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Artificial intelligence and engineering applications

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The main target of artificial intelligence is to supplement natural intelligence in an object so that it can do what we want it to do as for example robots, thus reducing human labor and reducing human mistakes. Intelligence is the ability to learn about, to learn from, to understand about and interact with one's environment. Artificial Intelligence (AI) is usually defined as the science of making computers do things that require intelligence when done by humans. AI is the study of ideas that enable computers to be intelligent. Artificial intelligence works with the help of: Scientific theorems (If-Then Statements, Fuzzy Logic) and Artificial Neurons (Artificial Neural Network). Machine learning is a scientific discipline concerned with the design and development of algorithms that allow machines to mimic human intelligence. The aim of this presentation is to introduce the mathematical tools which are used to build up intelligent agents like robots. These tools can be classified as fuzzy systems, neural networks and genetic algorithms. After introducing the topics of each tool, some real engineering applications are demonstrated. Also, some open questions about AI are raised up.

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Practical and useful control capabilities in CNC machine for higher productivity

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Owing to technical advances in CNC technology, the productivity and accuracy of machining process has been drastically increased. The CNC has enabled machine tools to move faster to be more accurate and more flexible. Compared with the advancement of the motion control, the control for machining process still has a lot of issues. Although there are several successful results applied in the market, the adaptive functions have not become general for machine tools especially for machining centers. This is because feedback control itself has time lag and it is difficult to control the process to enhance productivity while avoiding the unexpected situation such as tool breakage. This indicates that the combination of feed forward approach associated with CAM is necessary. Another reason is lack of monitoring capabilities. Adding expensive sensors is not welcomed by machine tool builders as they are always on the competitive edge. On the other hand, monitoring quality is very important in order to associate monitored information with prompt decision-making processes. We have been developing Intelligent Machine Tool (IMT) system that can autonomously determine machining conditions and adapt them according to the monitoring of actual machining processes in an intelligent manner. This research work describes the concept, configuration of the system and developed functions.

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