**NCC TexGen Workshop 21st March 2019**

* General introduction
  + Overview slide – Slide 3
  + Webpage - Slide 4
  + Download – Slide 5
  + Code on Github – Slide 6
  + Forum – Slide 7
  + Software overview – Slides 8,9
* Use Cases – S10
  + Permeability and mechanical modelling – Slides 11-25
  + CTE of sheared fabric – Slides 26-40
  + Knitted fabrics – 41-45
* Modelling Theory
  + Slides 46-54
* TexGen as a Pre-processor
  + Elastic analysis Slides 56-62
  + Flow simulation Slides 62-70
* Open TexGen
  + Windows – make sure have Controls, Outliner and Log windows open
  + Controls – most commonly used are Textiles and Modeller
  + Outliner – shows yarns and nodes
  + Log window
    - Demonstrate Python console
    - Python output – TexGen is written in C++ but functions are wrapped to give access via Python scripting. GUI calls via Python & output recorded here
      * Executing commands and looking at output can be a good way of seeing how to call Python commands
    - TexGen output – shows messages output by TexGen – useful to see if any error messages
* Most common starting point – 2D Wizard with default settings
* Slides showing CTextileWeave class
  + Classes inherited from CTextile – 72
  + CTextileWeave2D – 73-74
  + Yarn spacing is distance between centrelines of yarns
  + The yarn height will be the fabric thickness / 2
    - Show plain weave without refine
    - Weave pattern dialog
    - Create weave
    - Defaults to elliptical cross-sections
  + Python output shows commands which have been executed
  + Show outliner
  + Render x-ray, nodes, paths
  + Render interference
  + Right button – zoom
  + Centre button – pan
* Show same plain weave with refine
  + Gap size if want space between yarn surfaces
  + Cross-sections have been changed
  + Show changed to interp between nodes
  + Show use of options in modeller window to assign sections etc
* 2D wizard 4x4 textile
  + Show selecting bars – ctrl-click to select multiple
  + Change 2nd & 4th yarns to 0.9 width, 0.08 height
* 3D textiles
  + 3D weave wizard
  + Start with orthogonal
  + 4 wefts, 4 layers
  + Weft spacing needs to be sufficient to accommodate height of binder
  + Explain warp/binder ratio
  + Slide showing CTextileWeave3D - 75
  + All use same base class – can’t create using this in GUI
  + Refine (record) – same as 3DOrthogonal example in scripting guide
    - Weft – yarns = 4, layers = 3, spacing = 2.8, width = 2.58, height = 0.25, power = 0.6
    - Warp – yarns = 6, layers = 2, binder ratio = 1, warp ratio = 2, spacing = 3.8, width = 3.6, height = 0.35, power = 0.6
    - Binder – width = 1.375, height = 0.16, spacing = 1.4, power = 0.8, thickness = 1.5
    - All fibre diameter = 0.007 mm
    - Fibres/yarn – weft=5000, warp=8000, binder=3500
  + Demonstrate layer to layer
    - Increased number of layers governs max number of binder layers
    - Warp layers linked to number of weft layers
* Save textile
  + Tg3 format = Slide 77
  + File->SaveTexGenFile - save in TexGen/Workshop – satin.tg3
  + Edit file – standard XML file
  + Can edit file
  + Show weave data part of file
  + Save screenshot – Slide 78
* Export options
  + Properties – Slide 79
  + Show yarn properties for textile
  + Select yarns
  + Yarn properties for yarns
    - Need density etc for volume fraction
    - Note don’t necessarily need all of them
  + Show orientations
  + Slides for Export options – 80-84
* Manual creation of yarns
  + Create empty textile
  + Create default yarn
  + Select & duplicate yarn – use button or ctrl-d
  + Drag to y = 5
  + Select yarn 0 from outliner & duplicate
  + Select node 1 of yarn 2 using outliner
  + Type x = 0, y = 10
  + Select yarn 2 using outliner & duplicate
  + Drag yarn 3 to x = 5
  + Select node 1 in each yarn & insert node
  + Select nodes 0 & 2 of yarns 0 & 3 and node 1 of yarns 1 & 2
  + Type z = 2
  + Select all yarns
  + Assign section
  + Change to lenticular, width = 4, height = 2
  + Create box domain max x & y = 10, min z = -1, max z = 3
  + Trim to domain
  + Select all yarns
  + Assign repeats x = 10 & y = 10
  + Show render interference depth – look at node 1
  + Select yarn 1
  + Assign section – change to interpolate between nodes
  + Select yarn 1 – change distortion ( to 0.1 or 0.2?)
  + Show interference depth
  + Select hybrid section – divide into 2 horizontally
  + Leave top section
  + Lower section – height = 1.8
  + Show interference depth
* Python editing of textile
  + Textile = GetTextile(‘name’)
  + yarn = textile.GetYarn(1)
  + yarn.SetResolution(20) (or numSlaveNodes, numSectionPoints)
  + newNode = CNode( XYZ(5, 5, 2.4)
  + yarn.ReplaceNode(1, newNode )
  + Scripting guide <https://github.com/louisepb/TexGenScriptingGuide>
* Python scripting
  + SingleYarn.py - Slides 86-91
  + SingleYarnSections.py – Slides 92-98
    - Move y plane to 6.9 to show hybrid section
  + TriaxialBraid.py
  + WeftKnit.py
  + 2dweave.py