



Mesh Cutting in Farming Simulator 15

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GAME DEVELOPERS CONFERENCE®

MOSCONE CENTER · SAN FRANCISCO, CA

MARCH 2-6, 2015 · EXPO: MARCH 4-6, 2015



Farming Simulator

- Realistic farming simulation allowing the player to grow crops, breed livestock, and...
- ..., since FS 15, cut trees!
- Developed by GIANTS Software, Zürich.





Logging Demo





Mesh Cutting in Three Steps

- Visual mesh and collision geometry are split by a plane:
 1. Split the visual mesh (XYZs, UVs, normals) and tessellate cross sections.
 2. Split the collision geometry.
 3. Compute mass properties for the pieces.



Visual Mesh

- For fast retrieval of the cross-section and cut pieces we rely on a boundary rep.
- Triangle-based B-rep is loosely based on the *Corner Table* [Rossignac, et al. 2002].
- Winged- and half-edge B-reps are less suitable due to larger memory footprint (+1K trees on PC, Xbox 360, PS3, etc.).



Cross Sections





Cross Sections

- Cross sections are non-intersecting loops.
- UVs horizontal scale is fixed. Skinny trees have fewer growth rings than fat trees.
- Cross-section UVs are mapped to a plane orthogonal to branches' grow direction.
- Cuts of earlier cuts have matching UVs.



Collision Geometry

- Composed of convex polyhedra.
- Splitting a convex by a plane results in convex pieces.





Mass Properties

- Mass properties of the cut pieces are computed from the collision geometry.
- Total mass, center of mass, and inertia tensor are computed per convex polyhedron [Mirtich 1996].
- Mass properties of compounds of convexes are combined per piece.



References

- J. Rossignac et al. *Edgebreaker on a Corner Table: A simple technique for representing and compressing triangulated surfaces*. 2002
- K. Mamou. *HACD: Hierarchical Approximate Convex Decomposition of 3D Meshes*.
<http://sourceforge.net/projects/hacd>. License: BSD.
- Brian Mirtich. *Fast and accurate computation of polyhedral mass properties*. Journal of Graphics Tools, 1996.