Recursive Tessellation

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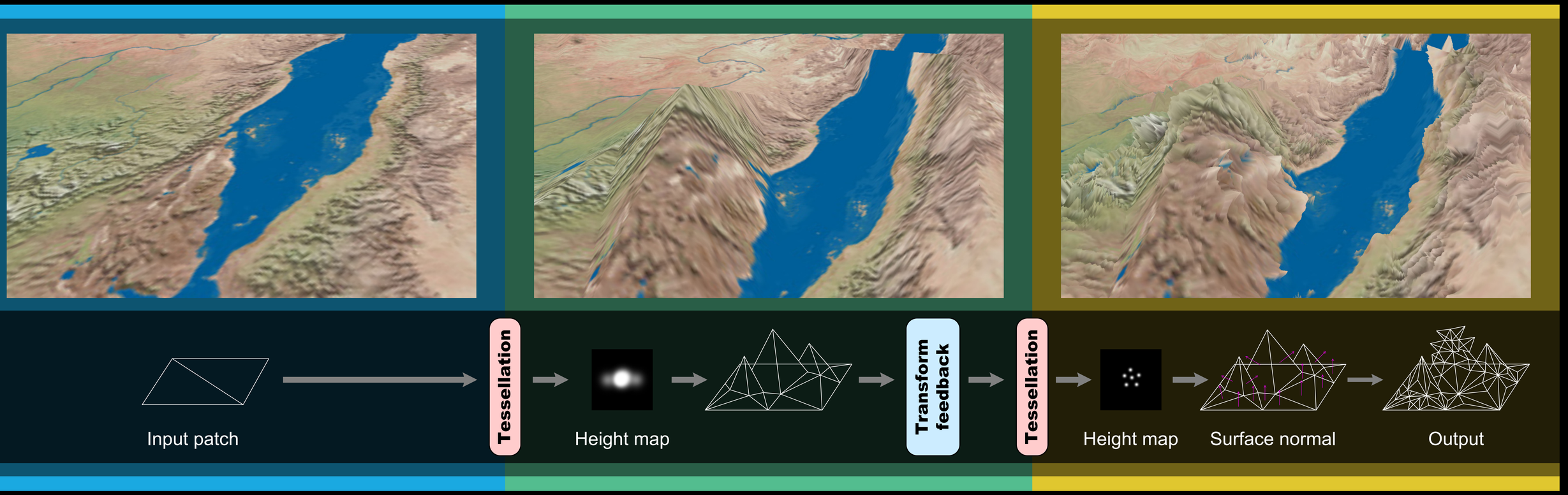
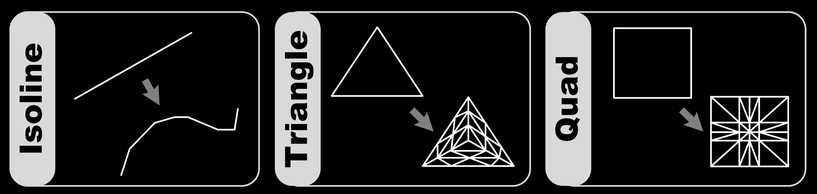


Motivation

Tessellation?

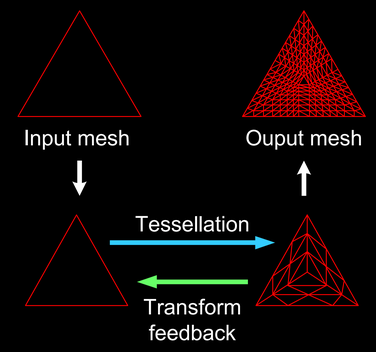
Tessellation shaders, available from the latest GPUs, allow us to subdivide a coarse input patch to tiny primitives.



Challenges

— Increasing degrees of tessellation by combining HW tessellation with transform feedback to go beyond HW tessellation limits.
— Multi-level height elevation for higher surface details.

Our Approach



Recursive Tessellation Multi-stage tessellation, combining tessellation and transform feedback (or stream-out in Direct3D), allows us to (virtually) infinitesimally subdivide a coarse mesh beyond typical hardware limits, which can lead to extremely detailed geometric representations.

Adaptive Level-of-Detail The tessellated mesh can be also a cache for on-demand tessellation, which may vary by level of details (LODs), and further serve as a fundamental building block for highly dynamic adaptive LOD management.

Multi-Stage Displacement Mapping With respect to the new normals of the tessellated meshes, we can apply another instance of displacement mapping recursively, which significantly enhances high-frequency details against the initial height elevation.

Rendering Performance

The frame rates reached 2910, 2850, and 2820 fps for meshes with 300K, 500K, and 1M triangles, respectively, which are generally higher than those without tessellation for the same number of triangles.