Preview

https://www.youtube.com/wa tch?v=TBap-r45q-M

SuperD: SubD Modeling without Subdivision

Visualization of SuperD Models in Verto Studio VR

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What are Subdivision Surfaces? (SubD)

Smoothly approximate a wireframe "cage"



CG Modeling and Animation Market

It is used to some degree in almost all industries that employ digital artists. -theOrangeDuck.com



Problems with SubD

Extraordinary points and limited continuity Clusters of recursively defined patches Irregular triangulation Shape problems



Steven Anson Coons



What are Coons Patches



Bilinearly blended Coons

The Bilinear Coons patch is defined by :

$$P(u, v) = S_1(u, v) + S_2(u, v) - S_3(u, v)$$



• Why ?

 S_1 interpolates A, B, C, D and the curves P1 and P2

 S_2 interpolates A, B, C, D and the curves Q1 and Q2

 S_1+S_2 does not interpolate A,B,C,D any more, one has to subtract a term depending on A,B,C,D and linear in u and v.



Take aways

- 1. Tangent ribbons match across
- patches for G¹ continuity ribbons
- 2. Blend to tangent ribbons
- 3. Blend function = 1 for on one edge, 0 other edges
- 4. Add sides, subtract corners.

Take aways

1. Tangent ribbons match across patches for G¹ continuity ribbons

- 2. Blend to tangent ribbons
- 3. Blend function = 1 for on one edge, 0 other edges
- 4. Add sides, subtract corners.
- (Relaxed condition, no corners, eg, Bezier, SuperD)



N-sided Patches joined with high order continuity

Create curve wireframe from SubD cage.



Face centers

Face centers become Bezier endpoints



Create curve wireframe from SubD cage.



Tangents lie in flats

Curves meet with continuity at endpoints

Derive interior control points from edge midpoints



- Create G^k continuous *ribbons* from curve grid.
- (Coons take away)

Create ribbons between opposing pairs Bezier curves along connecting base curve.



Conitinuity of curves "can" be inherited between adjacent ribbons and surfaces (Coons take away) "Multi-sided Transfinite Surfaces Based on Ribbons", Péter Salvi, Tamás Várady, Alyn Rockwood, *CAGD*, Dec 2012.



Weighted blend of ribbons based on distance To edges (Take aways 2 and 3, Coons patch): "Multi-sided Transfinite Surfaces Based on Ribbons", Péter Salvi, Tamás Várady, Alyn Rockwood, *CAGD*, Dec 2012.



Take away concepts from Coons' Patch:

Blend ribbons; blend away corner flats

$$S(u,v) = \sum_{i=1}^{n} R_i(s_i, d_i) \cdot B_i(d_1, \dots, d_n) - \sum_{i=1}^{n} Q_{i,i-1}(s_i, s_{i-1}) \cdot B_{i,i-1}(d_1, \dots, d_n).$$

But, with SubD Control Cage:

Blend ribbons only, because curves always have simple crossings, AND ribbons are simpler

$$S(u,v) = \sum_{i=1}^{n} R_i(s_i, d_i) \cdot B_i(d_1, \dots, d_n)$$



with SubD Control Cage:

Blend ribbons blend away corner flate



- No recursive
- No clusters of patches
- Good triangulations
- Better shapes (assert)



- No extraordinary points
- Smoother surfaces





Mobile friendly

- small database,
- few memory fetches,
- no recursion,
- efficient surface calculation



Mobile friendly

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- few memory fetches,
- no recursion,
- efficient surface calculation

SO WHAT?



• Also! Interacts with other polygon files (obj) with limited smoothing, but often acceptable



Graphical advantages on mobiles

Extraordinary points and limited continuity

No Clusters of recursively defined patches No Irregular triangulation

Shape problems



be desirable to have some handles for controlling the interpolating surface. In essence it simulates the way in which patternmakers work, that is, with modelling along and their thumber. They interpolate smoothly house particular single simulations with Performing one blend on top of another is simply a matter of composing ordinate transformations. The computational load for such compositions of increase as n^2 , where n is the level of frequencies of the second seco

Computational advantages on mobiles

Small data base (control cage), no recursion allows direct streaming of display polys to GPU. It is fast!



SuperD Demo



iPad App SuperD BoulderGraphics.Apple Store

