Surface Area for Final Project

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The following page has a good explanation of solid angle as well as the surface area of the patch: http://mathworld.wolfram.com/SolidAngle.html

From that page we know that

$$\Omega = \int \int sin(\phi)\, d\theta\, d\phi$$

We want to find the surface area of a patch $[\phi_1, \phi_2] \times [\theta_1, \theta_2]$. This ends up being

$$\Omega = \int_{\phi_1}^{\phi_2} \int_{\theta_1}^{\theta_2} sin(\phi)\, d\theta\, d\phi$$

$$\Omega = (\theta_2 - \theta_1) \int_{\phi_1}^{\phi_2} sin(\phi)\, d\phi$$

$$\Omega = (\theta_1 - \theta_2)(cos\phi_2 - cos\phi_1)$$

Our current patches are in the form $[x_1, y_1] \times [x_2, y_2]$ which are squares in the unit disk. This page lists more information: http://luki.webzdarma.cz/eng_12_en.htm