Withering Fruits: Vegetable Matter Decay and Fungus Growth

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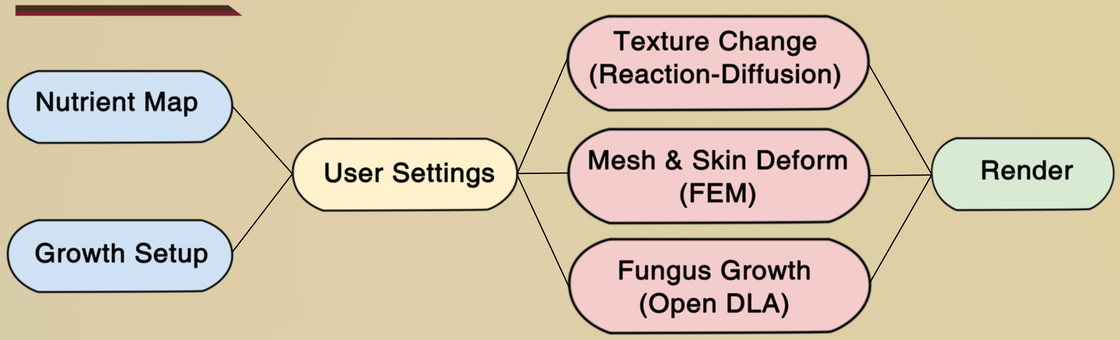
PIPELINE

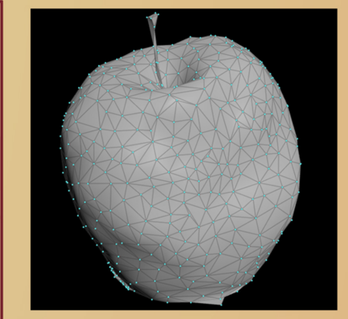


OVERVIEW

This work proposes a parametrised method for recreating drying and decaying vegetable matter from the fruits category, by taking into account the biological characteristics. The most common type of post-harvest apple moulds are Penicillium expansum (Blue Mould) and Botrytis cinerea (Gray Mould) [Kovács et al. 2013; Pierson et al. 1971]. The pipeline contains the three main phenomena implementations: mould propagation, volume shrinking and fungus growth on surface.

VOLUME SHRINKING & WRINKLES

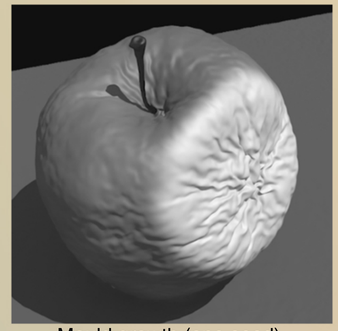
A lower resolution model is created, on which shrinking forces are applied according to the nutrient map [Liu et al. 2011]. The shrinking speed and behaviour are determined by the nutrient values, the biological parameters and the user defined timestep. The FEM solver uses the point deformation from the shrinking volume, and adds wrinkle detail between the points.



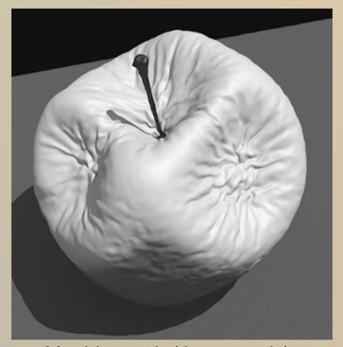
Shrinking points on low-res model

Rendered results

Real life photographs



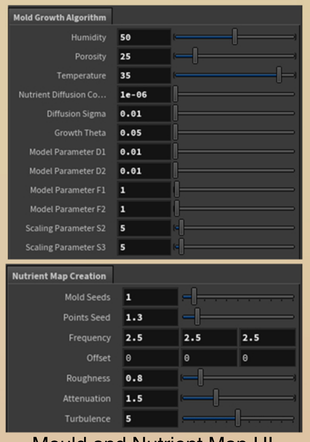
Mould growth (one seed)



Mould growth (three seeds)

MOULD DEVELOPMENT

The mould spread is computed using the reaction-diffusion model shown in equations 1 and 2 [Kider et al 2011]. The resulting values are used to act as an alpha map for the colour change. The mould feeds on the nutrient, and according to these values, fungus will also start developing from the surface.



Mould and Nutrient Map UI

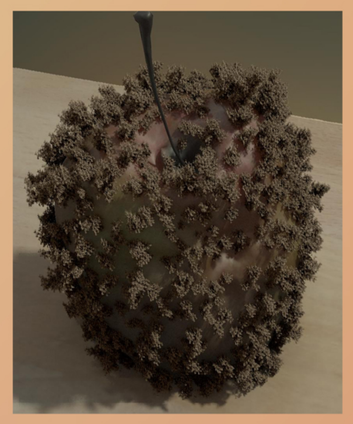
$$\frac{\delta u}{\delta t} = \nabla \cdot (D_c \nabla u) + \theta f(u,n) - a(u.n)u \qquad (1)$$

$$\frac{\delta v}{\delta t} = a(u,n)u \qquad (2)$$

Fungus photograph [Larsen 2018]

FUNGUS CREATION

The method used for the fungus growth is based on Lichen algorithms: Open Diffusion Limited Aggregation [Desbenoit et al. 2004]. This method takes the mould seeds and creates long branching filaments of multicellular aggregates. The process is based on the nutrient levels.



Early stage fungus test

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