

PointwiseApp

A Unique Pointwise® Application



Pointwise Tools for Wind Energy

Wind turbines present difficult fluid dynamic modeling problems: a large range of geometric scales, complex assemblies, and demands for high-fidelity, highly-accurate simulations. Pointwise is used by many of the leading wind turbine manufacturers and wind energy research organizations to improve efficiency and reduce costs. Its combination of high quality grids and ease-of-use lets researchers, designers and site planners quickly optimize wind turbine geometries and siting.

Pointwise software is able to quickly build high-quality grids on complicated geometry. These aspects allow it to be used to investigate complex problems such as the hub-blade interaction and optimization shown in Figure 1.

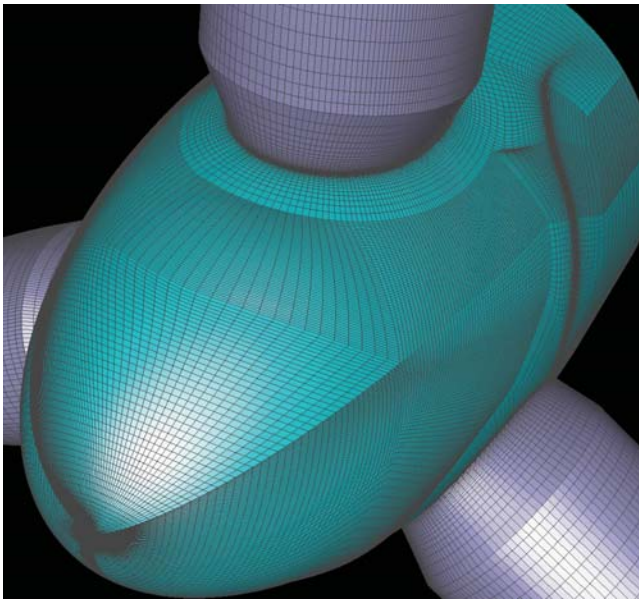


Figure 1: Accurately modeling the complex interaction between the hub and blade is critical to boosting turbine efficiency.

In addition to turbine design, Pointwise is utilized when designing collections of wind turbines, called wind farms, through the CFD analysis of the surrounding terrain (Figure 2). This siting process is crucial to maximizing wind power potential as well as ensuring that turbines operate safely. Industry leader Vestas

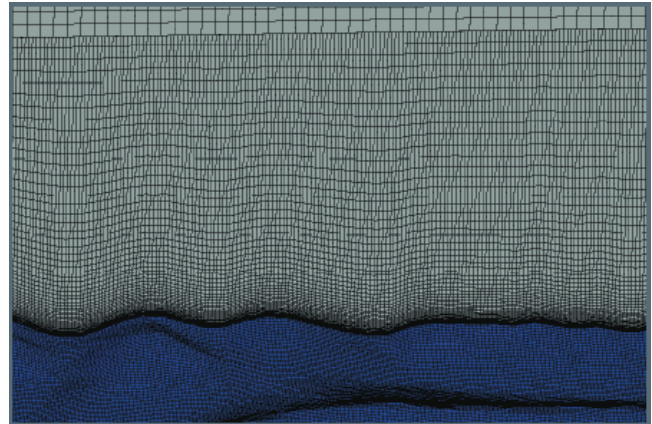


Figure 2: Pointwise efficiently meshes large wind farm sites while still resolving terrain features.

Wind Systems A/S has developed an automated terrain mapping tool using Pointwise software to create high fidelity structured grids for wind turbine farms.

The Glyph scripting language built into Pointwise can be used to automate the mesh generation process for whole classes of turbines.

The custom interface, shown in Figure 3, lets engineers enter basic turbine design parameters to have a high quality hexahedral mesh generated in minutes.

The section of grid in Figure 4 illustrates how Pointwise can resolve the high Reynolds number boundary layers typical of wind turbines with a minimal number of cells.

Pressure contours from a CFD solution on this grid are shown in Figure 5. Glyph scripting also can be used to couple Pointwise with optimization software for hands-off design space exploration.

Pointwise, Inc.'s new T-Rex (anisotropic tetrahedral extrusion) meshing technology is ideally suited to wind turbine analysis as well. T-Rex is a highly automated technique for generating high

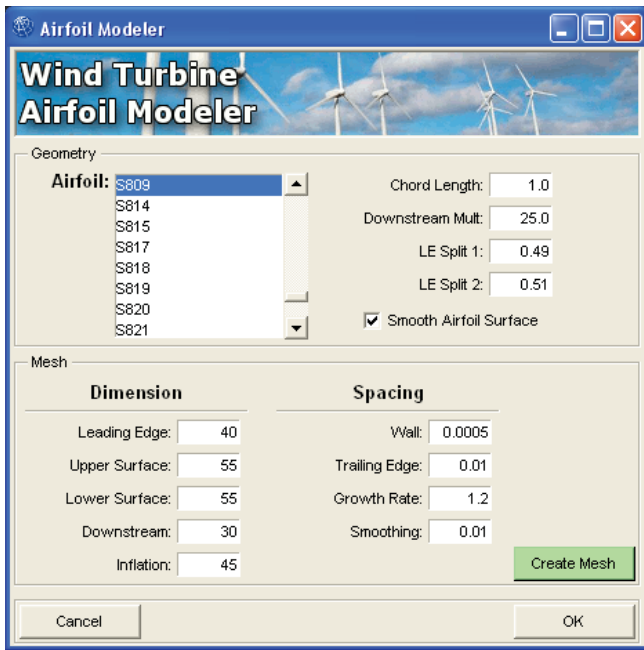


Figure 3: Glyph scripts automate the process of building grids.

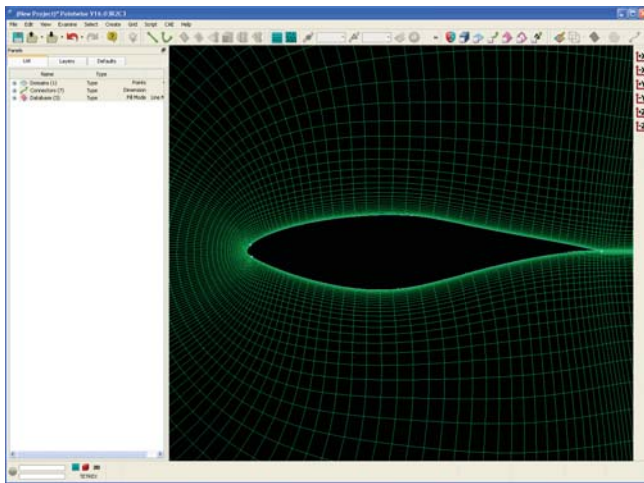


Figure 4: Cross section of hexahedral grid generated automatically with a Glyph script in Pointwise.

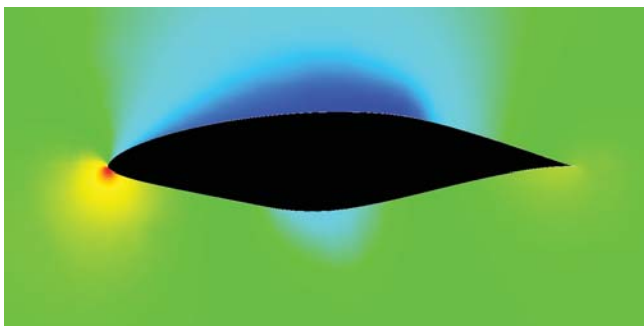


Figure 5: Pressure contours from CFD solution computed on the above mesh.

aspect ratio prism-tetrahedral grids with built-in quality checking and error detection. The grid in Figure 6 is a portion of a T-Rex grid for a horizontal axis wind turbine.

Pointwise helps wind turbine designers and researchers perform their CFD analyses more easily and efficiently.

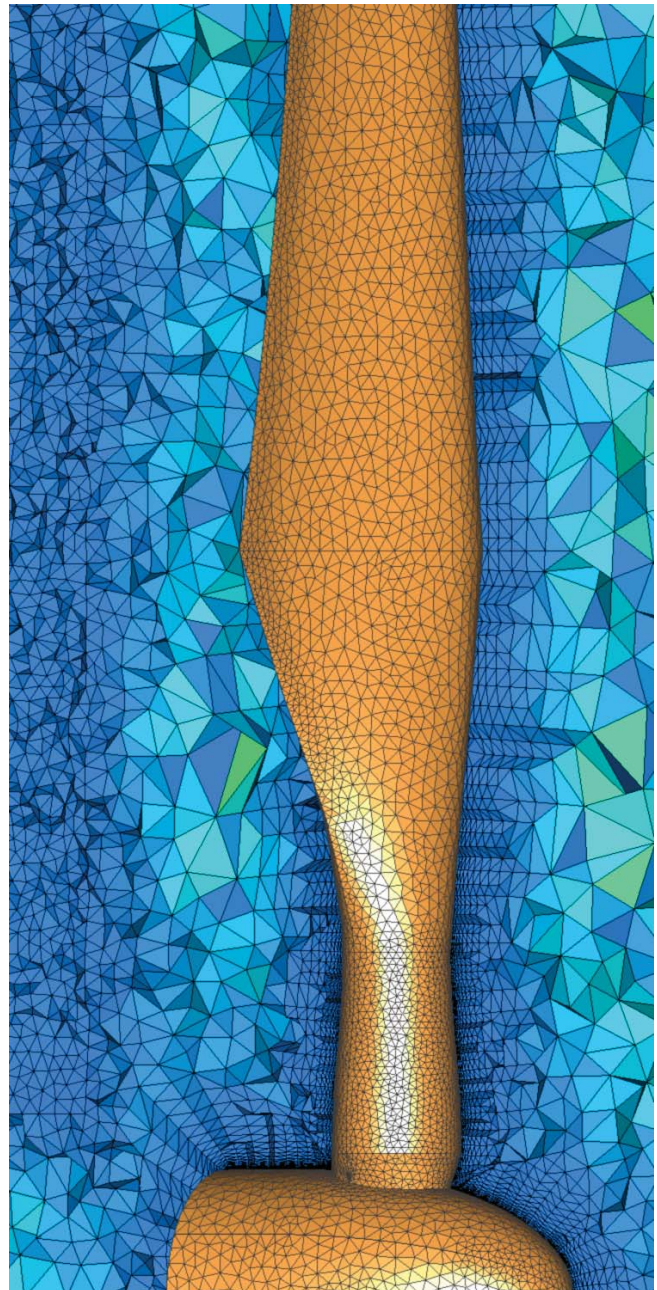


Figure 6: Surface grid and portion of prism-tetrahedral volume grid from T-Rex.

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www.pointwise.com.**