

Computer Science

Jerzy Świątek

Systems Modelling and Analysis

Choose yourself and new technologies

L.4. Model building task based on experiment - identification problem



HUMAN CAPITAL
HUMAN – BEST INVESTMENT!



Wrocław University of Technology

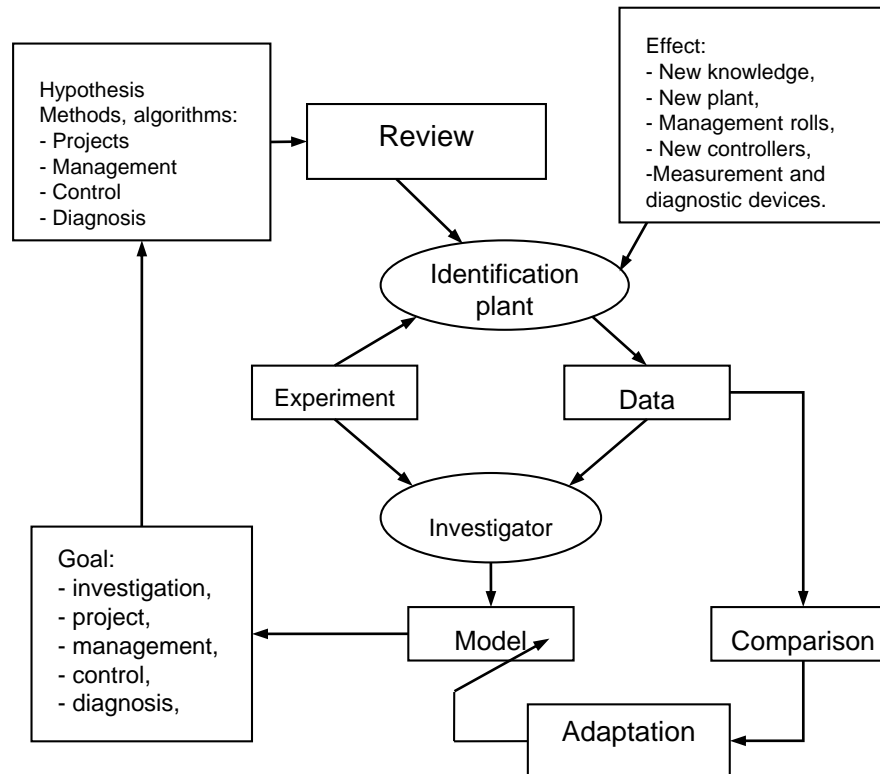
EUROPEAN
SOCIAL FUND



Project co-financed from the EU European Social Fund

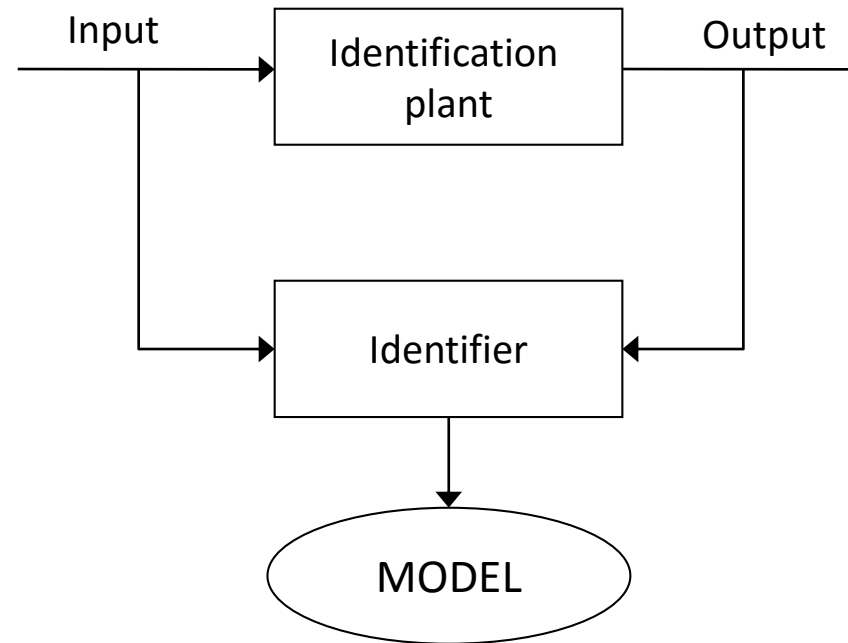


Model in the systems research





Identification task (1)



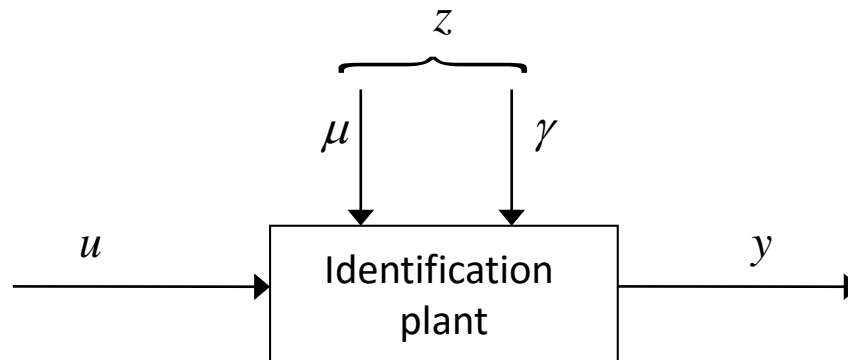


Identification task (2)

1. Determination of the identification plant
2. Determination of the class model
3. Experiment organization
4. Determination of the identification algorithms
5. Identifiers realization



Ad.1. Determination of the identification plant



u – input

y – output

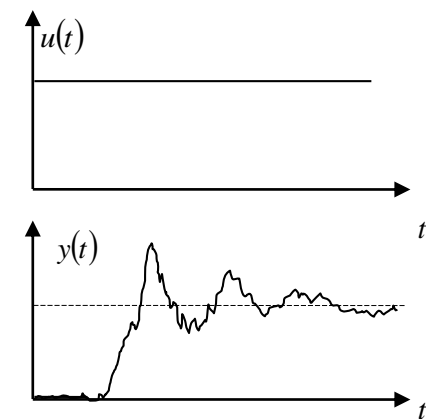
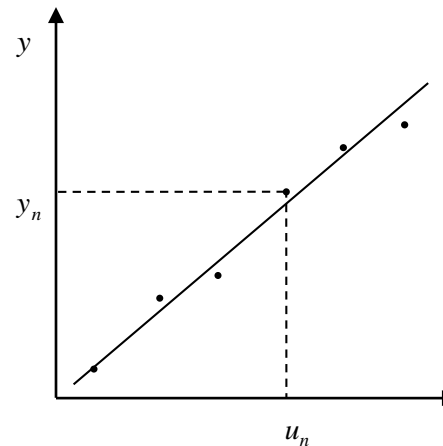
μ – measured disturbances

γ – unmeasured disturbances



Ad.2. Determination of the class of model (1)

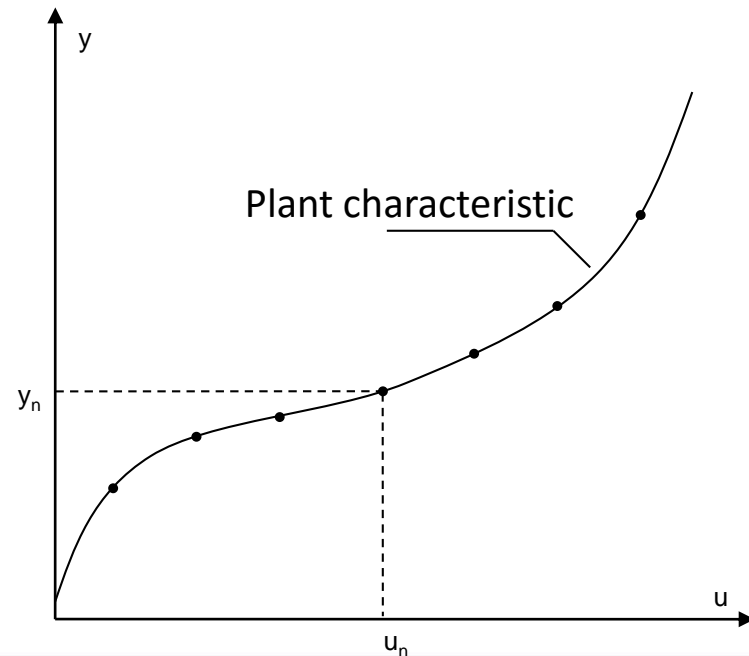
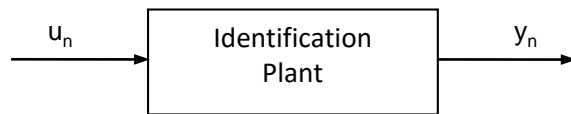
- Process analysis
- Data analysis
- Arbitrary model
- Expert model





Ad.2. Determination of the class of model (2)

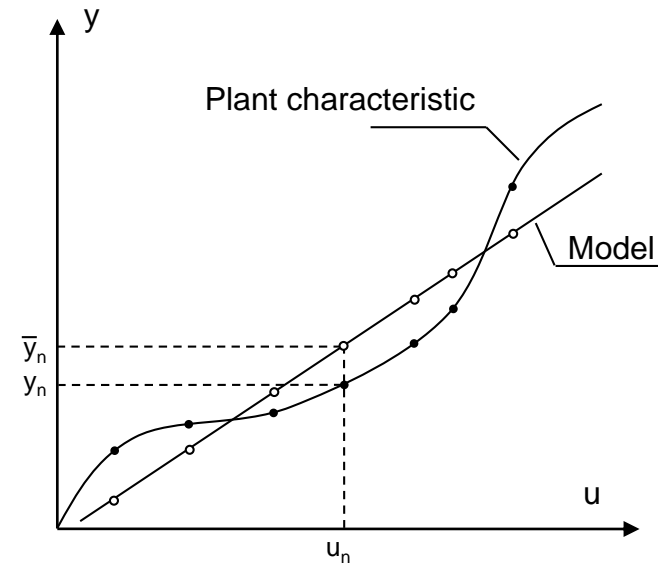
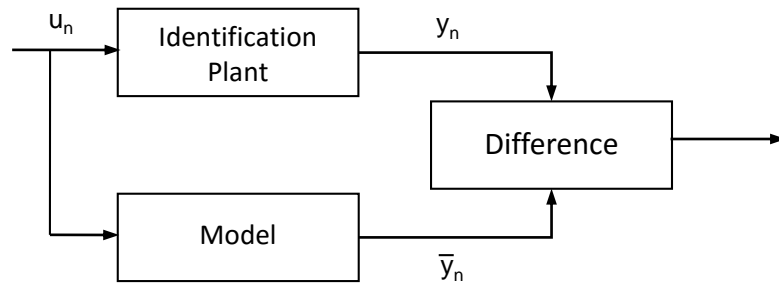
- Plant in the class of model





Ad.2. Determination of the class of model (3)

- Choice of the best model





Ad.3. Experiment organization

Static plant

$$U_N = [u_1 \quad u_2 \quad \cdots \quad u_N], \quad Y_N = [y_1 \quad y_2 \quad \cdots \quad y_N]$$

Dynamic plant

$$U_T = \{u(t)\}_{t=t_0}^T, \quad Y_T = \{y(t)\}_{t=t_0}^T,$$

Discrete type observations

$$t_1, t_2, \dots, t_N, t_n \in [t_0 \ T], n = 1, 2, \dots, N$$

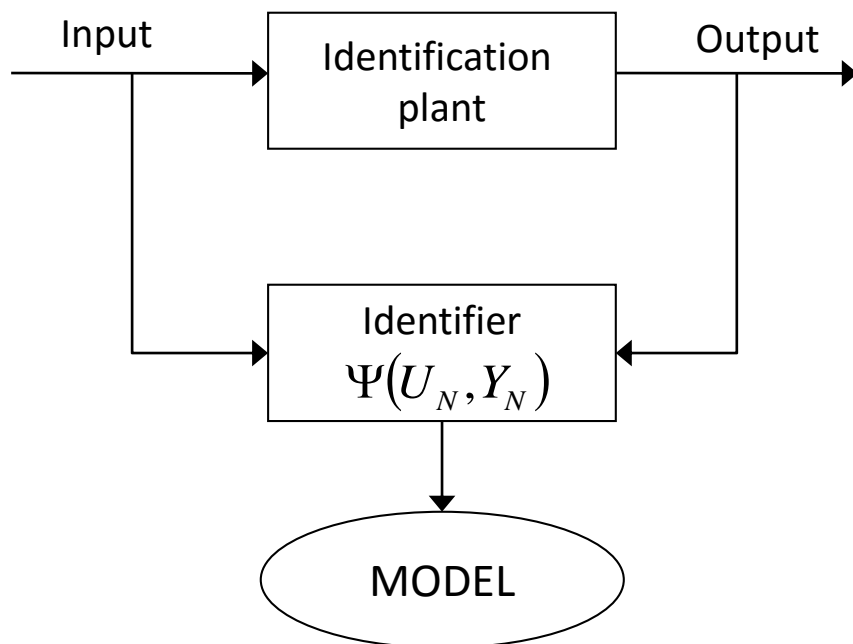
$$U_N = \{u(t_n)\}_{n=1}^N, \quad Y_N = \{y(t_n)\}_{n=1}^N.$$

Dynamic, discrete type plant

$$U_N = \{u_n\}_{n=1}^N, \quad Y_N = \{y_n\}_{n=1}^N.$$



Ad.4. Identification algorithm (1)



U_N – measurements of input signals

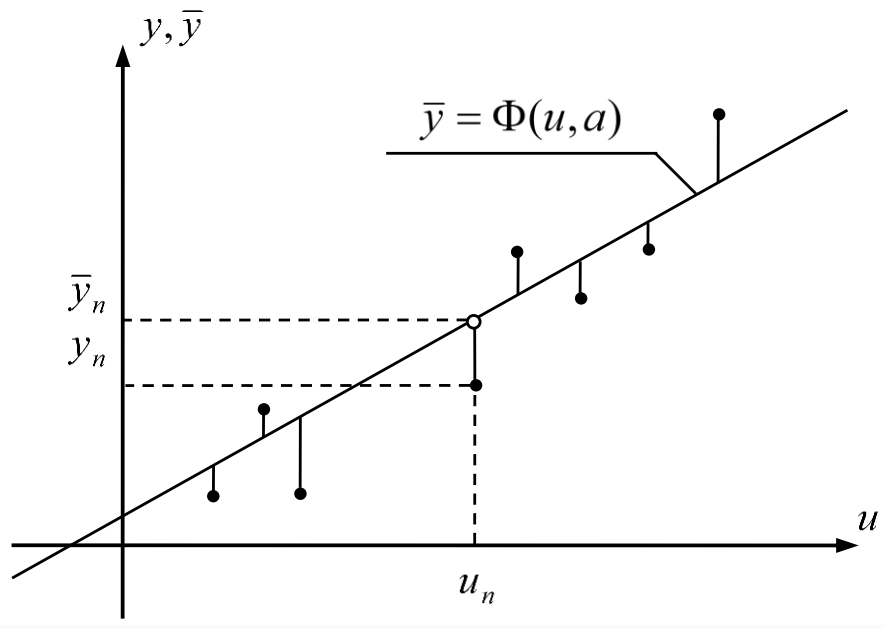
Y_N – measurements of output signals

Ψ – identification algorithm



Ad.4. Identification algorithm (2)

$$a_N^* = \Psi(U_N, Y_N)$$



$$Q_N \sum_{n=1}^N (y_n - au_n)^2$$

$$a_N^* = \frac{\sum_{n=1}^N y_n u_n}{\sum_{n=1}^N u_n^2}$$



Identifiers realization

- Identification algorithm
 - Computer program
 - Hardware realization



Thank you for attention

