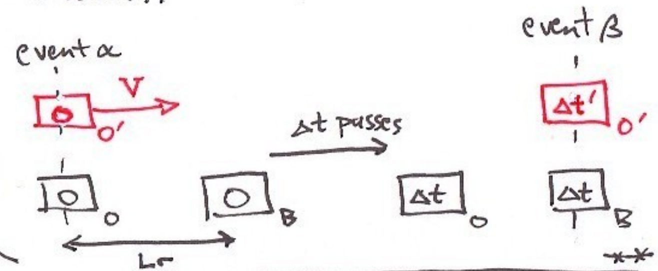
Physics 106b-2011 Class 31 Monday 4-20-11 Summary p. 1 of 2

Synchronization

Henry & Albert video ⇒ events that are simultaneous (but separated in space) in one frame are not simultaneous in a different frame!!!

analysis

As seen in S:



Rest length L_r ≡ distance between two objects as measured in frame for which they're at rest

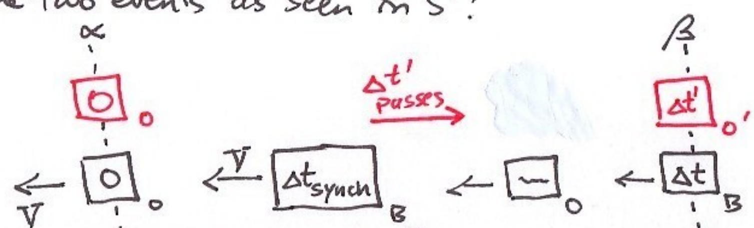
In Δt, O' moves a distance L_r ⇒

$V = L_r/\Delta t$. ①

O' measures Δt_{proper} between events α & β

⇒ $\Delta t = \gamma \Delta t'$ ②

Same two events as seen in S':



clock of B looks like it's "chasing" clock of O

since clocks of O & B are synchronized in S-frame, we know they won't be in S'-frame.

At event β, clock of B reads

$$\Delta t = \Delta t_{synch} + \Delta t'/\gamma$$

(Δt_{synch}: initial reading; $\Delta t'/\gamma$: time shown to have elapsed)

①,② ⇒

Chasing clock leads by $\Delta t_{synch} = \dfrac{L_r V}{c^2}$

Fitzgerald Contraction

Symmetry of frames ⇒ they agree on the magnitude of relative velocities

(see above)

⇒ In S: $V = \frac{L_r}{\Delta t}$ In S′: $V = \frac{L'}{\Delta t'}$ ⟶ $\frac{L_r}{\Delta t} = \frac{L'}{\Delta t'}$ ⇒ $\frac{L_r}{\gamma \Delta t'} = \frac{L'}{\Delta t'}$

$\Delta t = \gamma \Delta t'$ (Since O' measures the proper time between when she passes O and when she passes B.)

** ⇒ $\boxed{L_{other} = L_r/\gamma}$ **

Numerical example