TALK ON Cutting Tool Path Optimisation for Aerospace Components

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Aerospace components, like any other engineering components, need to be machined to very high tolerances before they can be assembled. However, most machining operations are limited by very high static and dynamic stiffness of the tool and the workpiece. The results of this are workpiece deflection and chatter.

There is therefore an urgent need to develop an intelligent toolpath for high speed machining (HSM).

Chatter is the self excited relative vibration between the tool and the workpiece. It is caused by the regeneration of surface waviness. It results in poor surface finish, shortened tool life etc.

To avoid chatter the tool and the workpiece need to be damped. This can be achieved by controlling the process parameters, i.e. by having actuators and sensors to sense and control the process parameters.

Many tool path strategies currently focus on optimising the distance travelled by the cutting tool, in an effort to reduce machining time. Complicated tool path strategies should be thoroughly studied using genetic algorithm or finite element techniques.

Genetic Algorithms have been used to control an iterative finite element (FE) analysis. The FE model is modified to simulate the removal of material during machining. Tool path optimisation is one of the approaches to avoid problems such as workpiece chatter and static deflection during machining.

The Genetic Algorithm does not give the optimum solution for a specific problem, but the method can give a near optimum solution, which is often adequate for most practical problems.

The Talk was held on 18 November, 2010 and the speaker was Dr. Mohd. Khairol Anuar Mohd. Ariffin from the Department of Mechanical and Manufacturing Engineering, Faculty of Engineering, Universiti Putra Malaysia. A total of 22 participants attended the talk, which lasted for 1 ½ hours.