Physiological Signals

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Rhythms of Life

Graph (a):
- Y-axis: (WBC/mm^3) \times 10^4
- X-axis: TIME (days)
- The graph shows a periodic pattern.

Graph (b):
- Y-axis: x(t)
- X-axis: TIME (days)
- The graph shows a non-periodic pattern.


Mathematical Basis of Biological Rhythms

(a) $\alpha = 2.5$

(b) $\alpha = 3.25$

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(b) $\alpha = 3.25$
Transition into Chaos

Source: From Clocks to Chaos by L. Glaser, M.C. Mackey
Pulse Oximetry Block Diagram

- RED LED
- IR LED
- Photo Diode
- Current to Voltage Converter
  - Output Voltage
  - Output Voltage
Pulse Oximetry Amplifiers

Infrared Photodiode Transimpedance Amplification Circuit

Red Photodiode Transimpedance Amplification Circuit
Pulse Oximetry Signal
Frequency Spectrum of the Pulse Oximetry Signal

(a) and (b) show the frequency spectrum of the pulse oximetry signal. The plots indicate peaks at certain frequencies, with (a) showing more pronounced peaks than (b).
Oxygen Levels in the Blood

![Graph showing oxygen saturation levels over time with and without averaging.](image)
Estimating Speed of Blood Flow

Before running

After running

Cross Correlation (arb. units)

Time (sec)
ECG Experimental Setup

Electronic Isolation

Instrumentation Amplifier

Band Pass Filter

ECG Waveform

Data Acquisition

AgCl Electrodes
Eithoven Triangle
Typical ECG Waveform