$\forall$ primitive a

$$\begin{bmatrix} a_x^a \\ a_y^a \\ a_z^a \end{bmatrix} \& \begin{bmatrix} h_x^a \\ h_y^a \\ h_z^a \end{bmatrix}$$

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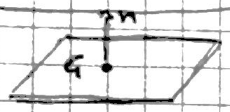
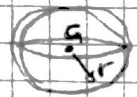
Primitive:



has $\boxed{G}$ x y z

$\boxed{a}x + \boxed{b}y + \boxed{c}z + \boxed{d} = \emptyset$

$$\boxed{n} = \begin{cases} n_x = a / \sqrt{a^2+b^2+c^2} \\ n_y = b / \sqrt{a^2+b^2+c^2} \\ n_z = c / \sqrt{a^2+b^2+c^2} \end{cases}$$

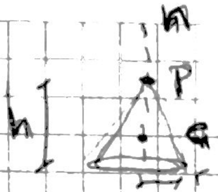


has $\boxed{G}$ x y z

centre = G

has $\boxed{\text{Radius}}$

$$hp \begin{cases} h_x = 0 \\ h_y = 0 \\ h_z = \emptyset \end{cases}$$



has $\boxed{G}$ x y z

~~has $\boxed{h}$~~ has $\boxed{h}$

has $\boxed{r}$

has $\boxed{P}$ { x y z

has $\boxed{n}$ { x y z

has $\boxed{G}$ z

has $\boxed{h}$ ~~xyz~~

has $\boxed{P}$ { x y z

has $\boxed{r}$

has $\boxed{n}$ { x y z

operation

* in a small range of $|\cdot| < \varepsilon$

relation

dot $\quad a \cdot b = \begin{bmatrix} a_x \\ a_y \\ a_z \end{bmatrix} \cdot \begin{bmatrix} b_x \\ b_y \\ b_z \end{bmatrix} = a_1 b_1 + a_2 b_2 + a_3 b_3 \quad \longleftrightarrow \quad a \cdot b = \emptyset \Leftrightarrow a \perp b$

cross $\quad a \times b = \begin{bmatrix} a_x \\ a_y \\ a_z \end{bmatrix} \times \begin{bmatrix} b_x \\ b_y \\ b_z \end{bmatrix} = \begin{array}{l} 11 \\ 21 \\ 31 \end{array} \begin{bmatrix} a_y b_z - a_z b_y \\ a_z b_x - a_x b_z \\ a_x b_y - a_y b_x \end{bmatrix} \begin{array}{l} 12 \\ 22 \\ 32 \end{array} \quad \longleftrightarrow \quad a \times b = \emptyset \Leftrightarrow a \parallel b$

distance between axis

$$\begin{cases} a = \begin{bmatrix} a_x^a \\ a_y^a \\ a_z^a \end{bmatrix} + t \begin{bmatrix} h_x^a \\ h_y^a \\ h_z^a \end{bmatrix} \\ a^b = \begin{bmatrix} a_x^b \\ a_y^b \\ a_z^b \end{bmatrix} \end{cases} \Rightarrow d^2 = (a_x^a + th_x - a_x^b)^2 + (a_y^a + th_y - a_y^b)^2 + (a_z^a + th_z - a_z^b)^2$$

where $t = -\dfrac{h_x(a_x^a - a_x^b) + h_y(a_y^a - a_y^b) + h_z(a_z^a - a_z^b)}{h_x^2 + h_y^2 + h_z^2}$

hp: sphere always // to all primitive type. $\quad h \begin{vmatrix} x \\ y \\ z \end{vmatrix} \begin{matrix} \ne \emptyset \\ \ne \emptyset \\ \ne \emptyset \end{matrix}$

$a \odot b \Leftrightarrow a \parallel b \ \& \ d(a,b) = \emptyset$

G on axis relation $\quad P = \{x, y, z\}$

$|G_p^a - G_p^b| < \varepsilon \quad \longleftrightarrow \quad a$ along P b

$G_p^a < G_p^b + \varepsilon$

$G_p^a > G_p^b + \varepsilon \quad \longleftrightarrow \quad$ right, left, behind, before

$\longleftrightarrow$ ~~[illegible]~~ explanation of always two different [illegible] coassiale $\Longleftrightarrow$ $\begin{cases} \cancel{A /\!/ B} \quad a /\!/ b \\ c_g^a \in b \pm \varepsilon \\ c_g^b \in a \pm \varepsilon \end{cases}$

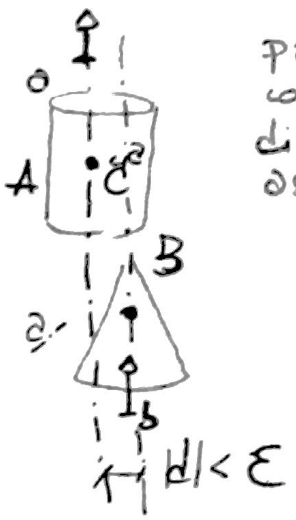
$A \odot B$

Primitive

$\Downarrow$

hp: spher // Primitive

$\boxed{\text{sempre!}}$



paralleli e con il baricentro di un $\in$ all'asse dell'altro

$$a: \left\{ \begin{bmatrix} c_{gx}^a \\ c_{gy}^a \\ c_{gz}^a \end{bmatrix} + t \begin{bmatrix} a_x \\ a_y \\ a_z \end{bmatrix} \right. \qquad c_g^b: \begin{bmatrix} c_{gx}^b \\ c_{gy}^b \\ c_{gz}^b \end{bmatrix}$$

$$\boxed{d^2 = \underbrace{\underbrace{(c_{gx}^a + \underbrace{t \cdot a_x}_{t_{cx}} - c_{gx}^b)}_{tabx}{}^2}_{tabx2} + \underbrace{\underbrace{(c_{gy}^a + \underbrace{t \cdot a_y}_{t_{cy}} - c_{gy}^b)}_{taby}{}^2}_{taby2} + \underbrace{\underbrace{(c_{gz}^a + \underbrace{t \cdot a_z}_{t_{cz}} - c_{gz}^b)}_{tabz}{}^2}_{tabz2}}$$

tab d

~~tab2~~ d^2

d^2 is min $\Longleftrightarrow \Delta = \dfrac{d\,(d^2(t))}{dt} = 0$ da cui mi posso ricavare t

$$\Delta = \frac{d}{dt}\Big\{ \left(c_{gx}^{a\,2} + t^2 \cdot a_x^2 + c_{gx}^{b\,2} + 2 c_{gx}^a \cdot t \cdot a_x - 2 c_{gx}^a c_{gx}^b - 2 c_{gx}^b \cdot t \cdot a_x \right) +$$
$$\left(c_{gy}^{a\,2} + t^2 \cdot a_y^2 + c_{gy}^{b\,2} + 2 c_{gy}^a \cdot t \cdot a_y - 2 c_{gy}^a c_{gy}^b - 2 c_{gy}^b \cdot t \cdot a_y \right) +$$
$$\left(c_{gz}^{a\,2} + t^2 \cdot a_z^2 + c_{gz}^{b\,2} + 2 c_{gz}^a \cdot t \cdot a_z - 2 c_{gz}^a c_{gz}^b - 2 c_{gz}^b \cdot t \cdot a_z \right) \Big\}$$

$$= \cancel{2} t (a_x^2 + a_y^2 + a_z^2) + \cancel{2} (c_{gx}^a a_x + c_{gy}^a a_y + c_{gz}^a a_z) - \cancel{2} (c_{gx}^b a_x + c_{gy}^b a_y + c_{gz}^b a_z)$$

$$= t (a_x^2 + a_y^2 + a_z^2) + a_x (c_{gx}^a - c_{gx}^b) + a_y (c_{gy}^a - c_{gy}^b) + a_z (c_{gz}^a - c_{gz}^b)$$

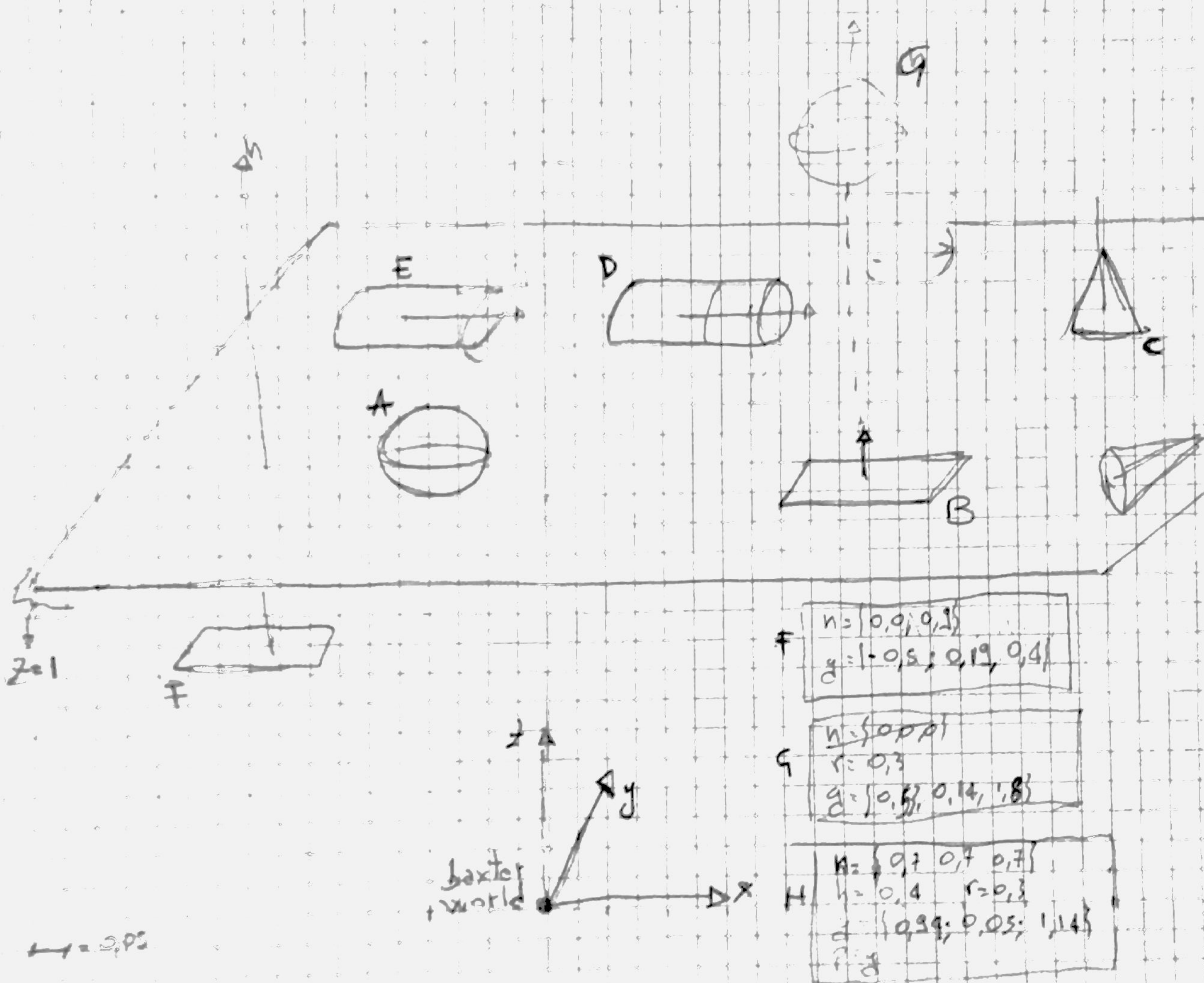
$$\Rightarrow \boxed{t = - \frac{a_x (c_{gx}^a - c_{gx}^b) + a_y (c_{gy}^a - c_{gy}^b) + a_z (c_{gz}^a - c_{gz}^b)}{a_x^2 + a_y^2 + a_z^2}}$$

$$= + \frac{a_x \cdot c_{gx}^{ab} + a_y c_{gy}^{ab} + a_z c_{gz}^{ab}}{a_{2x} + a_{2y} + a_{2z}} = + \frac{+ a c_g x + a c_g y + a c_g z}{a_{2x} + a_{2y} z} = + \frac{+ a c_g x + a c_g 1}{a 2} \ominus \frac{c_g 2}{a 2} =$$

$$= + \frac{c_g 2}{a}$$

[m]

A	B	C	D	E
h={0,0,0} r= 0,1 g={0,2; -0,2; 1,1}	h={0,0,1} → {a,b,c} d= g={0,35, 0,15, 1}	h={0,0,0,9} h=0,2 r=0,15 p=0 d={0,95, 0,55, 1,15}	h={1,1,0,0} r=0,2 p=0 h=0,1 d={-0,03, 0,59, 1,13}	h={1,0,0} r=0,2 p=0 d={-0,2, 0,53, 1,14}



F
h={0,0; 0,1}
d={-0,5; 0,19, 0,4}

G
h={0,0,0}
r=0,3
d={0,5, 0,14, 1,8}

H
h={0,7 0,7 0,7}
h=0,4 r=0,3
d={0,99; 0,05; 1,14}

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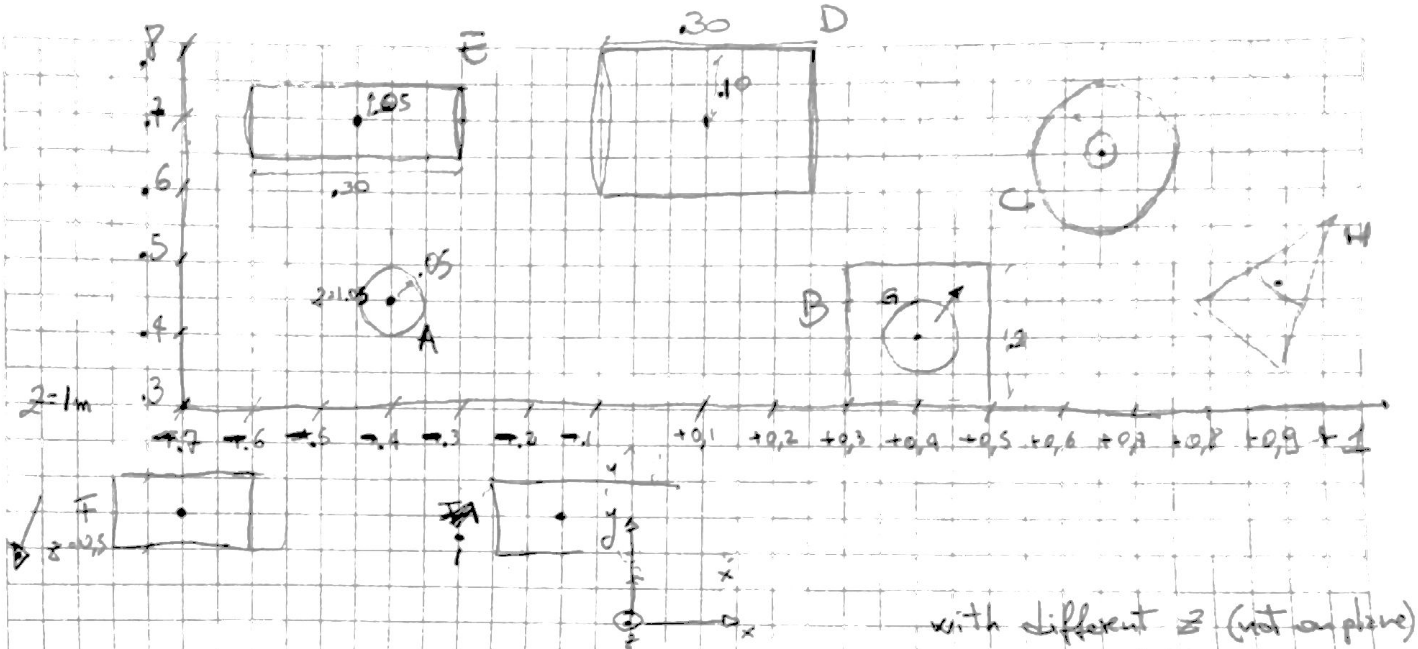
AL **VERTICE** DEI MOTORI DI RICERCA



with different z (not on plane)

noise

A → { r = .05 ; g: [-.33 .43 1.1] (-.4 .45 1.07)

B { h = [-.02 0.05 -1.12] (0 0 1) ; g = [+0.35 .43 1.05] (+.4 .4 1)

C { n = [.1 -.03 1.05] (0 0 1) ; g = [.68 .69 1.2] (.65 .65 1.1) ; h = .3 r = .2

D { n = [0.9 .01 .03] (1 0 0) ; g = [0.2 .75 .15] (.1 .7 1.1) ; h = .3, r = .1

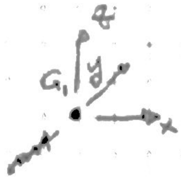
E { h = [1.1 0.07 -.2] (1 0 0) ; g = [-.4 .75 1] (-.45 .7 1.05) ; h = .3 r = .05

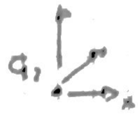
H { h = [0.9 1.1 1.2] (1 1 1) ; g = [0.93 .47 1.3] ??? ; h = .3 r = .2

F → { g [-.9 .2 .3] (-.7 .15 .3) ; h [0.1 -.1 1.1] (0 0 1)

G → { g = [.35 .43 1.8] (.4 .4 3) ; r = .5

I { g = [-.1 .2 .3] ; n = [.1 -.1 1.1]





$G_1 = g_1^x \quad g_2^x$
$g_1^y \quad g_2^y$
$g_1^z \quad g_2^z$

A $(g_1^x - g_2^x)^2 < \varepsilon^2 \Rightarrow$ G_1 along-x G_2 if (B & C)
B $(g_1^y - g_2^y)^2 < \varepsilon^2 \Rightarrow$ G_1 along-y G_2 if (A & C)
C $(g_1^z - g_2^z)^2 < \varepsilon^2 \Rightarrow$ G_1 along-z G_2 if (B & C)

→ ~~G_1 // G_2 & G_1 along G_2~~
G_1 coaxial G_2

→ G_1 along-P_1 G_2 & G_1 along-P_2 G_2
⇓
G_1 coplanar-P_1P_2 G_2

$g_1^x - g_2^x > \varepsilon \Rightarrow$ G_2 ~~rigth~~ onTheRigthOf G_1
$-g_1^x + g_2^x > +\varepsilon \Rightarrow$ G_2 onTheLeft Of G_1

$g_1^y - g_2^y > \varepsilon \Rightarrow$ G_2 bechind Of G_1
$g_1^y - g_2^y < -\varepsilon \Rightarrow$ G_2 inFront Of G_1

$g_1^z - g_2^z > \varepsilon \Rightarrow$ G_2 isAbove G_1
$g_1^z - g_2^z < -\varepsilon \Rightarrow$ G_2 isBelow G_1

~~a<b~~ $b - a > \varepsilon$

$a - b < -\varepsilon \rightarrow -a + b > \varepsilon \rightarrow b$