

MEEN 221 section 503/505

Lecture #25, 11/25/14

- Adminis-*trivia*

- Assignments

- Dynamics HW 14 due today
- Dynamics HW 15 due next Friday (December 5th) (Will be available online tomorrow, I will email you, you have 10 days to finish so start earlier!)

- Class Representatives

- 503 Nicole Moss <nsmoss@tamu.edu>
- and Cameron Uptmore <aggcam@tamu.edu>
- 505 Kevin Adrian Tad-y <kevintady@tamu.edu>
- and Qishu Zhang qishuzhang@tamu.edu

- Topics for the day

- Kinematics

- Cartesian Coordinate Systems
- Polar Coordinate System
- Path-Normal Coordinate System



Curvilinear Motion: Coordinate Conversions 2D (summary)

- Cartesian or Polar to Path Coordinates

Why useful: we want to know rate of the change of the speed (a_t helps) and sometime helps finding curvature of the path (a_n helps)

- Connection is the velocity vector
- \underline{v} ALWAYS tangent to path

Cartesian Co. $\left\{ \begin{array}{l} \underline{v}(t) = \underline{\dot{r}}(t) = \dot{x}\underline{i} + \dot{y}\underline{j} = v\underline{e}_t = \dot{s}\underline{e}_t \\ \underline{e}_t = \frac{\underline{V}}{|\underline{V}|} = \frac{\dot{x}}{v}\underline{i} + \frac{\dot{y}}{v}\underline{j} \quad \underline{e}_n = \pm \left(\frac{\dot{y}}{v}\underline{i} - \frac{\dot{x}}{v}\underline{j} \right) \end{array} \right.$

Polar Co. $\left\{ \begin{array}{l} \underline{V}(t) = \underline{\dot{r}}(t) = \dot{r}\underline{e}_r + r\dot{\theta}\underline{e}_\theta \\ \underline{e}_t = \frac{\underline{V}(t)}{|\underline{V}(t)|} = \frac{\dot{r}\underline{e}_r + r\dot{\theta}\underline{e}_\theta}{v} \quad \underline{e}_n = \frac{\pm (r\dot{\theta}\underline{e}_r - \dot{r}\underline{e}_\theta)}{v} \end{array} \right.$

Examining the motion path, we can find correct sign)



Dynamics Problem Decomposition

