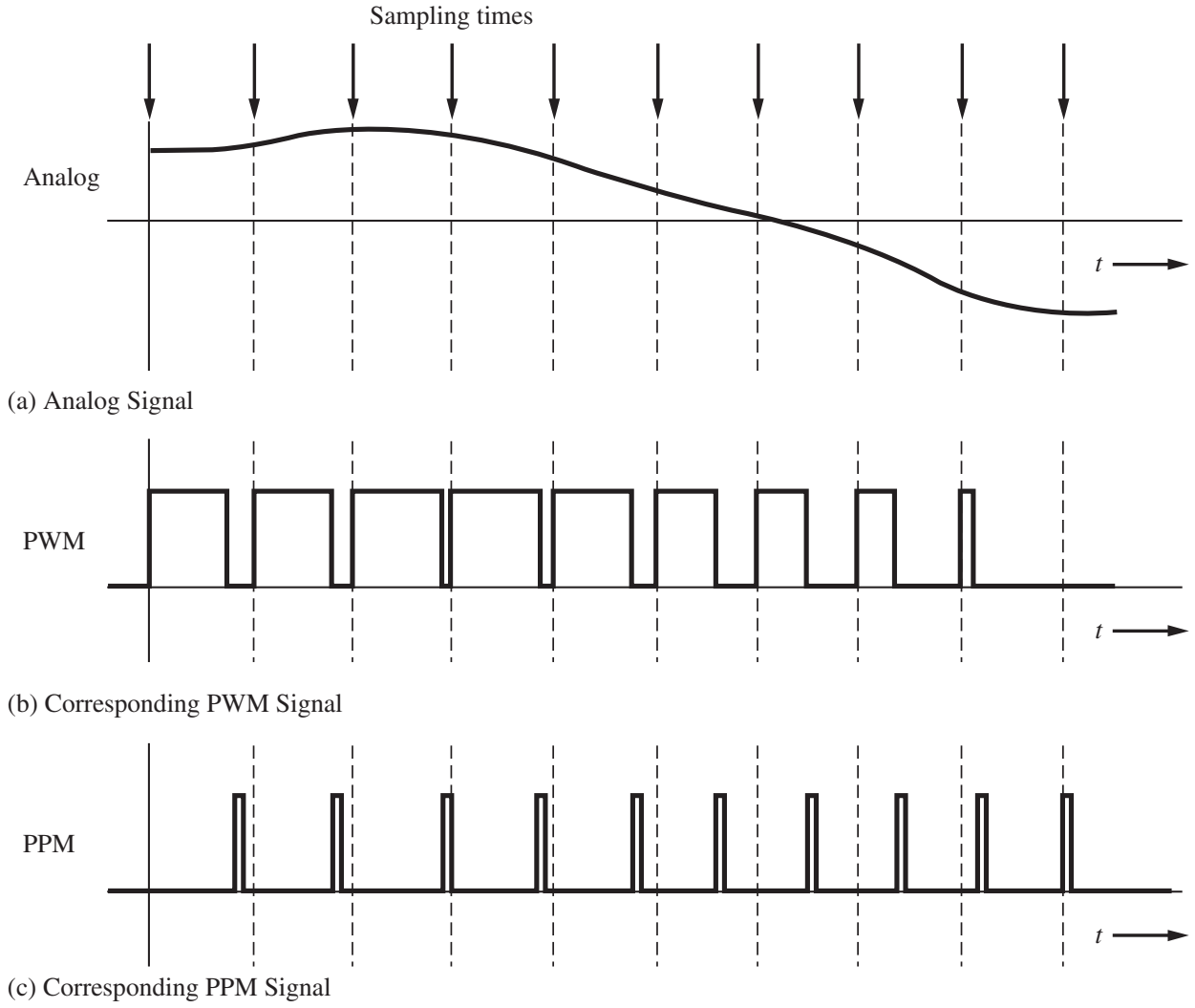

Figure 1: Pulse time modulation signaling, (Couch, 2001)

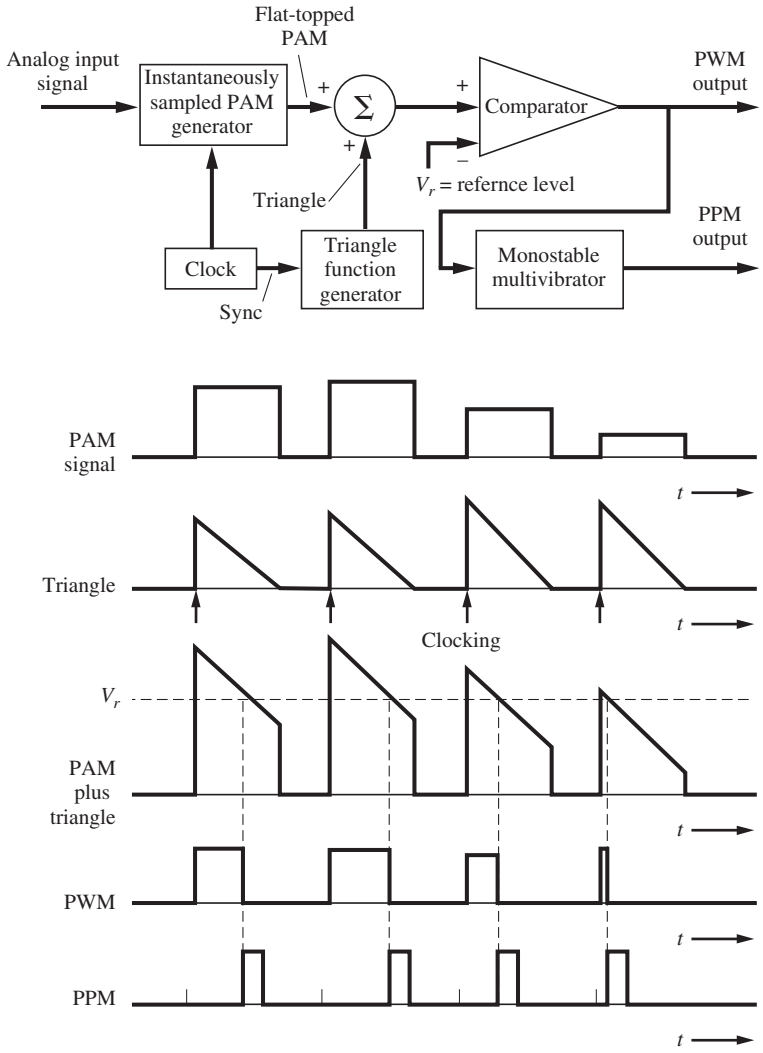

Figure 2: Generation of instantaneously sampled PTM signals, (Couch, 2001)

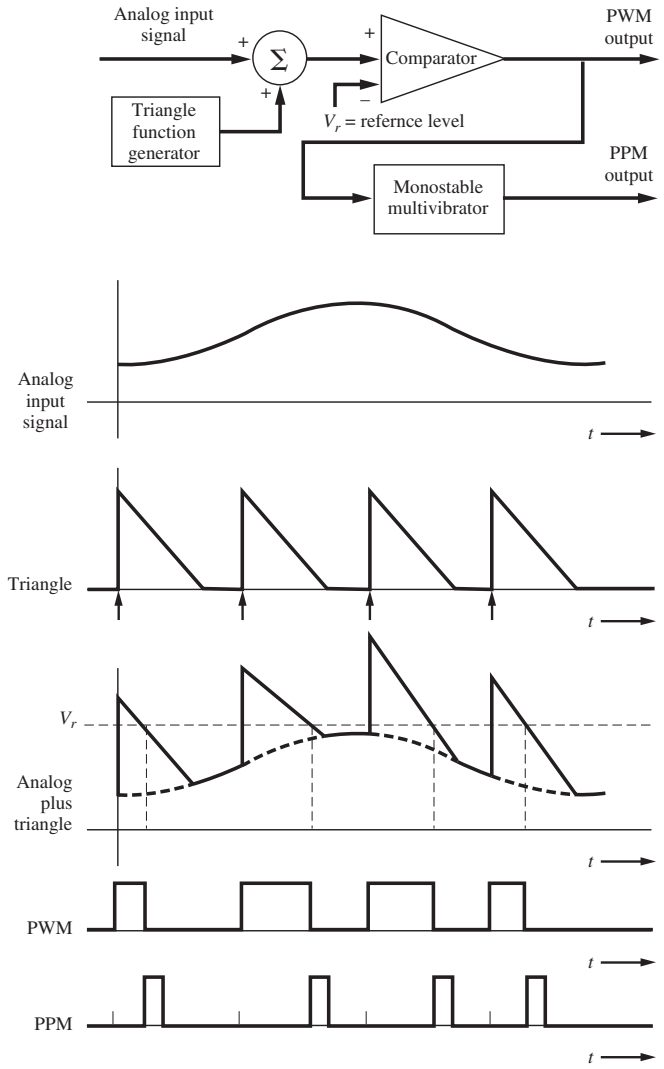

Figure 3: Generation of naturally sampled PTM signals, (Couch, 2001)

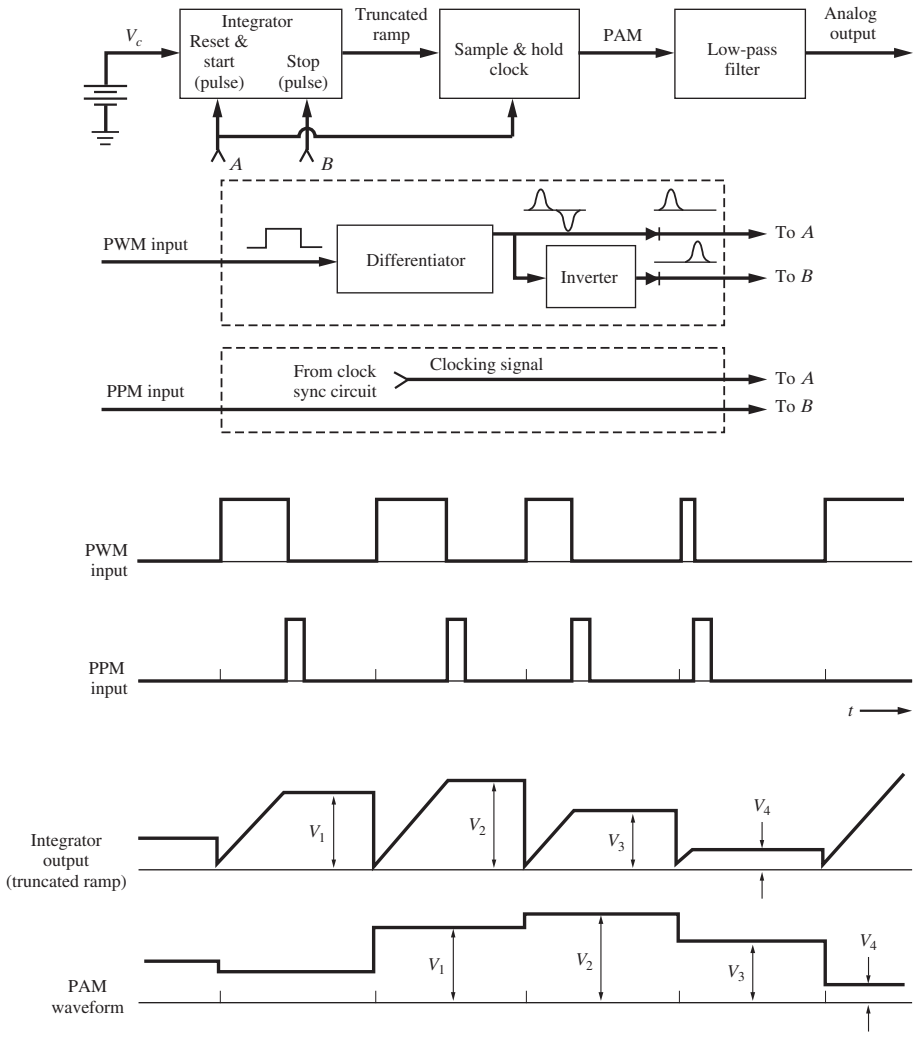

Figure 4: Detection of PWM and PPM signals, (Couch, 2001)

pulse goes from a low level to a high level and the integrator integrates until the PWM pulse goes low.

➢ The PPM signal is converted to PAM by using the clock pulse to reset the integrator to zero and start the integration. The PPM pulse is then used to stop the integration.

☞ Advantages and Disadvantages of PTM

PTM usually requires large bandwidth. The spectra of PTM signals are quite difficult to evaluate because of the nonlinear nature of the modulation.

The main advantage of PTM signals is that they have great immunity to additive noise compared to PAM. They are also easier to generate and detect than PCM which requires analog-to-digital conversion.