

ABSTRACT

By decision-making in a fuzzy environment is meant a decision process in which the goals and/or the constraints, but not necessarily the system under control, are fuzzy in nature. This means that the goals and/or the constraints constitute classes of alternatives whose boundaries are not sharply defined.

An example of a fuzzy constraint is: "The cost of A should not be substantially higher than α ," where α is a specified constant. Similarly, an example of a fuzzy goal is: "x should be in the vicinity of x_0 ," where x_0 is a constant. The underlined words are the sources of fuzziness in these examples.

Fuzzy goals and fuzzy constraints can be defined precisely as fuzzy sets in the space of alternatives. A fuzzy decision, then, may be viewed as an intersection of the given goals and constraints. A maximizing decision is defined as the set of points in the space of alternatives at which the membership function of a fuzzy decision attains its maximum value.

The use of these concepts is illustrated by examples involving multistage decision processes in which the system under

control is either deterministic or stochastic. By using dynamic programming, the determination of a maximizing decision is reduced to the solution of a system of functional equations. A reverse-flow technique is described for the solution of a functional equation arising in connection with a decision process in which the termination time is defined implicitly by the condition that the process stops when the system under control enters a specified set of states in its state space.