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Decision rationale capture to support complex system design

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This talk will address the problem of decision rationale capture to support complex system design using case studies developed in industry. A software tool for graphical documentation of decision rationale, actively used in Rolls-Royce, will be initially introduced. The tool, known as Decision Rationale editor (DRed), incorporates notation for argument-based rationale capture as well as technology to integrate various types of engineering documents. From a software tool developed in academia and introduced in Rolls-Royce in 2002, DRed is currently used by over 1000 engineers across Rolls-Royce UK, Germany, US and Canada and has become a key instrument to support the company's product development process. Using case studies of DRed application on engine development programmes such as RB211, Trent 700, Trent 900, and Trent 1000, Dr Aurisicchio will argue that a shift has occurred in Rolls-Royce from the old-school view that design rationale capture is time-consuming and burdensome to the awareness that the tool fits well in engineering work and it gives immediate benefits to engineers including improving design quality, saving time and supporting project management, while leaving behind clear and traceable legacy design knowledge. The speaker will also show how DRed is supporting communication within Rolls-Royce engineering teams and externally with airlines, aircraft manufacturers, aviation authorities, government departments and sub-contractors. More recent applications of decision rationale capture at NASA and Smiths Medical will also be discussed.

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Enhancement of geometric accuracy of five-axis machining centers based on on-machine work-piece measurement

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The five-axis machining centers make possible to machine complex parts such as impellers and also make possible to reduce the setup changing time, because of the machining center can rotate the tools or work-pieces by using rotary axes. The five-axis machining centers also make possible to get more beautiful machined surface by ball-end milling, because of the machining center can avoid the tool end point which has zero circumferential velocity. On the other hand, the rotary axes have geometrical errors such as offset and parallelism of the rotational centers. Since the geometrical errors deteriorate the accuracy of machined parts, it is important to identify and compensate the errors. It is also clarified; however, the geometrical errors change during the machining operation due to the thermal deformation and elastic deformation of the axes. This fact means that the geometrical errors are changing during the machining and the errors should be identified before the finishing process which determines the final geometrical shape of the parts. This fact also means that the geometrical errors should be identified under the same loading mass condition with the machining. This study demonstrates the identification and compensation of the geometrical errors of rotary axes in five-axis machining centers, based on the on-machine measurement results of machined work-piece. The geometrical errors can be identified from the shape geometry of the work-piece machined by five-axis motions because the shape geometry includes the influence of geometrical errors.

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