

Design, Simulation and Implementation of an Intelligent Greenhouse with Fuzzy Tools

M. Davarynejad, M.-R. Akbarzadeh-T., A. Akramizadeh

davarynejad@kiaeee.org, akbarzadeh@kiaeee.org

Abstract:

Greenhouse is a live nonlinear time-varying system with complex behavior. This system contains some sub-systems like cooling and heating systems, ventilation and irrigation systems, lighting systems, etc. It is possible to control these subsystems one-by-one. Soft computing, with the aim of exploiting tolerance for imprecision, uncertainty, and partial truth are a promising collection of methodologies which aims to achieve robustness, tractability, and low total cost. Thus in an economical way, fuzzy control methods can be used to optimize energy supply and improving the quality and quantity of plant growth. Here, the strategy is to use supervised fuzzy controllers. In most fuzzy-system applications, the structure of the system is chosen non-systematically by an expert according to his knowledge. Nevertheless the system parameters are not rich enough to ensure the desired behavior. Here, a genetic algorithm is used to approximate membership functions and rules of fuzzy system. In this study we try to extract the agricultural rules to achieve optimal plant growth in greenhouse and improve energy saving in greenhouse productions. The greenhouse is implemented at Ferdowsi University of Mashhad with floor area of about 20m² and 3 fuzzy controllers and a supervisory are implementation on Atmel AVR microcontroller since it is becoming the industry standard.

Key words:

Greenhouse, Climate Control, Evolutionary Fuzzy Systems, Supervised Fuzzy Controller