Numerical Analysis
- Simulation -

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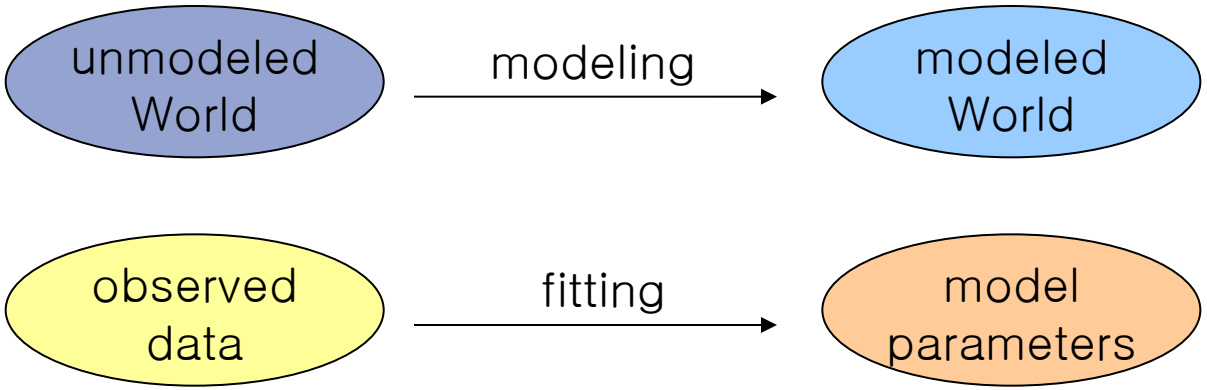
Modeling

- Modeling and fitting

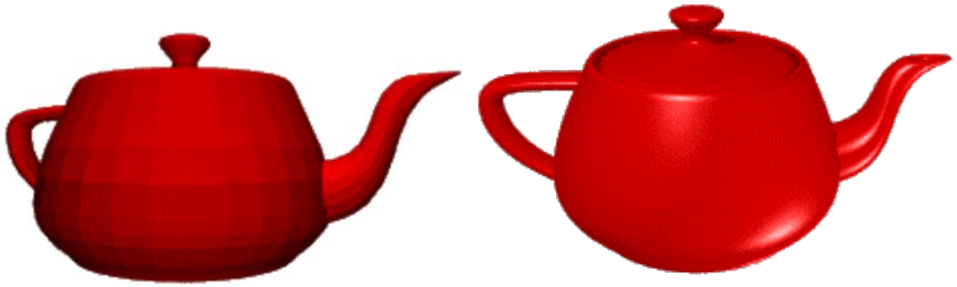


$$(\mathbf{x}_1, y_1)$$
$$\vdots$$
$$(\mathbf{x}_n, y_n)$$

$$y = f(\mathbf{a}, \mathbf{x}) + \mathrm{Noise}$$

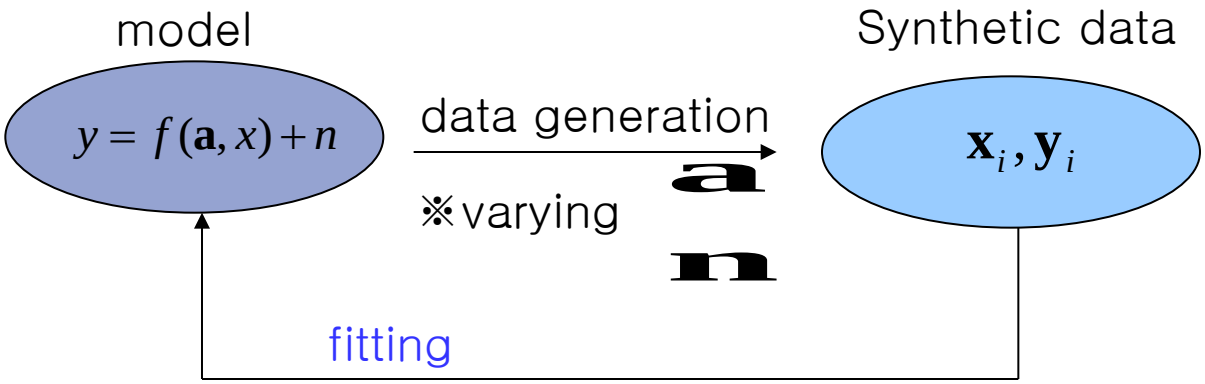
Modeling - complexity

Eg. Computer graphics



Simulation

Simulation



◦ Data generation

⟶ Random number generation

–Uniform distribution
–Gaussian distribution

} NR in C chap. 7

General procedure of random number generation

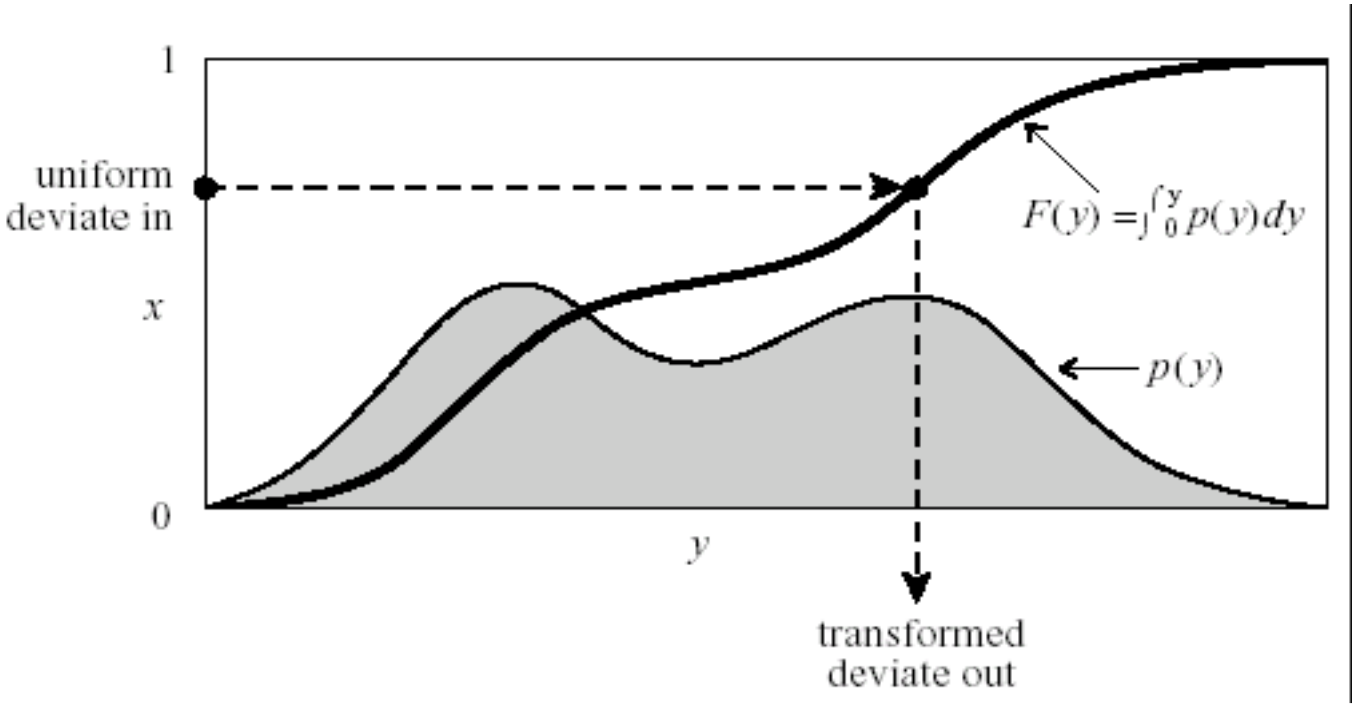
1. Determine the probability density function(pdf)
   - uniform, Gaussian, Poisson, Gamma,...

2. Generate a RN with uniform distribution
   eg. Call ran1() in NR in C.

3. Generate a RN with an arbitrary pdf using the RN of 2.
   - Transformation method, Rejection method...
   eg. Call gasdev() in NR in C for Gaussian distribution

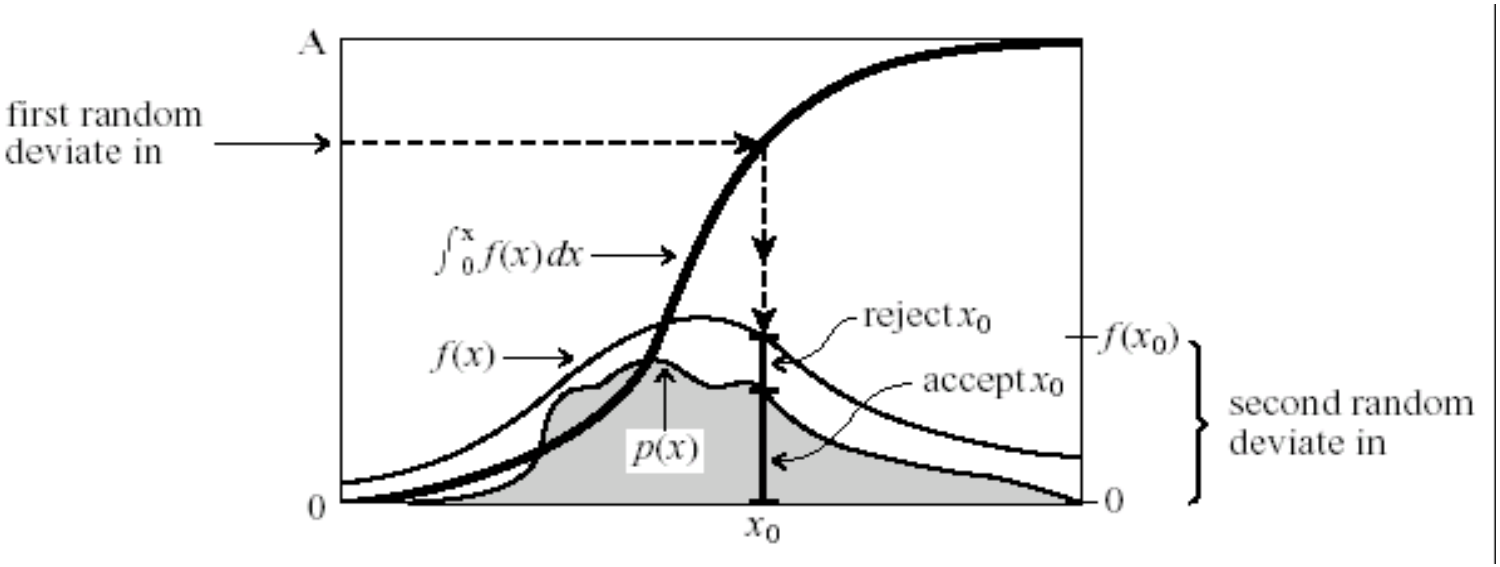
Generating an arbitrary pdf(I)

- Transformation method



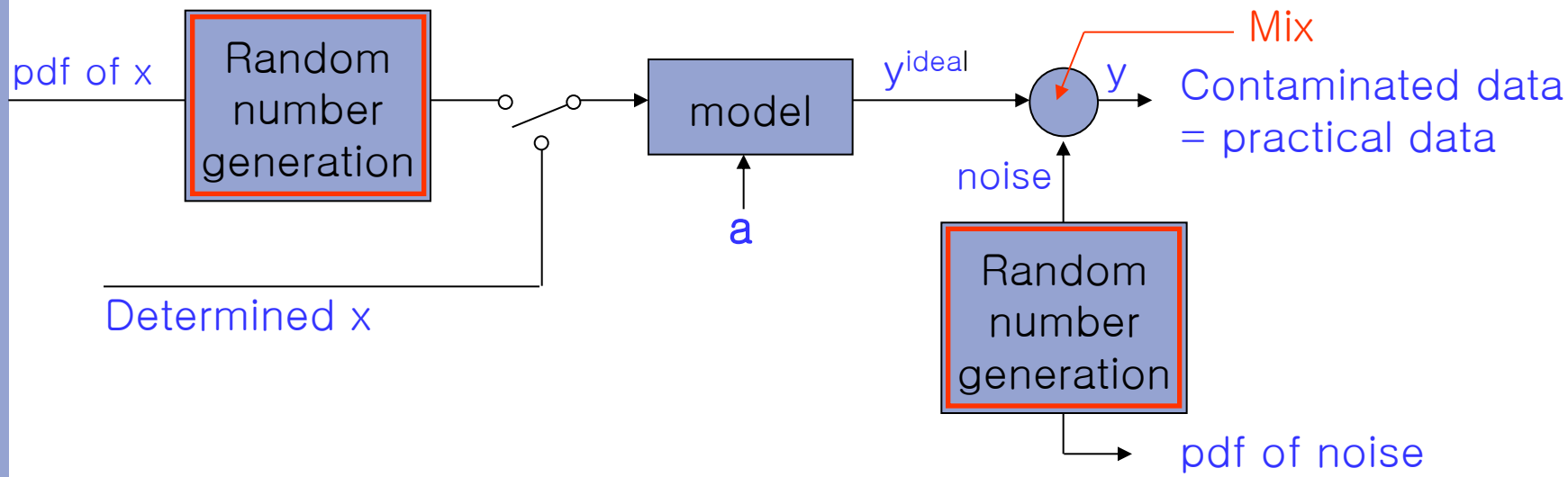
Generating an arbitrary pdf(II)

- Rejection method



Synthetic data generation

- Flow diagram of synthetic data generation



- pdf of x : uniform, Gaussian, … ; probability
- Determined x : $x_1, x_2, \ldots, x_N$ given
- y^{ideal} : no noise
- y : contaminated data
- pdf of noise : uniform, Gaussian, …
- Mixer : additive, multiplicative, …

Homework #4

[Due: Nov. 9]

- **Programming on Random Number Generation:**

  (1) Uniform distribution in [a,b],

  (2) Gaussian distribution with mean=m, standard deviation=s.

- Generate 1000 samples and draw a histogram(100 intervals for each distribution (a=-3, b=4, m=0.5, s=1.5).
- Repeat the same job with varying the number of samples. (eg. 100, 10000, 100000)
- Discuss the shape of the histograms in terms of the number of samples. Refer to Ch. 7, NR in C.