

Computer Aided Engineering

The CAE theme covers two main areas: geometrical modelling and process modelling. Our specific focus in these two areas is outlined below.

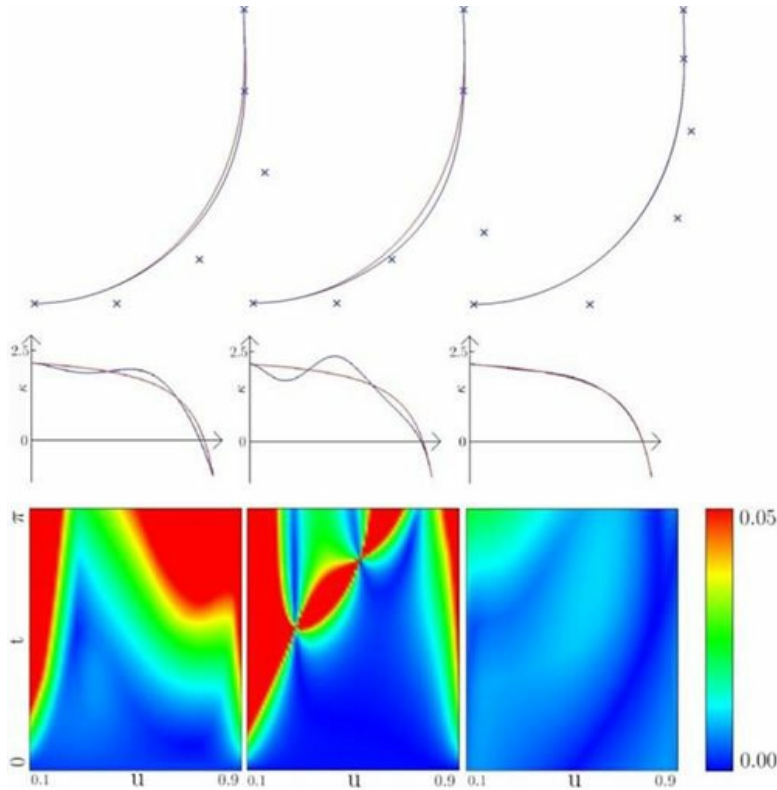
Geometric Modelling Group (GMG)

GMG is part of the Advanced Manufacturing Centre located in Mechanical Engineering. Headed by Dr R. J. Cripps, it has its own dedicated well-equipped office, a comprehensive library and a modern working environment. The Group also has access to 3- and 5-axes machining centres that are used in both research and teaching. The Groups research interests are in fundamental aspects of CAD/CAM, with a particular focus on geometry, applied to develop robust solutions to engineering problems in surface modelling and CNC machining. GMG undertakes internationally recognised collaborative research funded by EPSRC and industry and maintains very strong links with our industrial collaborators that include CAD users in the automotive, aerospace and shoe industries along side CAD/CAM vendors especially Delcam plc.

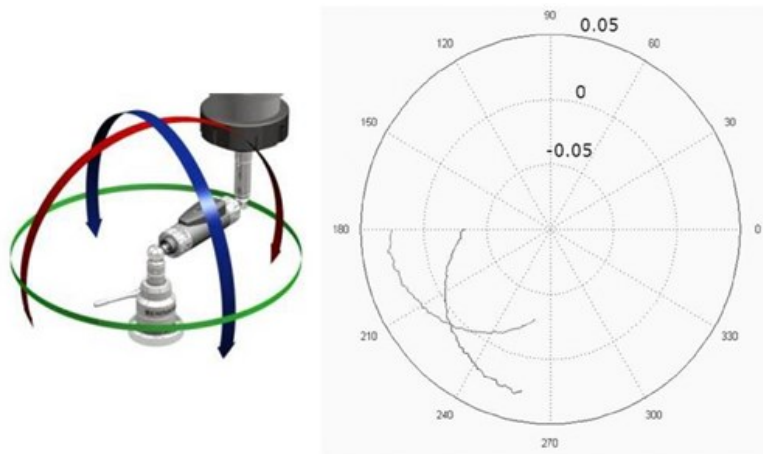
GMG pioneered the point-based approach to geometric modelling which is underpinned by the generalised cornu spiral (GCS). This allows the construction of high quality curves with specified curvature characteristics.

Current project are focused on:

- CAD/CAM compatible representation of the GCS to enable existing systems to take advantage of the high quality curve definitions.



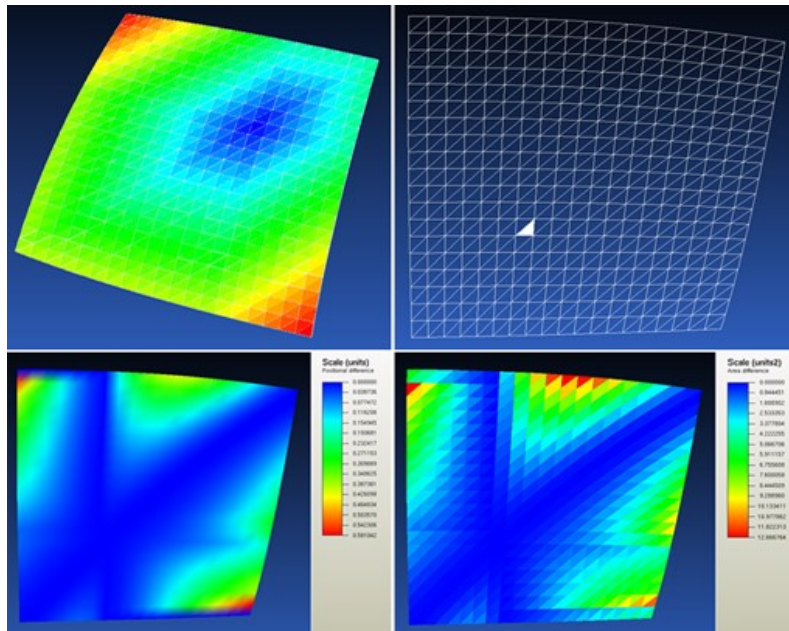
- Geometric Characterisation of errors in multi-axis machining centres using the Renishaw Ball Bar:



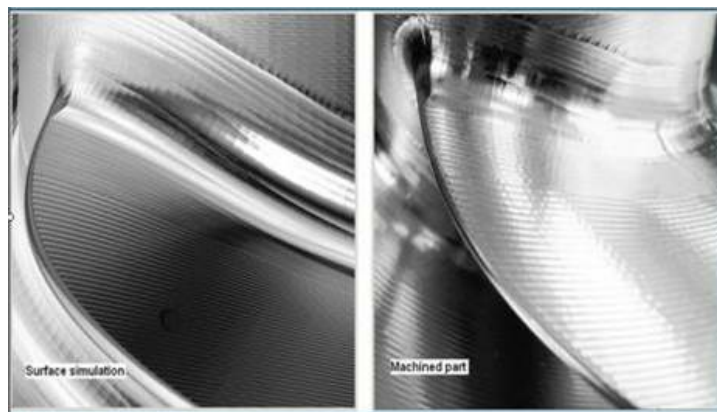
Recent projects have focused on:

- Developability of triangulated surfaces. This has applications in for example the ceramics industry where 2D transfers have to be wrapped onto doubly curved surfaces with minimum distortion.





- Realistic simulation of the true surface finish of 5-axis machining of highly complex parts, for example turbine blades:



Contact

Dr. Robert Cripps ([/staff/profiles/mechanical/cripps-robert.aspx](http://staff/profiles/mechanical/cripps-robert.aspx))

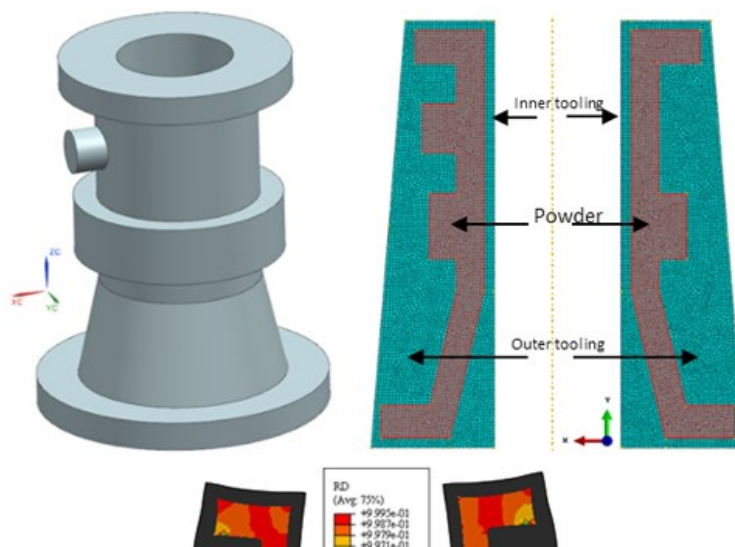
E-mail: r.cripps@bham.ac.uk (<mailto:r.cripps@bham.ac.uk>)

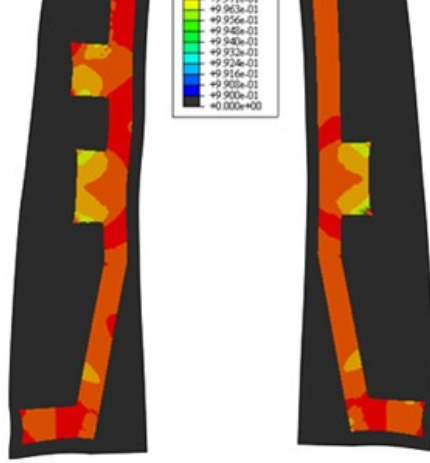
Process Modelling

The Process Modelling group is part of the Advanced Manufacturing Technology Centre and led by Dr K. Essa. The group has access to the University's High Performance Computing facility, the Birmingham Environment for Academic Research (BlueBEAR). The BlueBEAR consists of 58 nodes 16 cores each and memory size ranging from 32GB to 256GB. This cluster provides the capability to model and simulate complex processes in reasonable time. The group specialises in the modelling of materials, manufacturing and design for applications in the automotive, aerospace and power generation sectors. The group current focus is on the simulation of advanced material processing technologies such as Hot Isostatic Pressing HIP and Additive Layer Manufacturing (ALM). Other active research interests include metal spinning, incremental sheet forming and machining of fiber reinforced composites. The group has established research collaborations with Rolls-Royce, BEA systems, ITP, CEIT and the MTC.

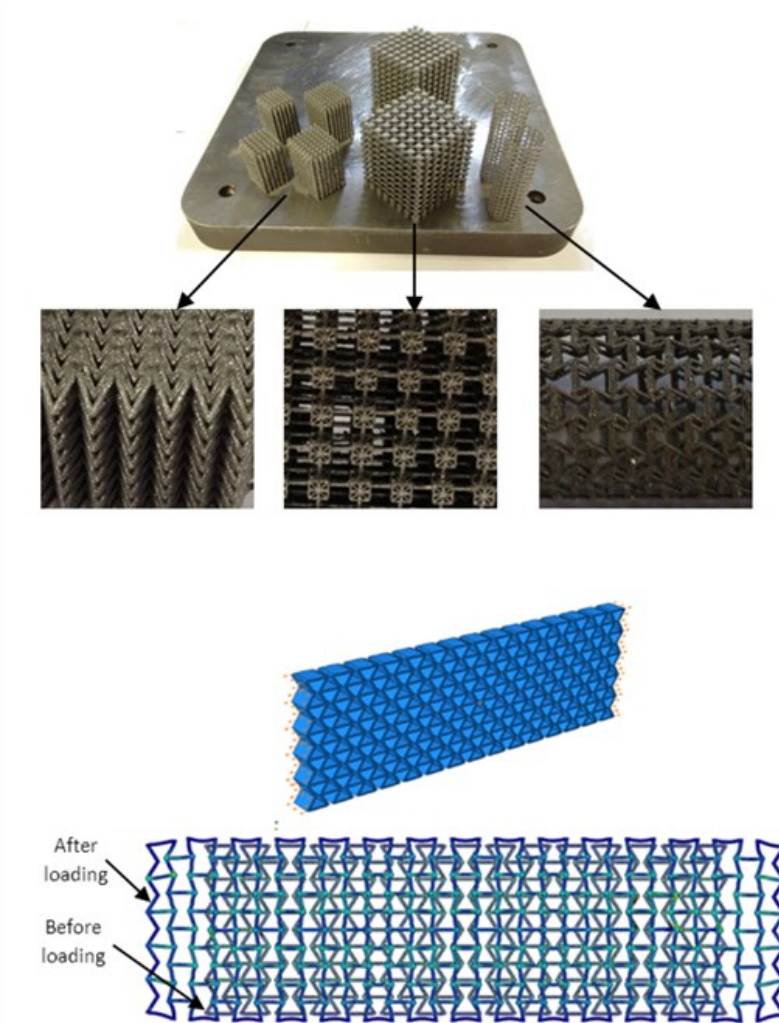
Active research projects

- Hot Isostatic pressing of INC 718 nickel-based superalloys aerospace engine casing, funded by Clean Sky.

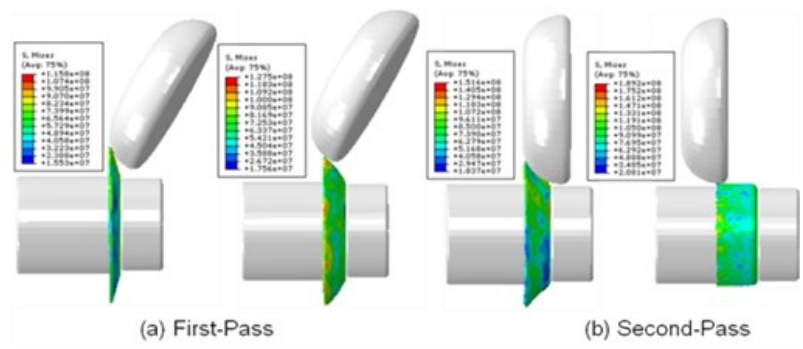


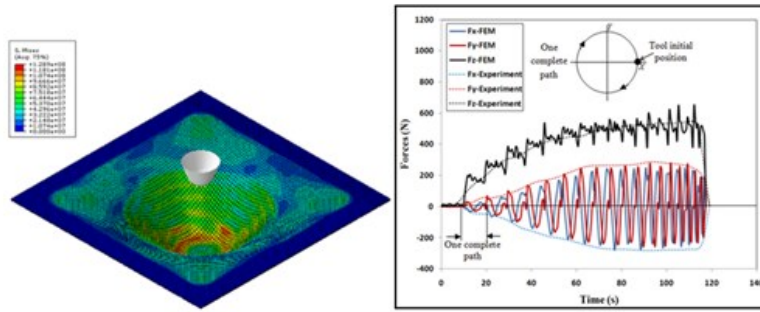


- Experimental development and numerical modelling of additive layer manufactured superelastic auxetic structures, funded by DSTL and MOD



- Deformation mechanisms in metal spinning and single point incremental forming, PhD research project.





Contact

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