

System identification is a branch of science which deals with building mathematical models (equations) of relations between various processes changing in time. The problem is interdisciplinary and spectacular applications of modelling can be met not only in automatic control but also in various other domains, e.g.:

- optics (modelling of the eye pupil size depending on the light intensity)
- hydrology (design of anti flood systems)
- physics (modelling of heat-exchange systems)
- chemistry (modelling of fermentation, distillation and pH neutralization processes)

Reaction of the system on the input excitation is usually delayed and extended over long period of time. Since each system is in fact nonlinear and dynamic, accurate model must involve very complicated formulas. Building adequate representation allows to replace experiments on the real plant with computer simulations, which can be performed faster, significantly reduces the costs, increases the safety and enables making decisions supported by the prediction model. However, individual components should not be treated separately, because they are connected with other elements and mutually dependent. It results in very restrictive limitations, which can make the identification problem much more difficult. In particular, interaction signals are not accessible for direct measurement and cannot be arbitrarily generated/manipulated. The problem is often met in practice, when a number of processes work in parallel and share common resources (e.g. production, transportation or biological systems). Since the global analysis of the system is excluded for the computational complexity reasons, the decomposition strategy will allow to identify small parts of the system independently and effective synthesis of the whole structure under supervision of coordination layer.