

In control theory, two types of feedback systems are distinguished - direct control and indirect control systems. In direct control systems controls are statically (instantaneously) transformed signals from a measuring device. In many cases, such signals cannot be used for control of dynamic systems as they are, for example, are too weak or cannot be momentarily transmitted to the input of the control system. In such cases signals can be fed at the input of a specific device, called an actuator, that produces sufficiently powerful outputs to be used as controls. An indirect control system is a dynamic system along with an actuator.

Modern mathematical control theory was developed for direct control systems, although optimal control problems for indirect control systems were formulated at the same time as for direct systems. A specific feature of optimal indirect control problem is that natural constraints imposed on the input and output signals of the actuator make this problem an optimal control problem with state constraints. Problems with state constraints are much more complicated than problems without state constraints. Nowadays, the theory of necessary optimality conditions for optimal control problems with state constraints is well developed. However, there are fundamental difficulties that complicate the use of this theory for constructing optimal open-loop controls and especially feedbacks.

The aim of the presentation is to produce constructive methods for solving optimal indirect control problems taking into account specific features of actuators. It will be shown that specific features of the problem under consideration make it possible to efficiently implement constructive linear programming methods to design algorithms with complexity equivalent to those of algorithms for direct optimal control problems for calculating open-loop controls and optimal feedbacks in real time.