EXPERT SYSTEMS: DEVELOPMENT AND CURRENT UTILITY

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EXTENDED TUTORIAL ABSTRACT

Expert systems are currently used in an enormous range of applications, ranging from scientific to huge industrial engineering and non-engineering applications. Some of these examples may be implicitly familiar to some of us such as banking systems with built-in fraud detection, voice recognition software, even facial recognition software, which are still topics of intensive research. A number of possibly in common use today and perhaps the most trivial expert system in use is Microsoft Window's troubleshooter, though sometimes the conclusion given seems to be "inconclusive".

What is Expert System? According to Edward Feigenbaum, an Expert System is a class of computer program that can advise, analyze, categorize, communicate, consult, design, diagnose, explain, explore, forecast, form concepts, identify, interpret, justify, learn, manage, monitor, plan, present, retrieve, schedule, test or tutor and they address problems normally thought to require human specialist for their solution. Expert System is purely a knowledge-based system. Knowledge is the brains of such a system. Expert System is highly domain specific and restrictive, meaning it is used only to solve specialized problems. This is similar to a human expert in his/her own specialized field. An expert system consist of four major components, knowledge base, where expert knowledge are being stored; inference engine, containing algorithm(s) determining the problem resolution strategies; user interface; and an explanation faculty.

This tutorial concentrates on two knowledge representation techniques, rules and frames, for coding knowledge into the system, after which, two inference techniques, forward chaining and backward chaining, are described. Forward chaining is a data-driven technique and is suited for rule-based systems, as well as, monitoring-typed systems, whereas backward chaining is a goal-driven technique and is suited for frame-based systems, as well as, diagnostic- and proving-based systems. In rule-based systems, knowledge is encoded as discrete IF-THEN statements, whereas in frame-based systems, IF-THEN rules are grouped into a pre-determined set of conclusions. A brief side-note will be made on hybrid expert systems, those employing both forward and backward chaining techniques.

This tutorial ends with a discussion of some of the expert systems featured in literatures, such as, jet engine diagnostic systems and scheduling systems.