

Fuzzy Logic and Fuzzy Control:
Enabling Computers to Think and Behave Like Human-Beings

By

Irvin R. Jones Jr., Ph.D.

Abstract:

Computers and humans have complementary strengths and weaknesses. Computers are good at computation – the manipulation of data using mathematical and/or logical methods. Humans are good at information processing – the manipulation of data and/or information (data with an attached meaning or context) for decision-making purposes. The ability of humans to understand vague concepts enables us to easily identify faces in a photograph or to understand the meaning of the term “long distance”; whereas these are difficult tasks for a computer. It is interesting to note that computers use computation to do information processing.

Digital logic, a basis of computation in a computer, is the representation and manipulation of sets of well-defined data. Fuzzy logic is a means of representing and manipulating sets that are not well-defined. By “not well-defined”, we mean that there are degrees of membership in a set, whereas in digital logic membership is binary. By extending the concept of fuzzy logic to computation, we are able to give concrete form and structure to vague concepts like “long distance”. This (fuzzy logic) allows computers to “think” like human-beings. Transforming fuzzy computation into action can enable computers to exhibit more human-like behavior.

In this presentation, I will introduce the basic concepts and methodology of fuzzy logic; demonstrate the application of fuzzy logic in the design of a simple controller for an air conditioning system. This demonstration will utilize a fuzzy systems development environment, Xfuzzy 3.0 (copyright IMSE-CMN 1997-2003). And lastly, I will discuss future applications of the methodology in the development of intelligent systems.

Biography:

Irvin Jones received his bachelor’s degree in Electrical Engineering from Stanford University in 1982. He earned his master’s degrees in Computer Engineering and in Computer Science from the University of California at Santa Barbara in 1984 and 1986 respectively. He received his doctorate in Electrical Engineering from the University of Colorado at Boulder in 1998. He is an experienced engineer through his work as a development engineer for Sony Corporation, and as a senior software engineer and system architect for Hewlett-Packard Corporation, where he shares two patents for system memory design. He has held faculty positions in the Department of Engineering Technology at the University of North Carolina at Charlotte; and in the Department of Electrical and Computer Engineering at the University of Denver. He is currently adjunct faculty in the Department of Electrical, Computer, and Energy Engineering at the University of Colorado at Boulder and a consultant for VRI Consulting, L.L.C. He currently teaches courses in digital logic, computer organization, and embedded systems design; consults on the development of software systems and applications; and continues his research in intelligent systems, where he has a patent pending for the design of a dynamically reconfigurable neural network.