GOOD!

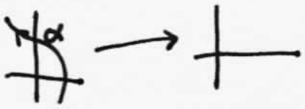
4/16/2011

How do forces transform?

$$\beta(t) = \alpha(t) - \sigma(t)$$

we assume m is unchanged in new co-ords.

Absolute Fixed sys



translation

$m\ddot{\alpha} = F(\alpha(t))$

[could be more general $F(\alpha, \dot{\alpha})$]

we seek $m\ddot{\beta} = G(\beta)$

$\alpha = \beta + \sigma$

obviously $\ddot{\beta}(t) = \ddot{\alpha} - \ddot{\sigma}$

$$m\ddot{\beta} = m\ddot{\alpha} - m\ddot{\sigma}$$

$$m\ddot{\beta} = F(\alpha) - m\ddot{\sigma}$$

$$= F(\beta + \sigma) - m\ddot{\sigma}$$

$$= (F \circ \tau_\sigma)(\beta) - m\ddot{\sigma}$$

let $\tau_\sigma(\beta) = \beta + \sigma$

$$F \longmapsto \overbrace{F \circ \tau_\sigma + -m\ddot{\sigma}}^{G(\beta)?}$$

Here $F = 0$
$m\ddot{\beta} = -m\ddot{\sigma}$
still non zero accel

Now consider pure rotation:

$\beta(t) = Q^T\alpha$

$m\ddot{\alpha} = F(\alpha)$

$$\alpha = Q\beta$$

$$\dot{\alpha} = \dot{Q}\beta + Q\dot{\beta}$$

$$= QW\beta + Q\dot{\beta} = Q(\omega \times \beta + \dot{\beta})$$

$$\ddot{\alpha} = Q(\ddot{\beta} + \dot{\omega} \times \beta + 2\omega \times \dot{\beta} + \omega \times (\omega \times \beta))$$

$$(Q^T m\ddot{\alpha}) = m\ddot{\beta} + m\dot{\omega} \times \beta + m2\omega \times \dot{\beta} + m\omega \times (\omega \times \beta)$$

$$Q^T(F(\alpha))$$

$$= \underbrace{Q^T F(Q\beta)}_{\tilde{F}(\beta)} - m\dot{\omega} \times \beta - m2\omega \times \dot{\beta} - m\omega \times (\omega \times \beta) = m\ddot{\beta}$$

THIS DOES IT!

Here, if $F \equiv 0$ we still have
accel: $m\ddot{\beta} = -m(\dot{\omega} \times \beta + 2\omega \times \dot{\beta} + \omega \times (\omega \times \beta))$

not time depend

σ of this form

Gallilean transform $\beta = A\alpha + \overbrace{vt + b}$ $\qquad \alpha = A^{-1}(\beta - vt - b)$

$$\dot{\beta} = A\dot{\alpha} + v$$

$$\ddot{\beta} = A\ddot{\alpha}$$

$$m\ddot{\beta} = Am\ddot{\alpha} = AF(\alpha) = AF(A^{-1}(\beta - vt - b))$$

$$\boxed{m\ddot{\beta} = A \cdot F(A^{-1}(\beta - (vt + b)))}$$

that is considered to preserve the form of Newton's eq.
Maybe it is the $F = 0$ case

Look at McCauley.

I have a curve $\tilde{\alpha} = m\alpha(t)$