Determining shape of strawberry crops with spherical harmonics

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Mathematical Representation

$$Y_l^m(\theta, \phi) = \sqrt{\frac{(2l+1)(l-m)!}{4\pi(l+m)!}} e^{im\theta} P_l^m(cos(\phi))$$

$$f(\theta, \phi) = \sum_{l=0}^{\infty} \sum_{m=-l}^{m=l} c_l^m Y_l^m(\theta, \phi)$$

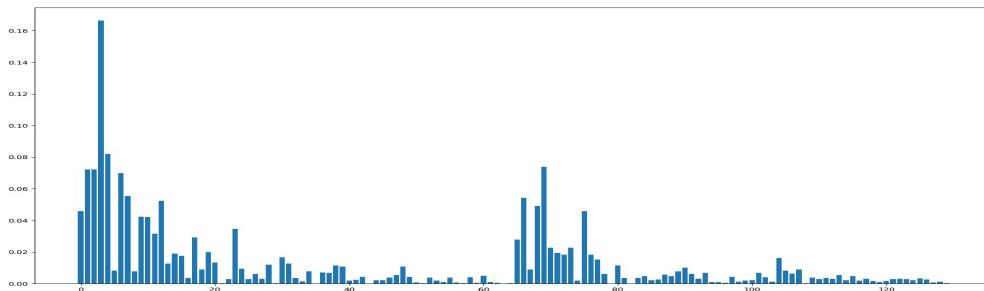l , m : Degree and order of harmonic

c_l^m : Coefficients for each harmonics

θ : Azimuthal coordinates

ϕ : Polar coordinates

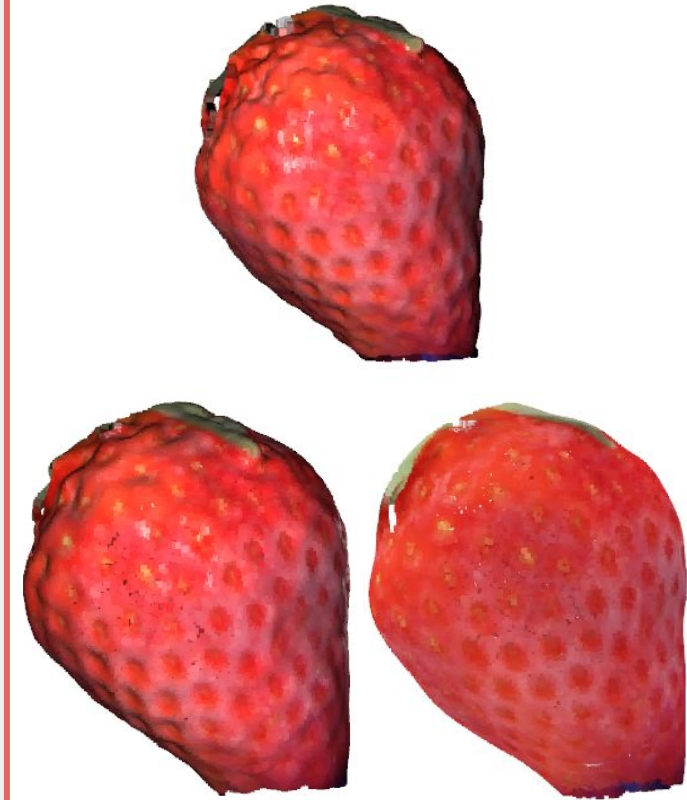$Y_l^m(\theta, \phi)$: Spherical harmonics definition for angle θ and ϕ.

Compact Representation

Normals
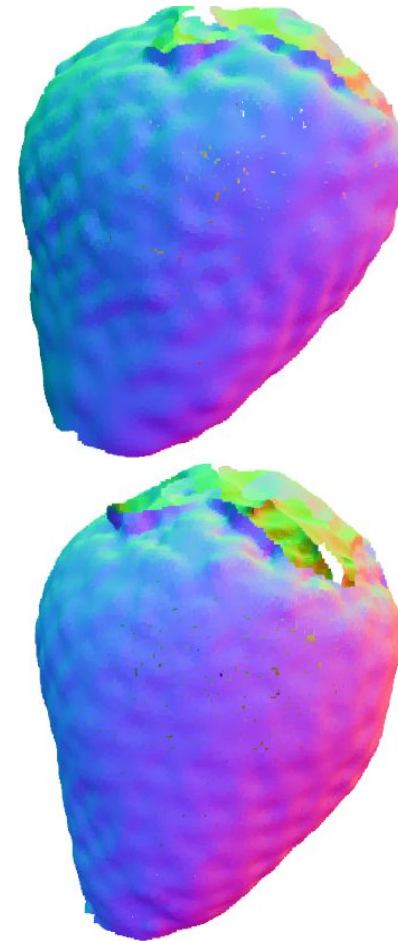
Original

Degree 30 with fine details   *Degree 15 with broad shape*

Reconstruction