EECS 192: Mechatronics Design Lab

Discussion 9: Car Construction and Simulation

GSI: Justin Yim
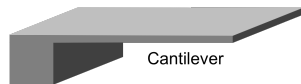
20 & 21 March 2019 (Week 9)

- Car Construction
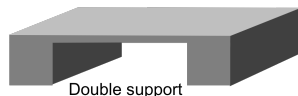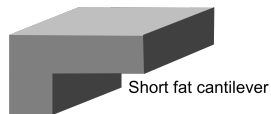
- Controls

- Simulation

Car Construction

Structures to Avoid

- Long and narrow cantilevers
    - Easily bent or snapped
    - Bounce like a diving board (amplifying vibrations)
- Holes close to edges
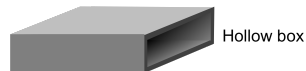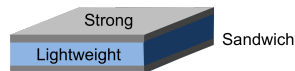   - Stress concentrations

Cantilever

Better Structures

- ~~Long and narrow cantilevers~~
    - Double-support or short and fat cantilevers
    - Support applied moments much better
    - Higher resonant frequency, less likely to oscillate
- ~~Holes close to edges~~
    - Plenty of space around cutouts
    - Fillets or chamfers on sharp internal edges

Short fat cantilever
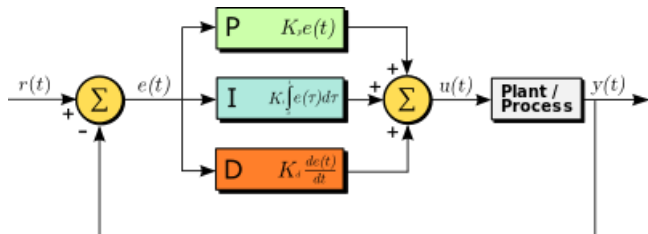

Double support

Many ways to build strong structures

▶ Some ideas for strong & light structures

▶ Composites, tubes, I-beams, lightening holes, trusses, and more

▶ However: reliability first, performance (and weight saving) after

Strong
Lightweight
Sandwich

Hollow box

Trusses

Electronic Hardware Tips!

- ▶ Watch out for current limits through small headers
- ▶ Perfboard- watch out for low current traces
- ▶ Perfboard- dont try to wire up the Buck- it probably will not work. Use a linear regulator instead.
- ▶ STAR!!
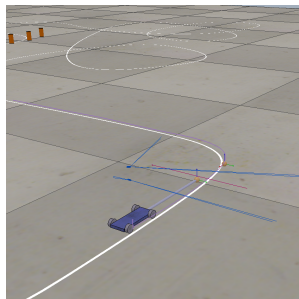- ▶ Heatsinks (especially linear regulators).

Controls

V-REP Simulator

- ▶ Robot simulation environment
- ▶ Built on several standard physics engines
- ▶ Some nice prebuild robot components and interfacing
- ▶ Full free educational version
- ▶ (User Manual Link)

V-REP Car Simulation

- Car modelled in V-REP
- Tune control in simulation through python to get a starting point for the real car
- Homework 2

Setup

- ▶ Installation
    - ▶ Download V-REP (Linux/Windows/Mac Download Link) and unzip it
    - ▶ Download and unzip the homework files
    - ▶ Copy (V-REP)/programming/remoteApiBindings/lib/lib/(your OS)/remoteApi.dll
      into your homework python folder
- ▶ Running
    - ▶ Run V-REP: File "open scene" carscale_oneLoop.ttt
    - ▶ Run python carTest-slew19-line.py
        - ▶ Python will error and V-REP will pop up a warning. Ignore the warning about custom settings and close the pop-up message.
    - ▶ Run python carTest-slew19-line.py again