

Mechanism Feasibility Design

Tutorial Session Notes

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Before Easter

1. Types of Gear
2. Gear Definitions
3. Gear Forces
4. Multi-Stage Gearbox Example
5. Gearbox Design Report Section

You should have evaluated a number of motor, gear ratio and damping values

What are your cases?

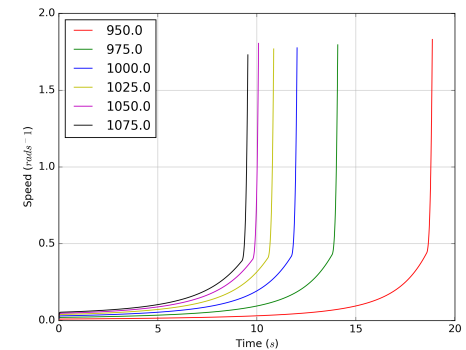
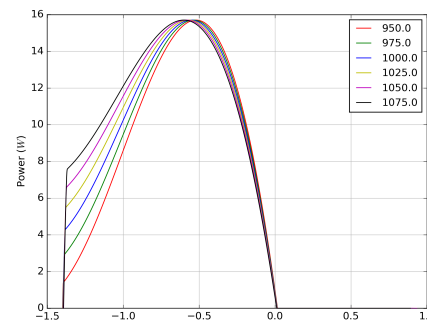
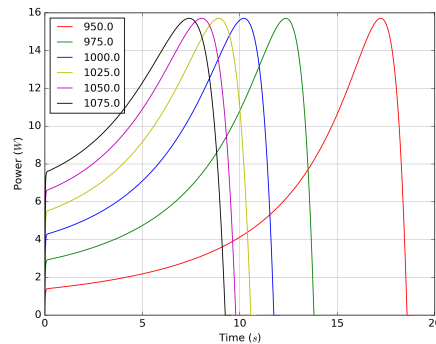
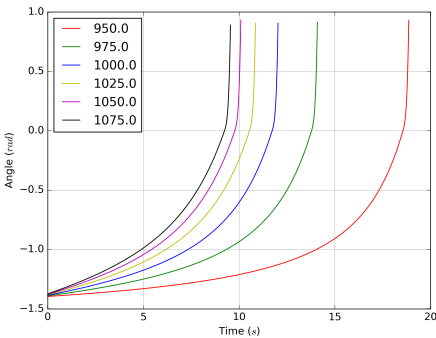
Case No.	Motor	Gear Ratio	Damping
1
2

You should have evaluated a number of motor, gear ratio and damping values

What are your cases?

Case No.	Motor	Gear Ratio	Damping
1
2

Plotting the results

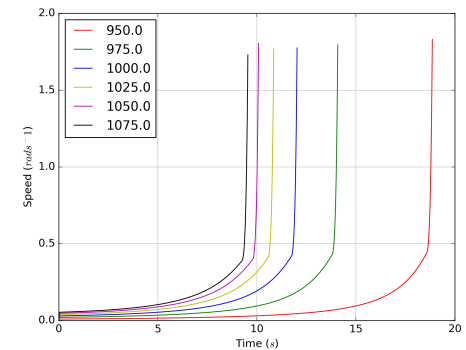
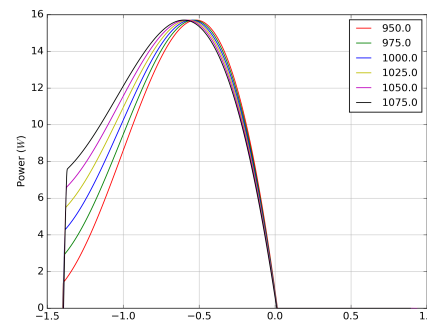
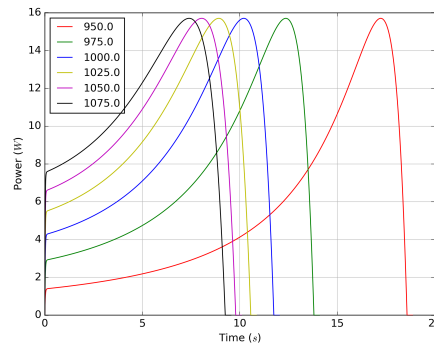
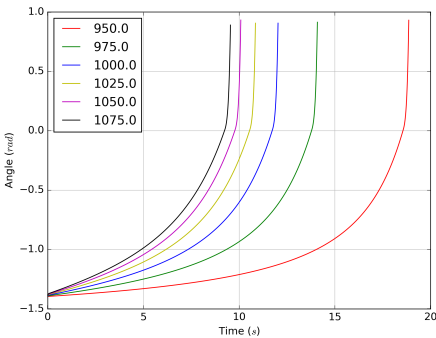


You should have evaluated a number of motor, gear ratio and damping values

What are your cases?

Case No.	Motor	Gear Ratio	Damping
1
2

Plotting the results



Bring key results together and compare your cases

What are your metrics for comparison?

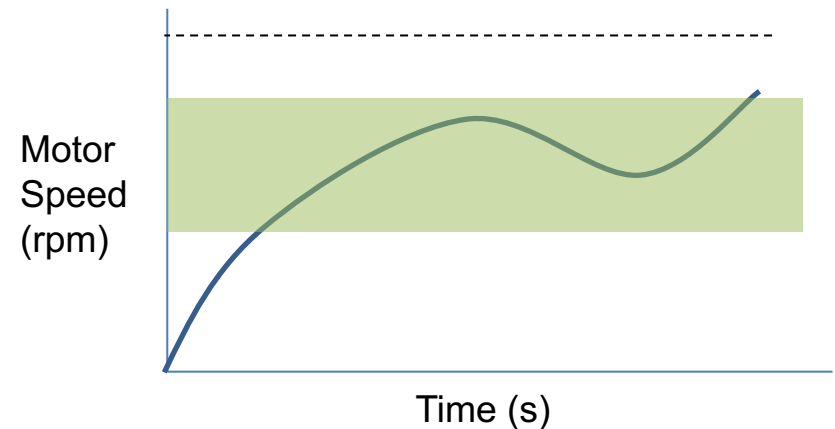
Case No.	Deployment Time	Energy Required	Smoothness of Motion
1
2

You should have evaluated a number of motor, gear ratio and damping values

- What are you investigating?
 - Energy used
 - Smoothness of motion
 - Motor working within its operating window
 - ...?
- What information can the model give you to investigate these?

For example: Motor working within its operating window

- Plot Motor Speed or Torque over time with graph showing the ideal window of operation and the limits of operation



You should have evaluated a number of motor, gear ratio and damping values

- From this analysis and comparative work, you should have selected your
 - Motor
 - Gear Ratio
 - Level of Damping

This Week

- Generate an initial spur and helical gear set to drive your mechanism
- Select type and refine gears
 - Evaluate against forces, packaging and suitability for the application
 - You may have to compromise on your ideal gear ratio from your deployment model
 - Make sure you record your rationale
 - Tooth Hunting
 - Qualitative affordances of each type of gear

Gear Stage	1	2	3
VR			
Combined VR			
Module			
Pinion Teeth			
Pinion PCD (mm)			
Wheel Teeth			
Wheel PCD (mm)			
Hunting Tooth Frequency			
Efficiency			
Pinion Speed (rev/min)			
Wheel Speed (rev/min)			
Pinion Torque (Nm)			
Wheel Torque (Nm)			
Pinion Forces			
Tangential Force (kN)			
Separating Force (kN)			
Resultant Force (kN)			

Lecture 5 contains an example of the process as well as the mathematics

This afternoons lecture

Submission Criteria & Guidelines