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Towards Enhanced Integration of Design and Production in the Factory of the Future through Isogeometric Technologies

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www.terrific-project.eu

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MISSler
S O F T W A R E

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SEVENTH FRAMEWORK
PROGRAMME

The global process and perpetual cycle

- The TopSolid user gets some geometry coming from various designers using various Software that most likely are not TopSolid. The TopSolid'Cam option needs to calculate tool paths on this geometry.
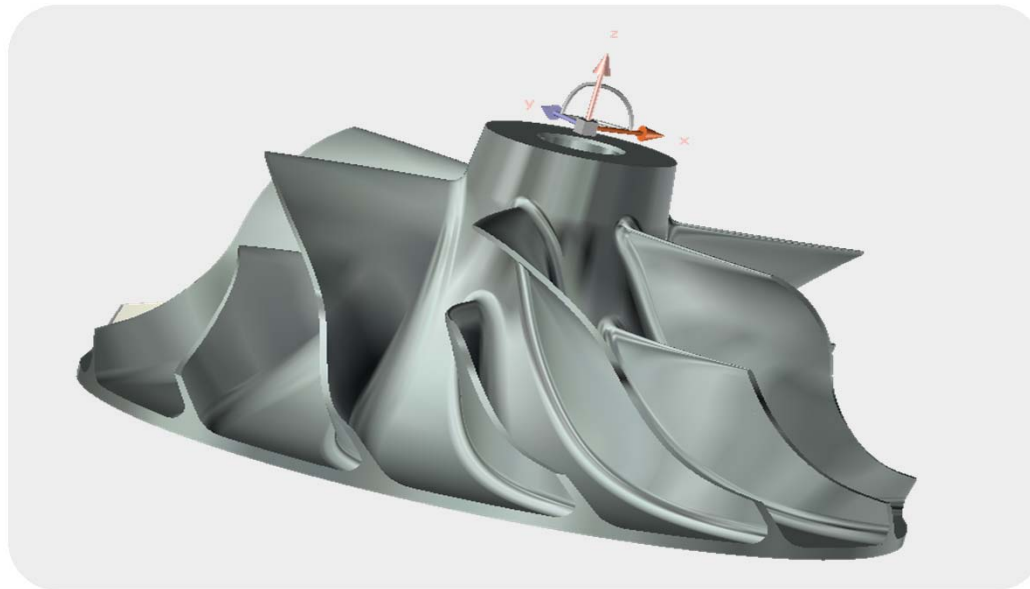
The problem to be solved

- Usually this geometry is a collection of more or less well connected surfaces {Si} in 3D space (position, tangency, and curvature … connections). The standard representation is given by a collection of maps of the flat 2D space into the 3D space. It is exactly the same process as the flat map that describes the geography of an earth region (All country in Europe before the EU).

- Unfortunately these maps had no reason to link well together on the table (the flat land), as it is with the map of countries defining the geographic Europe area. However, like the geograph, the Cam toolpath developer wish to design his travelling in the flat land, with some good correspondence in the real (3D) space, not leading to absurd paths.

- A unique global map that could reconnect well the various local maps coming from various provenances is highly demanded.

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Face fitting concept

- **The proposed solution**
  - Thanks to Isogeometry , one algorithm is now proposed to solve a "Dirichlet like" problem to recollect the various local maps in a single global one. This is a complete new solution proposed to the market.

- **Technical benefits**
  - Various benefits could be achieved with such an algorithm:
  - Simplify a set of surfaces in a single one, with smoothness properties
  - Get West/East or South/North lines on the surfaces, that one could follow to walk along and paint the surfaces progressively. These lines will not cross together.
  - With these properties, it will be much easier to calculate toolpaths on the initial collection of surfaces.
  - Impeller example)
  - To obtain a good surface quality after milling of the impeller blade, it is necessary to mill in a single time a set of surfaces, with respect of "flow" on the surface.
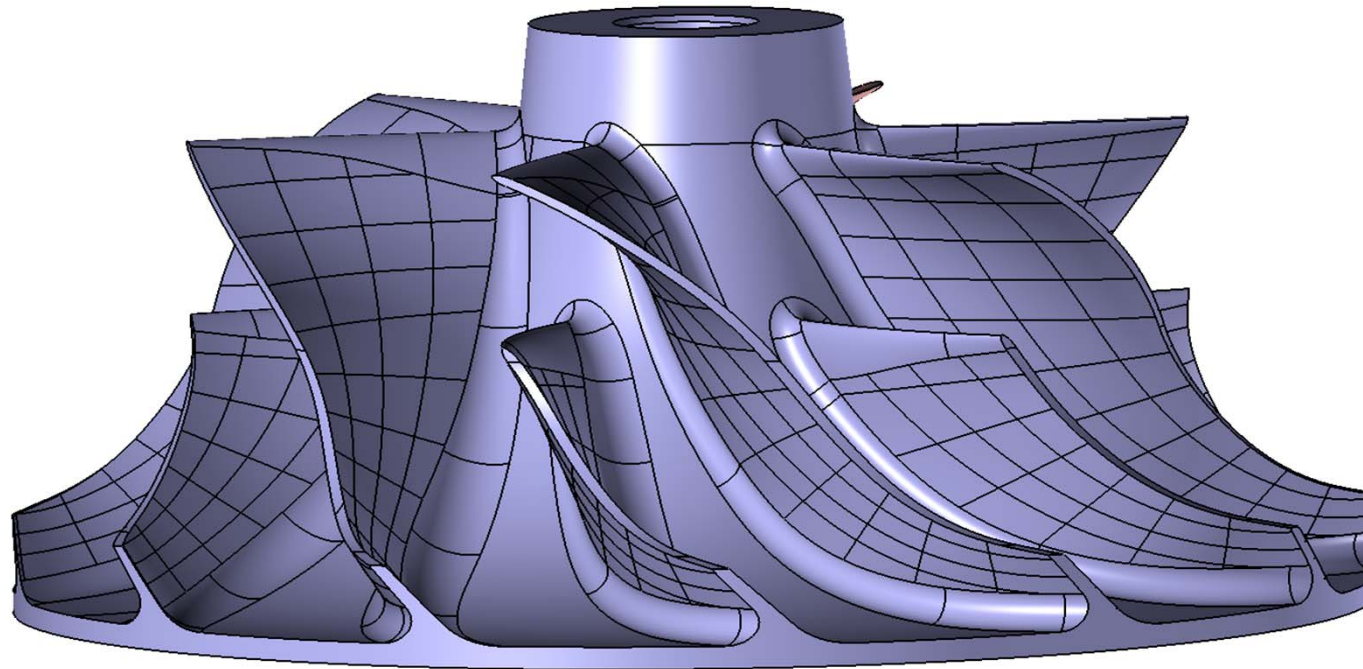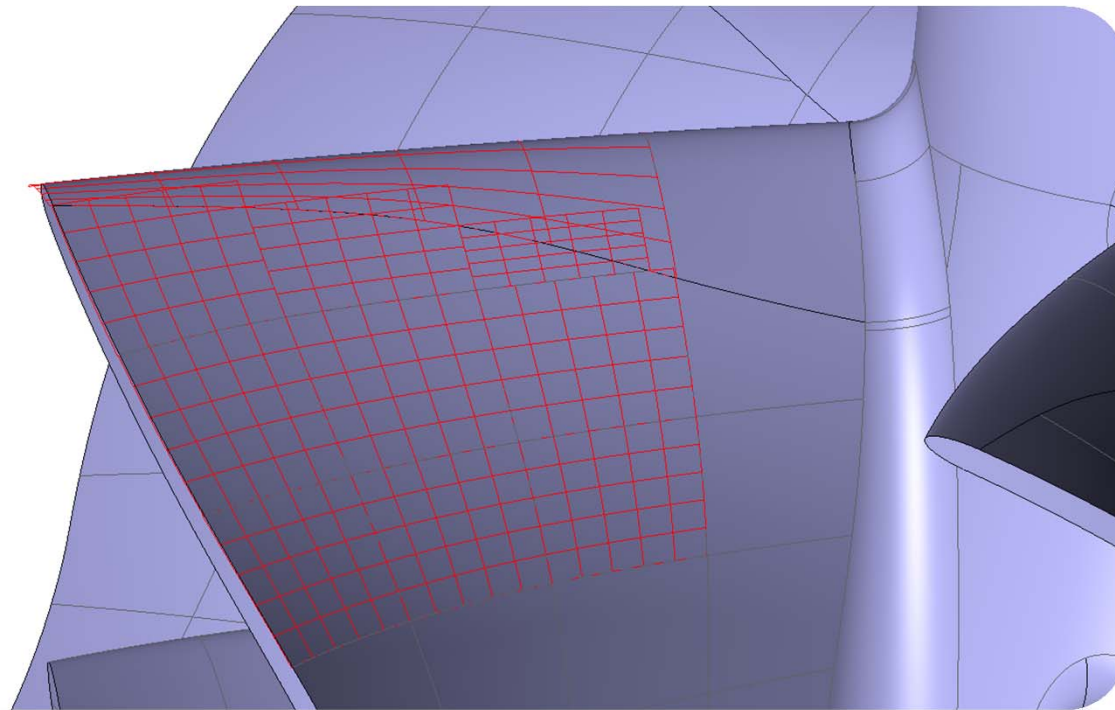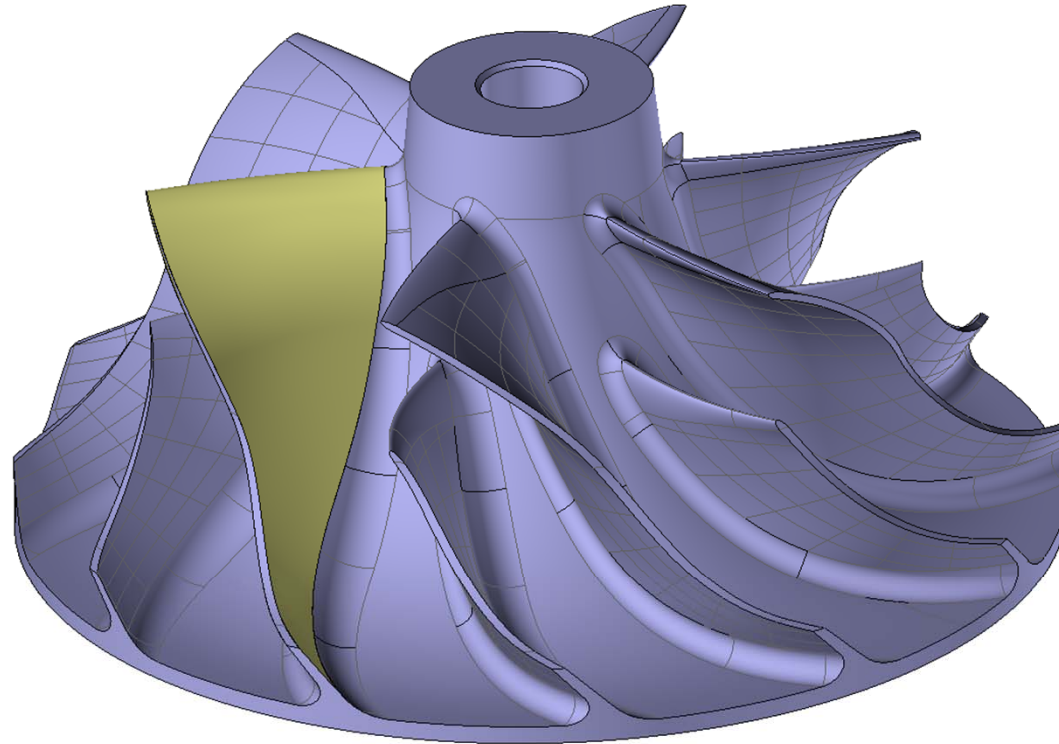
Exemples

Impeller to be milled

Unfortunately, the blades have no good parametrization
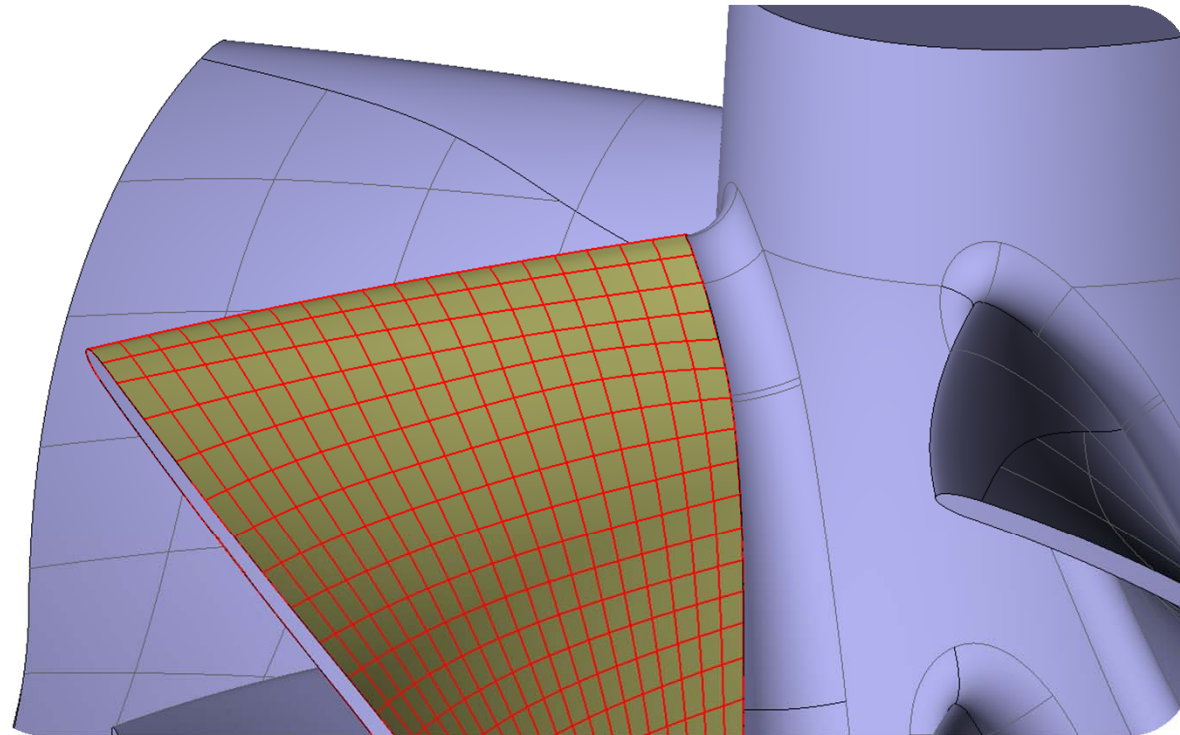
Exemples

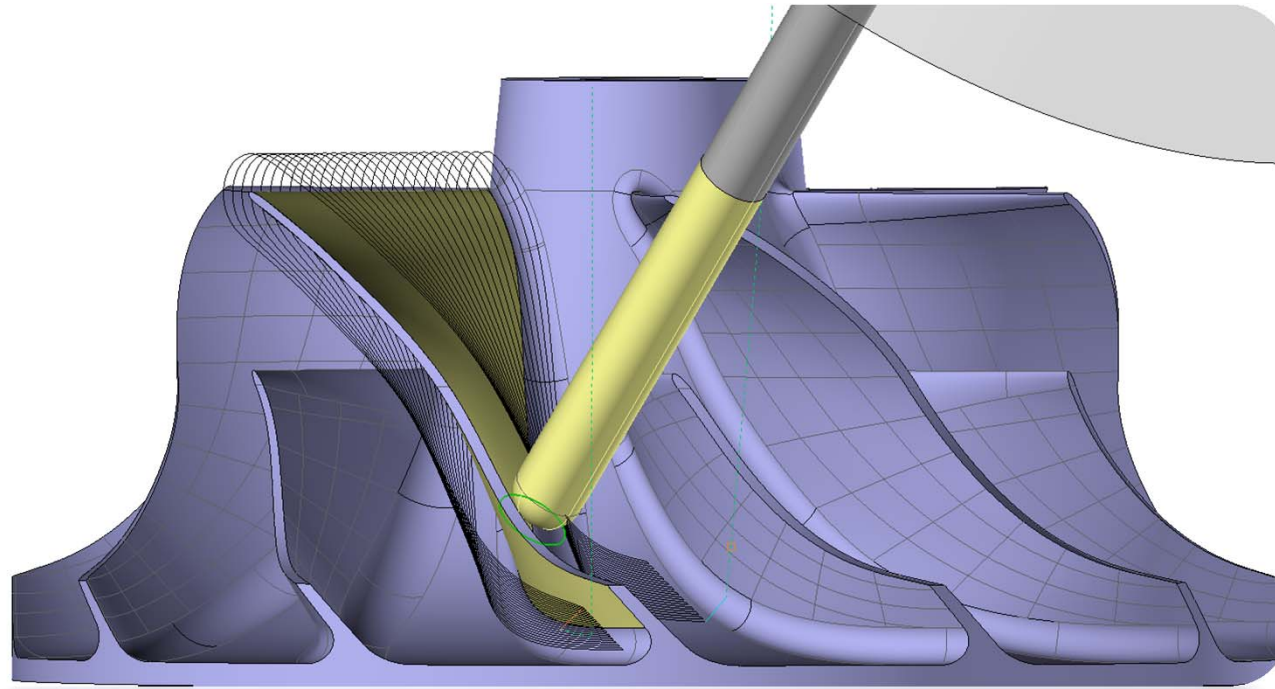no good "flow of curves" on the surface

Exemples

reparametrization with the new
Isogeometric algorithm.

Exemples

good "flow of curves" on the surface

Exemples

perfect milling then!

Industrial benefits

- One could expect a breakthrough in the very complex domain of 5 axis tool path calculation, especially for aeronautic geometries, where shapes are highly complex. Because the complexity problem, the competitor who could supply such an easy way to design right and natural tool paths, would get an important competitive advantage

Conclusion

- We are now close to make a conclusion about that. The algorithm has been successfully implemented by Inria and Missler Software inside TopSolid, and are currently being tested on various industrial examples.

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THANK YOU !

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