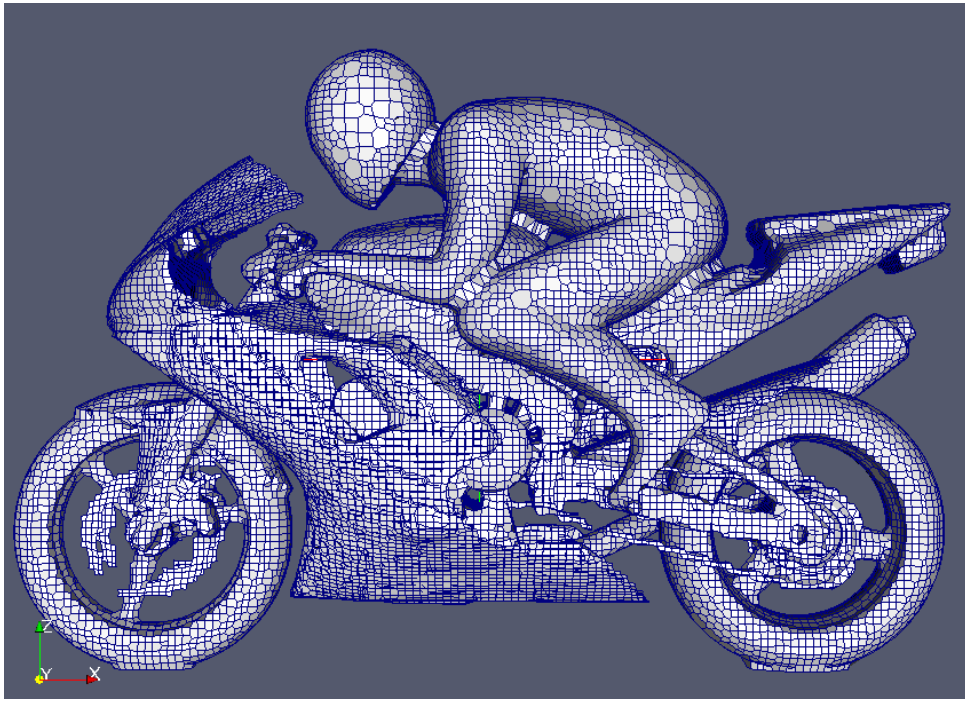
OpenFOAM 1.5

SnappyHexMesh

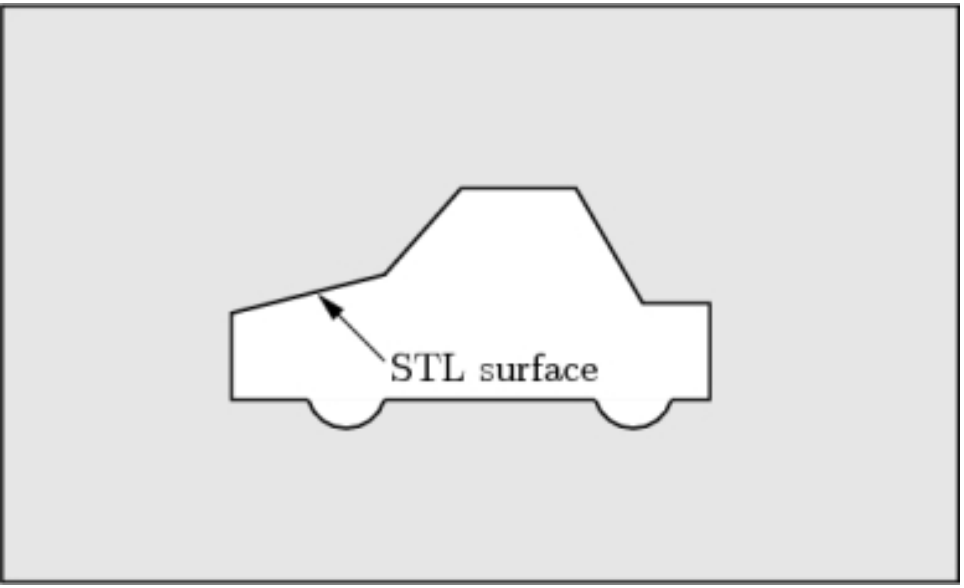


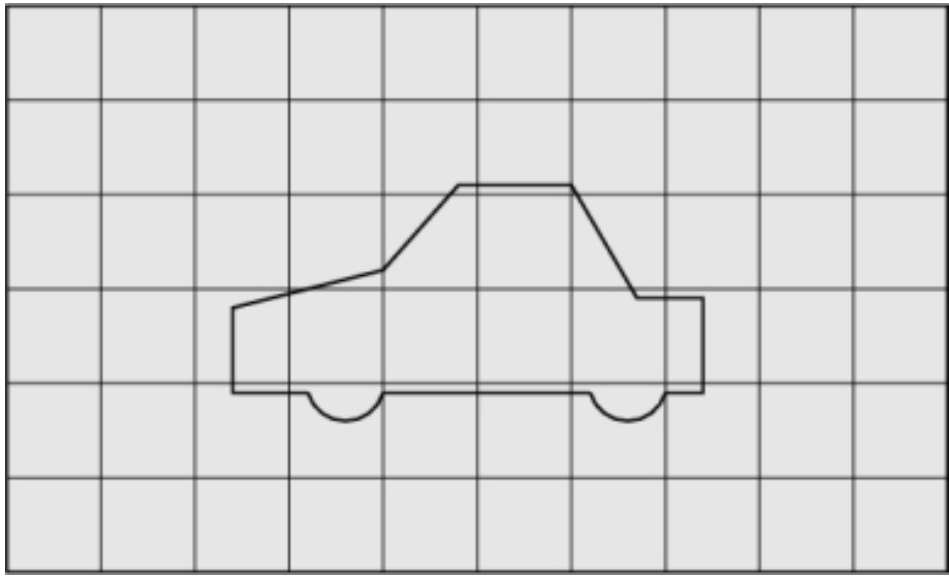
Håkan Nilsson – Olivier Petit

snappyHexMesh:

- Generates a 3-D mesh containing hexa, and split hexa cells from STL files (triangulated surface geometry)
- Very flexible specification refinements
- Runs in parallel very easily (load step balancing at every iteration)

First step: create a simple hexa mesh around it

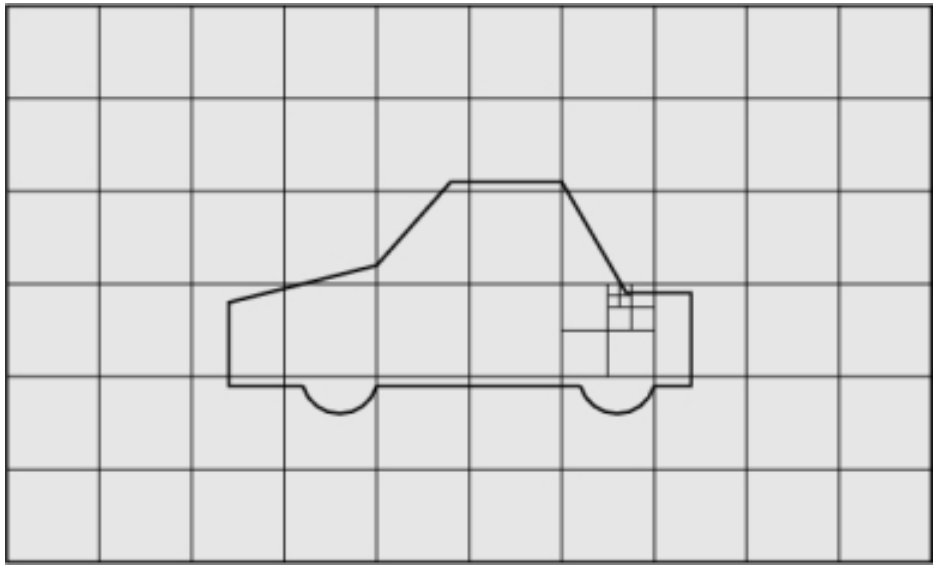


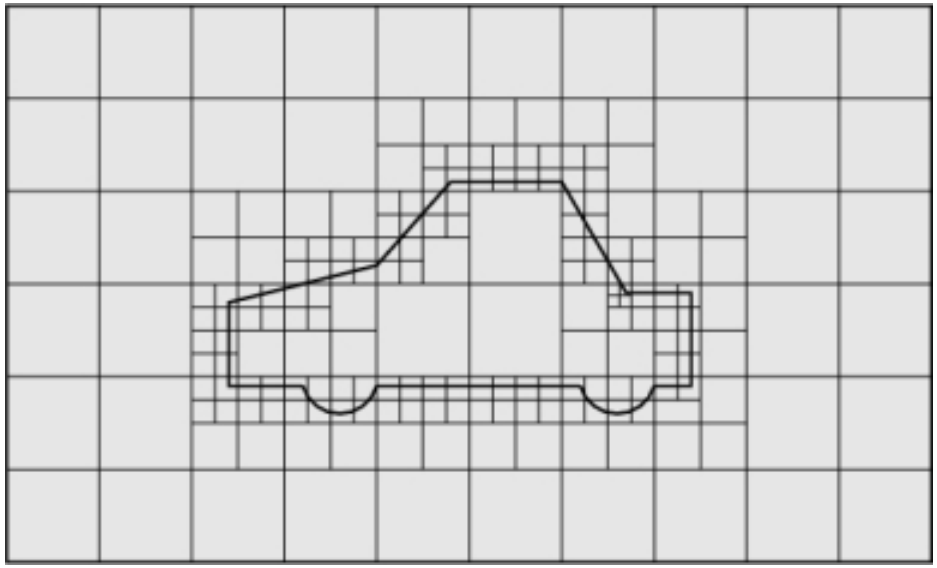


Aspect ratio should be around 1, with more than one cell in the z direction

- There must be at least one intersection of a cell edge with the STL surface
- There can not be empty patches, it is a 3D mesher.
- Easily done in blockMesh

second step: starting the splitting process

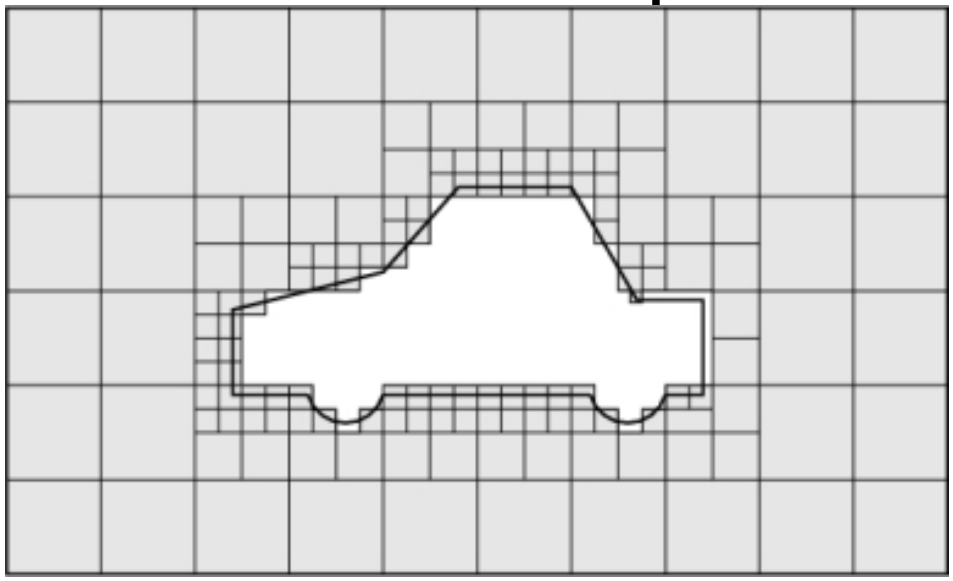


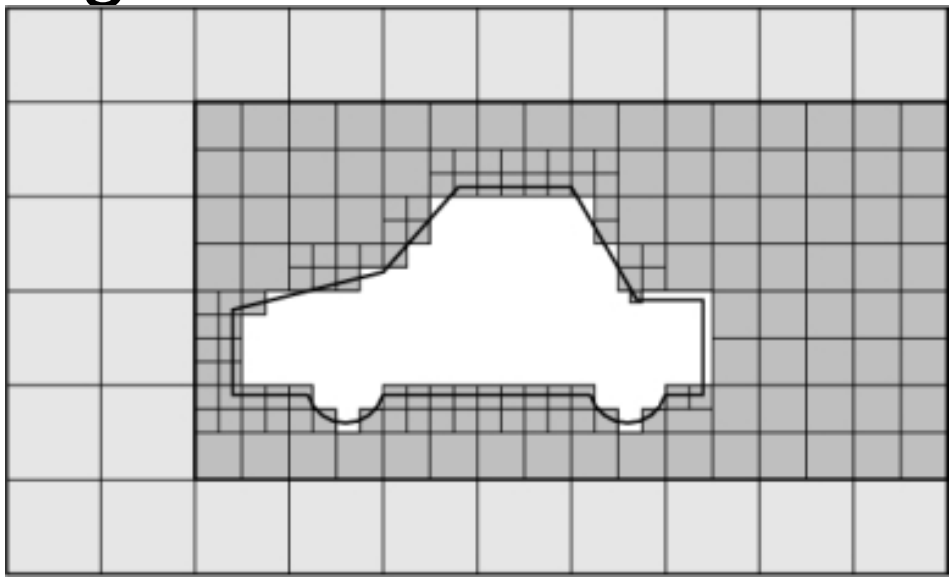


- It starts according to a first edge specified in snappyHexMeshDict by the user. **This edge must be inside the region to be meshed and must no coincide with a cell face either or before the refinement**

- Following feature refinement, cells are selected for splitting in the locality of specified surfaces, specified in snappyHexMeshDict

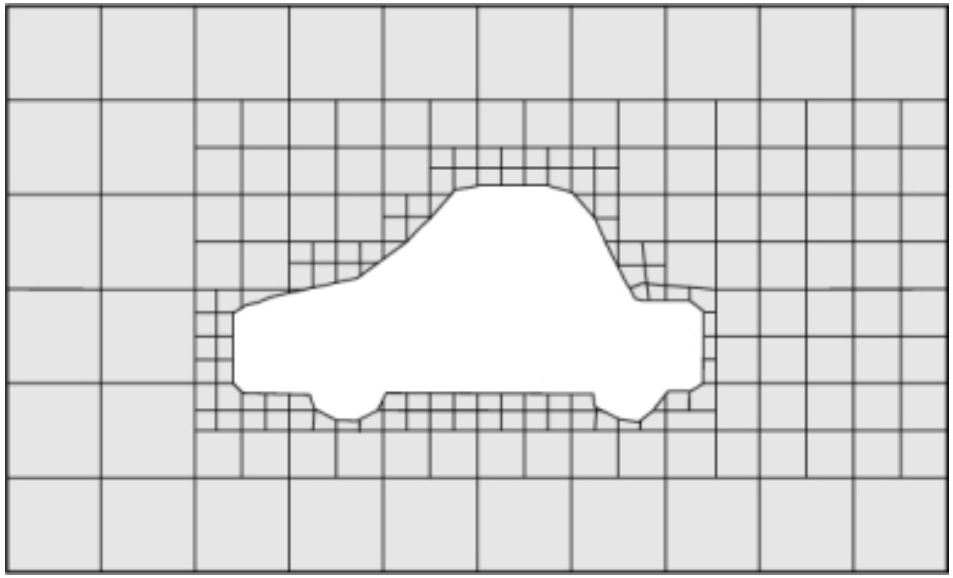
third step: cell removal, and refinement of specified regions

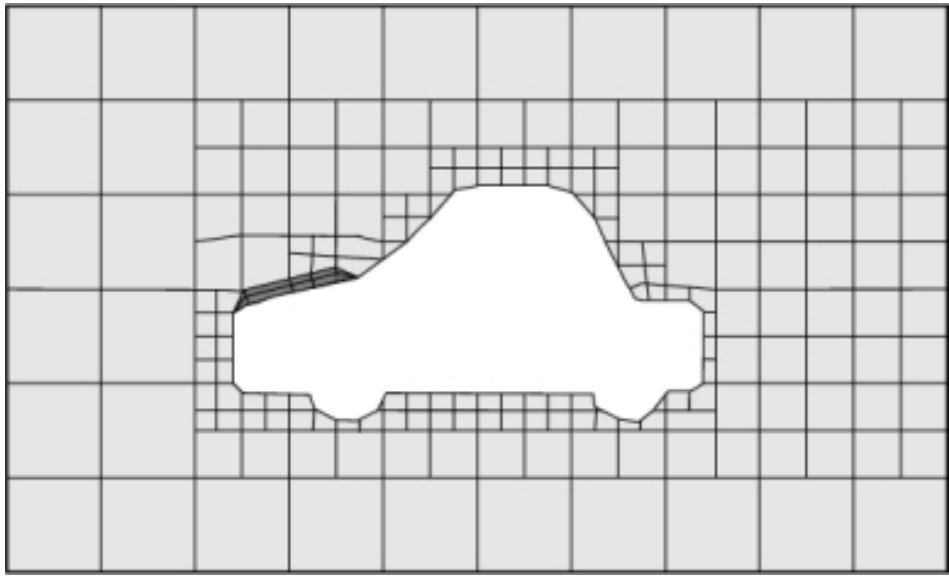




- Remove all cells that have above 50% of their volumes in the meshed region
- Refinement of specified region, as specified in snappyHexMeshDict

Fourth step: snapping to the surface and eventual layers addition

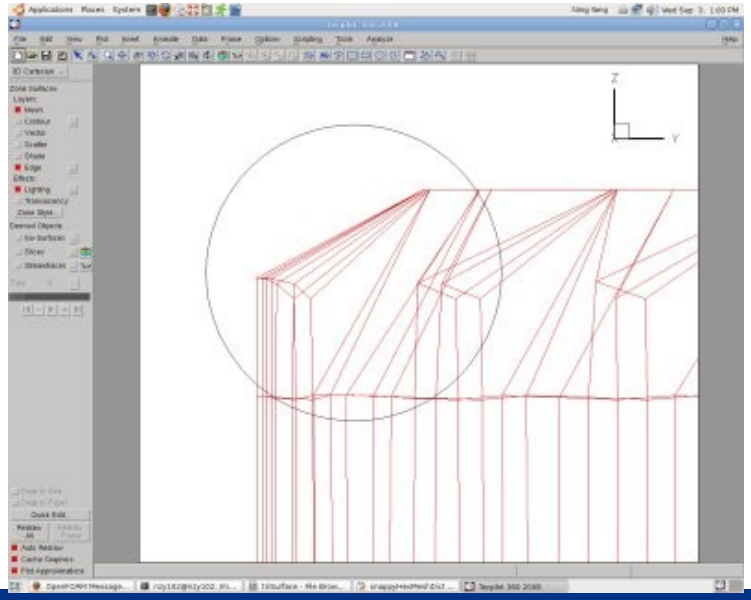


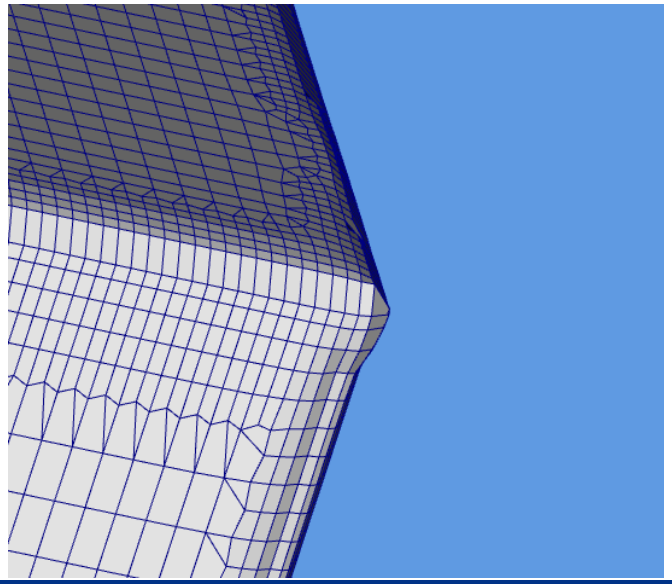


- After deleting the cells in the region specified, the points are snapped on the surface and spread depending on different parameters that one can find in snappyHexMeshDict
- If boundary layer is needed in some part of the mesh, it is possible to add it.

snappyHexMesh: pros and cons

- Possibilities of multiple refinements that make it very robust.
- Quality mesh control makes it trustworthy, and ensures good results.
- One major drawback is the lack of a geometry feature line that makes snappyHexMesh unreliable on sharp edges





References and places to look for more details:

- User guide for snappyHexMesh:
  http://www.opencfd.co.uk/openfoam/doc/snappyH

  or find it in the OpenFoam installation:
  $WM_PROJECT_DIR/doc/Guides-a4/UserGuide.pdf
- OpenFoam forum has a lot of threads about snappyHexMesh. Some are very interesting and most of the problems one can encounter have been discussed in the Forum
- Note: It is not possible to run the motorBike tutorial in the student lab. It seems to require 64-bit machines. Also: Large cases require quite a lot of memory.