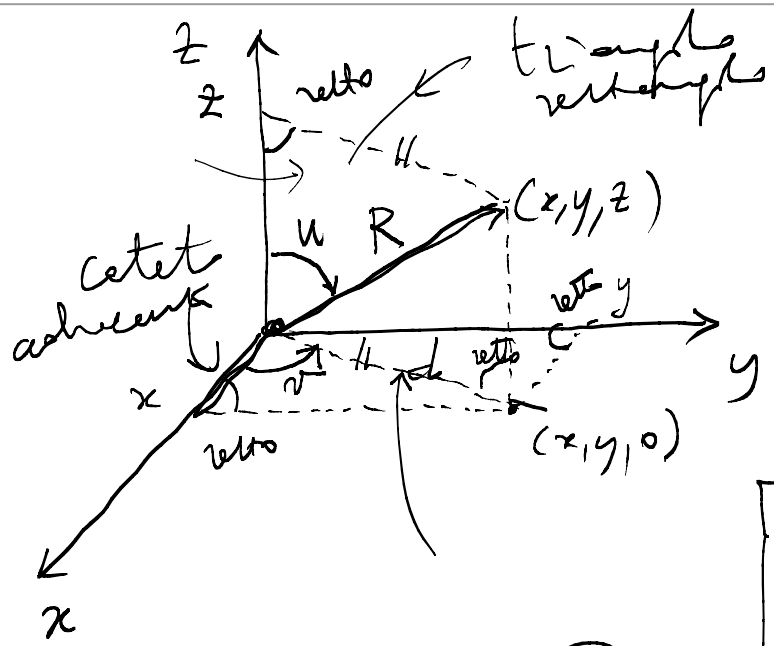
Note Title 4/16/2021

$$x(u,v) = \sin u \cos v$$
$$y(u,v) = \sin u \sin v$$
$$z(u,v) = \cos u$$

$$R = 1$$



$$u \in [0, \pi]$$

$$v \in [0, 2\pi]$$

R, u, v Coordinate polari sferiche

$$z = R \cos u$$

$$d = R \sin u$$

$$x = d \cos v = R \sin u \cos v$$

$$y = d \sin v = R \sin u \sin v$$

$$\phi(u,v) = \begin{pmatrix} \sin u \cos v \\ \sin u \sin v \\ \cos u \end{pmatrix}$$

$(u_0, v_0) \in [0,\pi] \times [0, 2\pi]$

$$\phi_u = \begin{pmatrix} \cos u_0 \cos v_0 \\ \cos u_0 \sin v_0 \\ -\sin u_0 \end{pmatrix}$$

$$\phi_v = \begin{pmatrix} -\sin u_0 \sin v_0 \\ \sin u_0 \cos v_0 \\ 0 \end{pmatrix}$$

$$\psi(\alpha,\beta) = \phi(u_0,v_0) + \alpha\phi_u(u_0,v_0) + \beta\phi_v(u_0,v_0)$$

punto di tangenza

due spostamenti sul piano tangente

In $\mathbb{R}^3$ si può trovare la direzione normale calcolando

$$\gamma(u_0,v_0) = \phi_u(u_0,v_0) \times \phi_v(u_0,v_0)$$

$$\begin{pmatrix} \cos u_0 \cos v_0 \\ \cos u_0 \sin v_0 \\ -\sin u_0 \end{pmatrix} \times \begin{pmatrix} -\sin u_0 \sin v_0 \\ \sin u_0 \cos v_0 \\ 0 \end{pmatrix} =$$

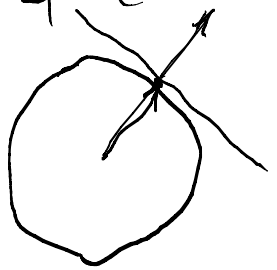
$$= \begin{pmatrix} \sin u_0^2 \cos v_0 \\ -\left(-\sin u_0^2 \sin v_0\right) \\ \sin u_0 \cos u_0 \cos^2 v_0 + \sin u_0 \cos u_0 \sin v_0^2 \end{pmatrix} =$$

VETTORE NORMALE

$$= \sin u_0 \begin{pmatrix} \sin u_0 \cos v_0 \\ \sin u_0 \sin v_0 \\ \cos u_0 \end{pmatrix} = \sin u_0 \, \phi(u_0, v_0)$$

$\sin u_0 \cos u_0$

è parallelo a $\phi(u_0, v_0)$



scalare

$$\phi(u_0, v_0) = \begin{pmatrix} x_0 \\ y_0 \\ z_0 \end{pmatrix}$$

$$\gamma(u_0, v_0) = \begin{pmatrix} a \\ b \\ c \end{pmatrix}$$

Piano normale al vettore normale $\begin{pmatrix} a \\ b \\ c \end{pmatrix}$, cioè il piano tangente per $\begin{pmatrix} x_0 \\ y_0 \\ z_0 \end{pmatrix}$:

$$a(x - x_0) + b(y - y_0) + c(z - z_0) = 0$$

spostamento sul piano $\perp \begin{pmatrix} a \\ b \\ c \end{pmatrix}$