Note

The $m \times 3$ matrix $U = [cos(\boldsymbol{\theta})sin(\boldsymbol{\varphi}) \quad sin(\boldsymbol{\theta})sin(\boldsymbol{\varphi}) \quad cos(\boldsymbol{\varphi})]$ is the sphere of radius 1 where $\boldsymbol{\theta} = [\theta_1 \quad \cdots \quad \theta_m]$ is a vector of size m $(0 \leq \boldsymbol{\theta} \leq 2\pi)$ and $\boldsymbol{\varphi} = [\varphi_1 \quad \cdots \quad \varphi_m]$ is a vector of size m $(0 \leq \boldsymbol{\varphi} \leq \pi)$.

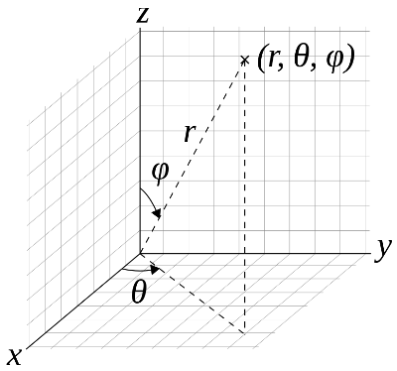

Figure 1. Spherical coordinates (r, θ, φ) are $x = r \cdot cos(\theta) \cdot sen(\varphi)$, $y = r \cdot sen(\theta) \cdot sen(\varphi)$ and $z = r \cdot cos(\varphi)$ where $r \in [0; \infty)$ is radial distance, $\theta \in [0; 2\pi)$ is polar angle and $\varphi \in [0; \pi)$ is azimuthal angle.