Motorbike with ParaFoam

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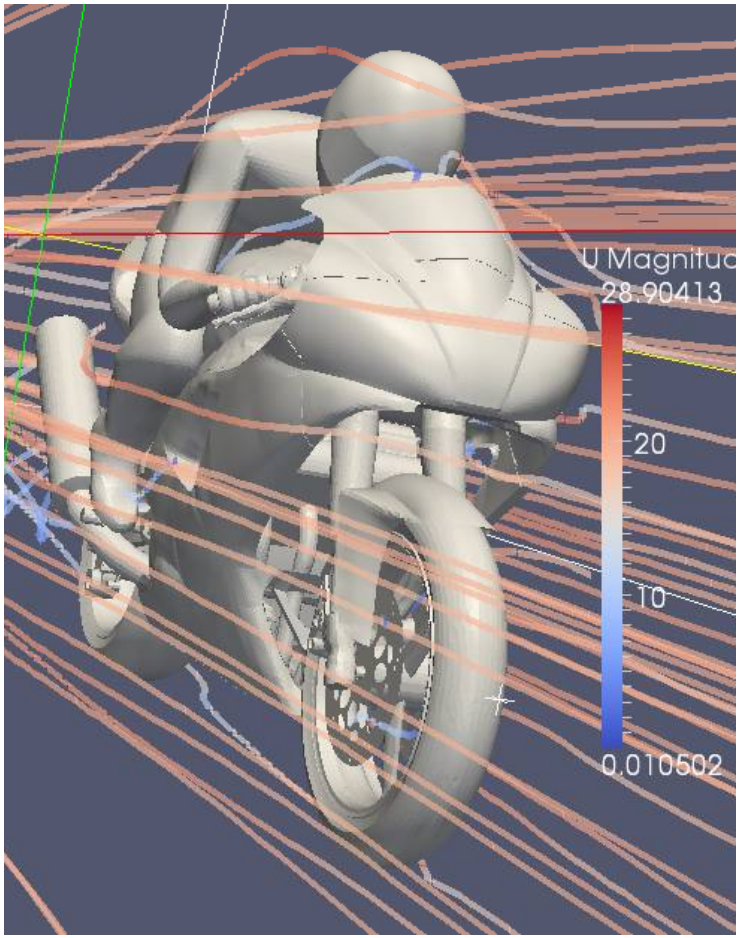
Learning outcome

After initial overview of the visualization tools capabilities students will exercise visualization tools on CFD data obtained by running OpenFoam's motorbike tutorial.

Comparison of ParaView and VisIt will be performed to find strengths and weaknesses on example. Deficiencies will be resolved by additional data manipulation programming and creation of custom viewer in OpenGL.

Outline

- ParaFoam motorbike visualizations
- Motorbike mesh reader and writer coding
- VisIt motorbike visualizations
- Extend motorbike mesh reader with OpenGL code
- Add velocity glyphs
- Discussion



Obtaining motorBike data

- By running OpenFOAM example

```
mkdir -p $FOAM_RUN
cp -r $FOAM_TUTORIALS $FOAM_RUN
cd $FOAM_RUN/tutorials/incompressible/simpleFoam/motorBike/
sh AllRun
FoamToEnsight # conversion for VisIt
```

- Or by copying precalculated results from the temporary BSCW link passed by email

```
mkdir  motorBike
cd motorBike
wget https://bscw...
tar xvzf motorbike.tar.gz
```

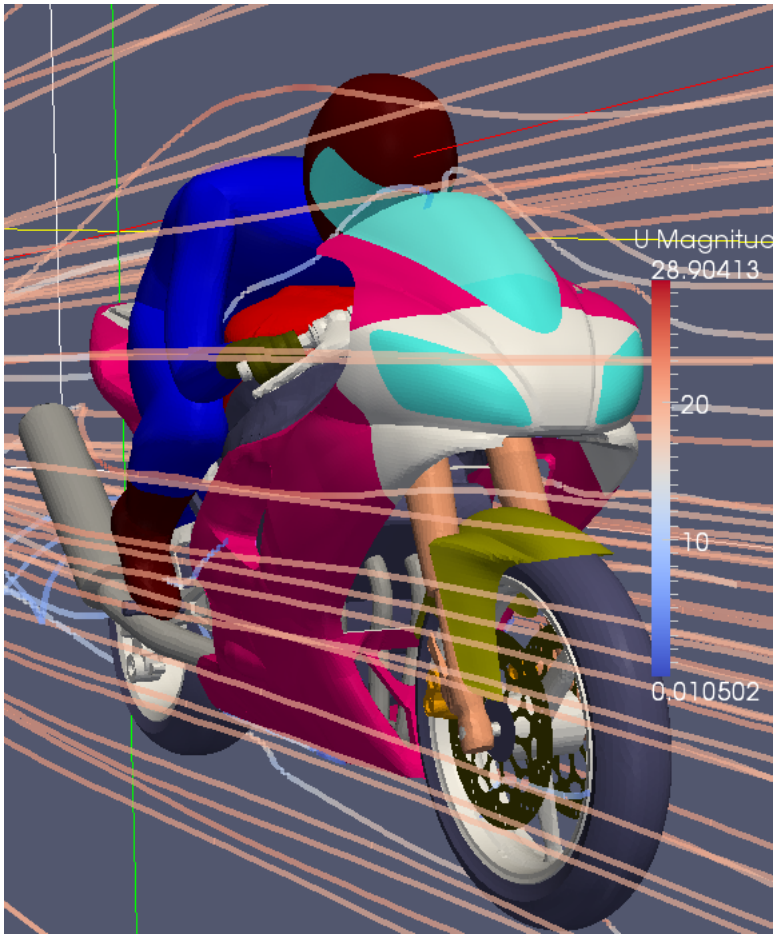
ParaFoam and ParaView

- paraFoam is ParaView with the OpenFoam reader plugin that reads “dummy” **`motorBike.OpenFOAM`** file. Use of paraFoam is recommended as the plugin is compiled to match OpenFOAM version.
- ParaView contains VTK *builtin* OpenFOAM database reader that can open “dummy” **`motorBike.foam`** file that can be created and opened by

```
touch motorBike.foam
paraview --data=motorBike.foam
```

ParaView visualization

1. Mesh
2. Pressure (volume scalar field)
    1. Slice
    2. Isocontour
    3. IsoSurface
3. Velocity (volume vector field)
    1. Vectors
    2. Streamlines
    3. Magnitude



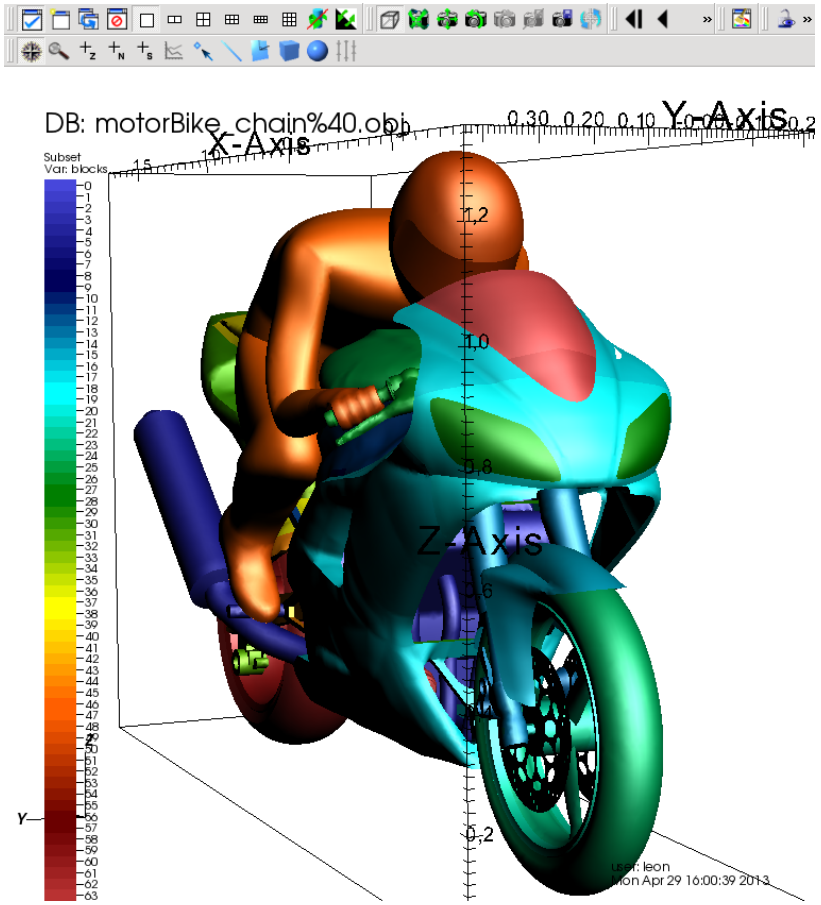
Motorbike source converter

- We would like to “colorize” biker. After some inspection we realize that source mesh **`constant/triSurface/motorBike.obj`** contains description of regions. However, ParaView and VisIt OBJ reader disregards this *group* markup when creating surface blocks!
- We quickly get familiar with the Wavefront OBJ format and create a surface grouper similar to OpenFOAM command $ **`surfaceSplitByPatch constant/triSurface/motorBike.obj`**
- We will need this converter when writing OpenGL code!

VisIt visualization

1. Mesh
2. Pressure (volume scalar field)
    1. Slice
    2. Isocontour
    3. IsoSurface
3. Velocity (volume vector field)
    1. Vectors
    2. Streamlines
    3. Magnitude

Render motorbike by grouping surface blocks with .visit file



motorBike.obj source splitted into 67 patches can be imported by opening patch by patch and visualized with **subset.** VisIt provides automatic and manual grouping of motorBike_*.obj by user supplied `.visit` file that looks like:

```
!NBLOCKS 67
motorBike_chain%40.obj
motorBike_clutch-housing%52.obj
motorBike_dial-holder%44.obj
motorBike_driversseat%28.obj
...
```

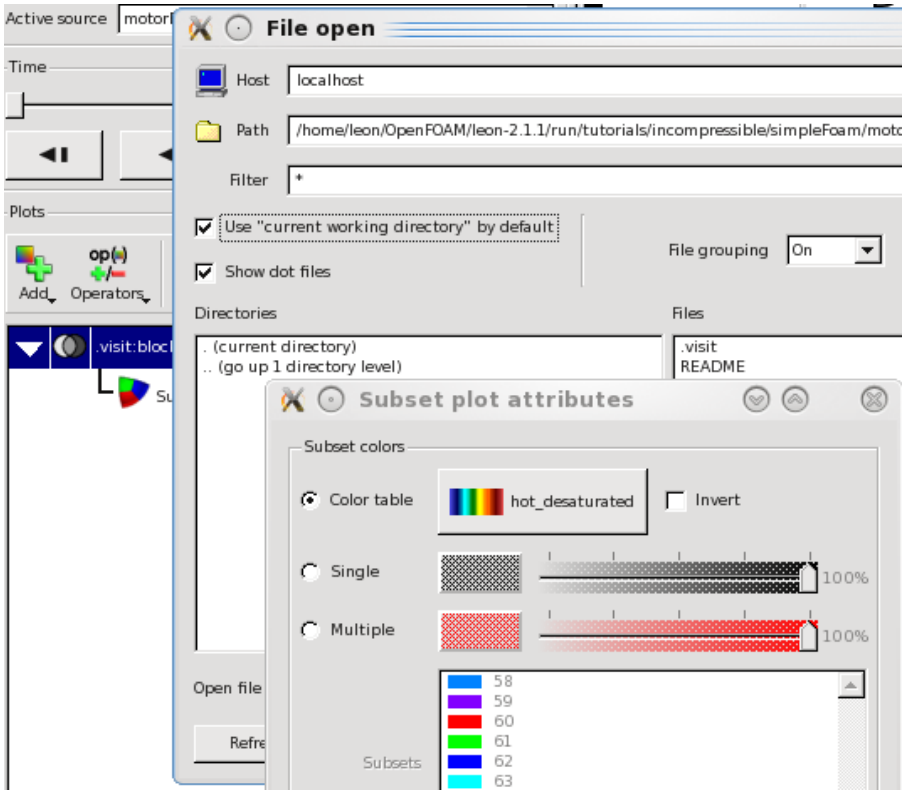
Such file can be created by entering the following shell commands:

```
cd constant/triSurface
(echo -n '!NBLOCKS ' && echo motorBike_*.obj|wc -w) > .visit
ls -1 motorBike_*.obj >> .visit
```

Using Subset with grouped object

After creation of the .visit file open database by

1. Open File (Ctrl+O)
2. Check *Show dot files*
3. Select by clicking .visit file located in `constant/triSurface/.visit`
4. Create plot by Plots ► Add ► Subset ► OBJMesh
5. Select Draw and rotate the biker in Window 1
6. Change attributes by ► double clicking Subset icon ► Color table ► hot_desaturated ► Apply ► Dismiss



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