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How force profiles are related to speed and sense of vertical motion?

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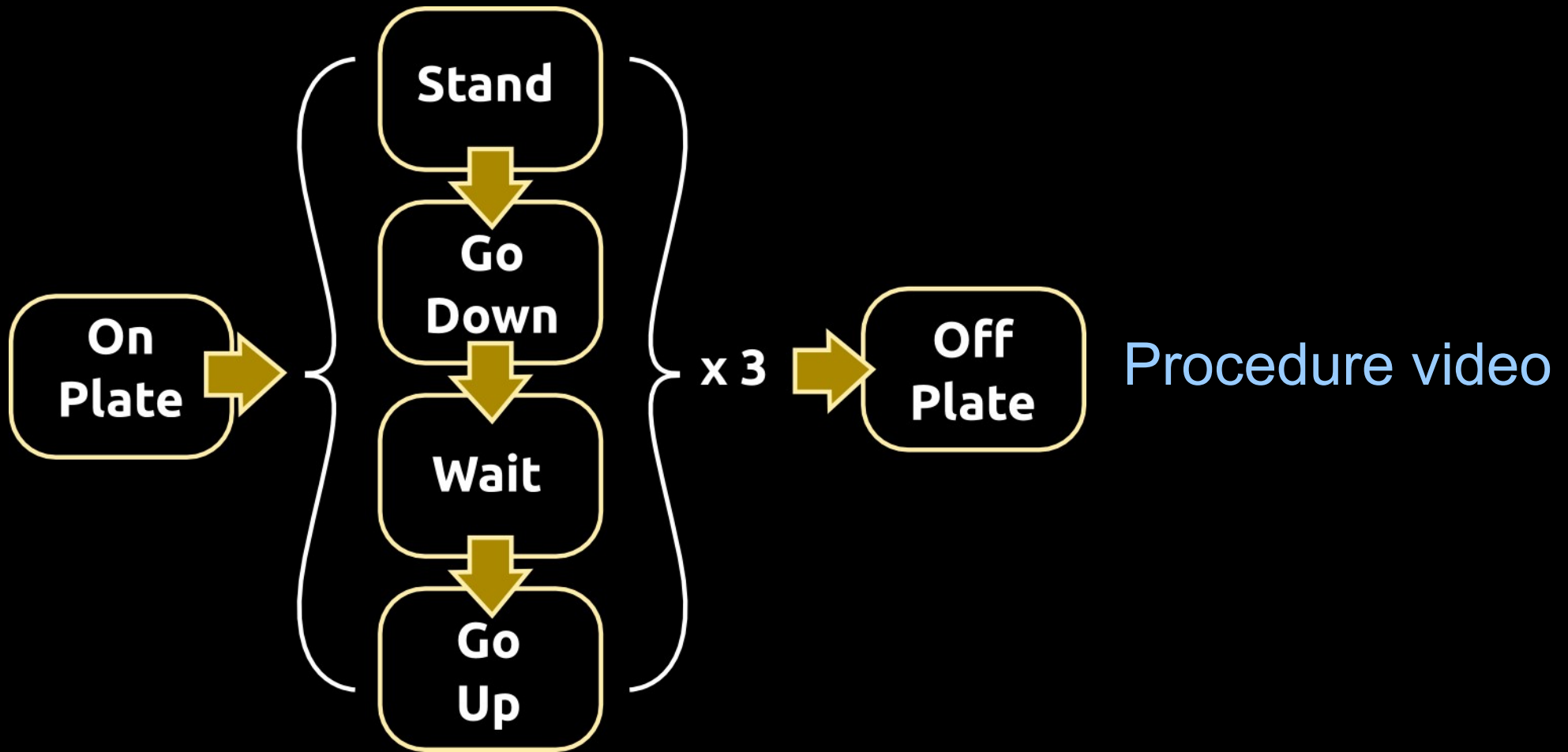
Locomorph Summer School, 27th August 2012

Odense, Denmark

Goals

- Getting up and down to measured differences in vertical ground reaction forces at two different motion speeds.
- Balance and damping ratio studies.
- Comparison between going up force profiles and going down force profiles.
- Characteristic force patterns across individuals.
- Incipient purely mechanical model.

Experiment



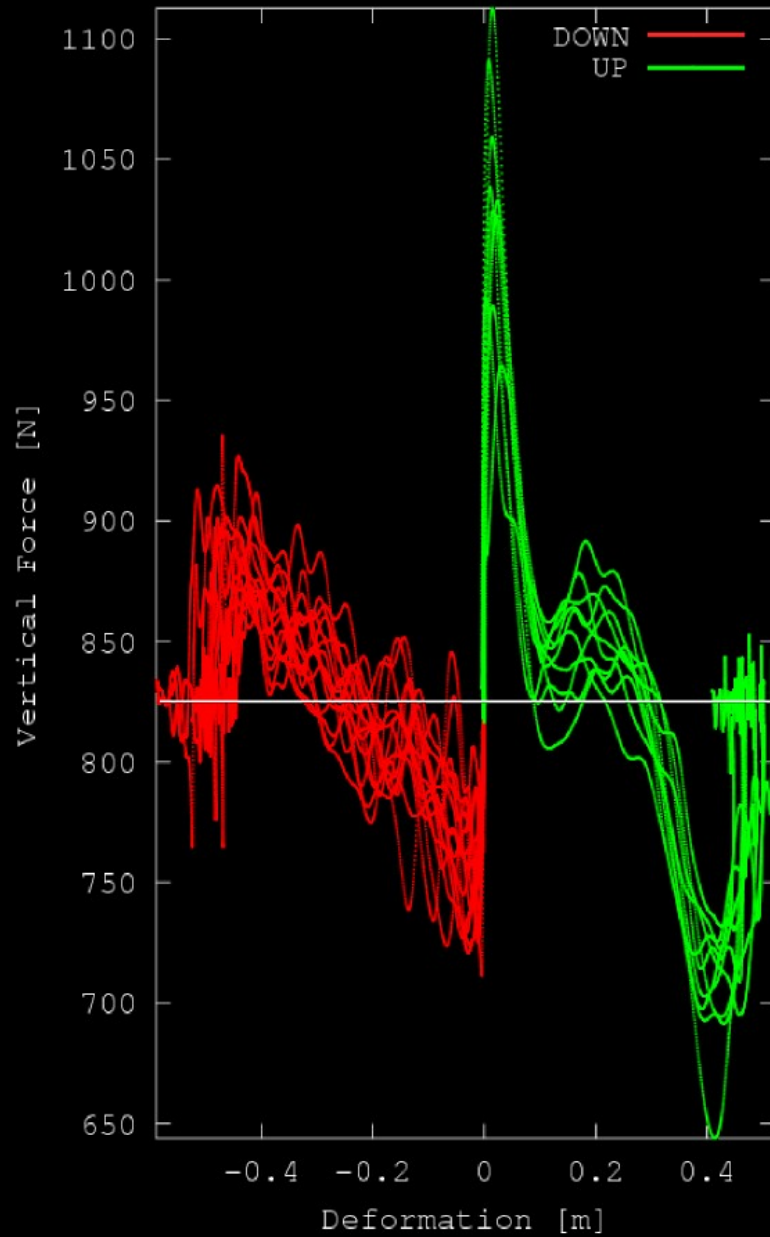
Experiment

- Good amount of data collected: 30 curves for going down and 20 for going up, per subject.
- Female/Male balanced.

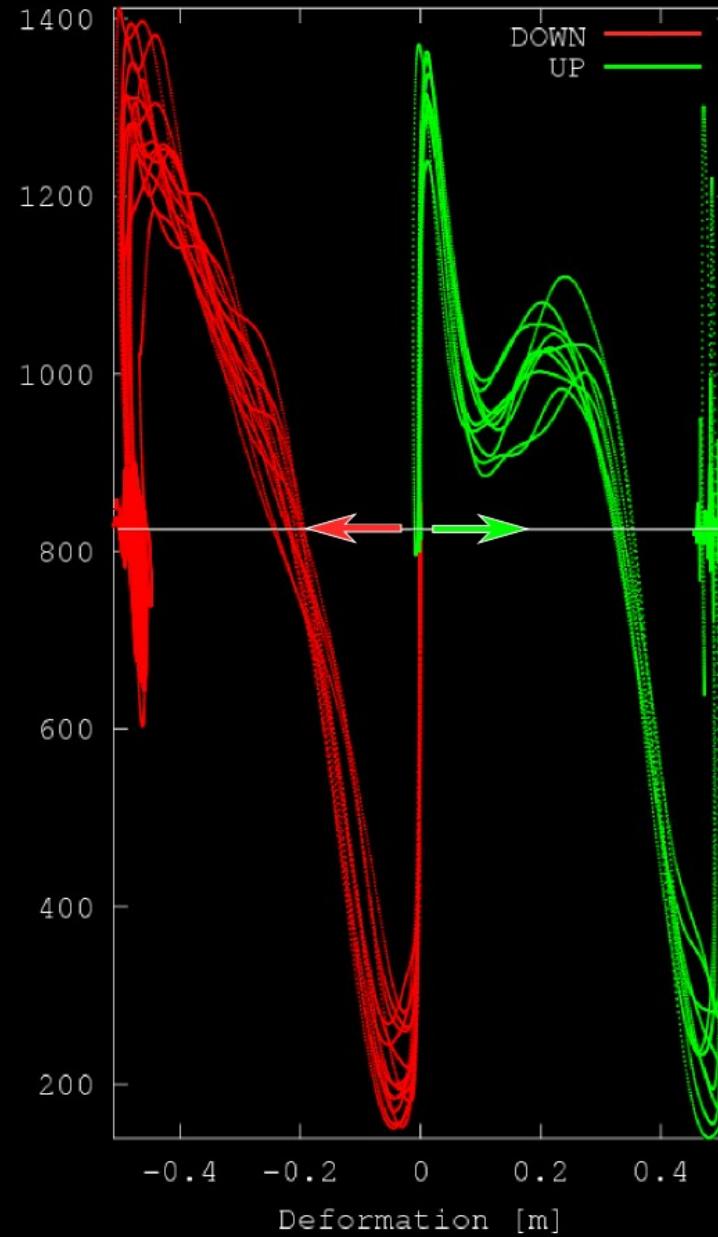
<u>SUBJECT</u>	SEX	AGE	
1	M	42	
2	M	32	
3	M	24	
4	M	42	
5	M	23	
6	F	32	
7	F	24	
8	F	32	
9	F	25	
10	F	25	
		F	M
	MEAN	27.6	32.6

Results

SLOW



FAST



Data overview

Discussions are now allowed!

Results - Observations

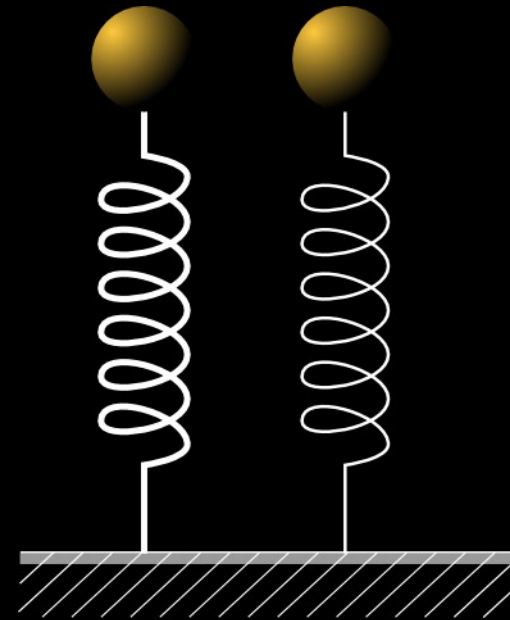
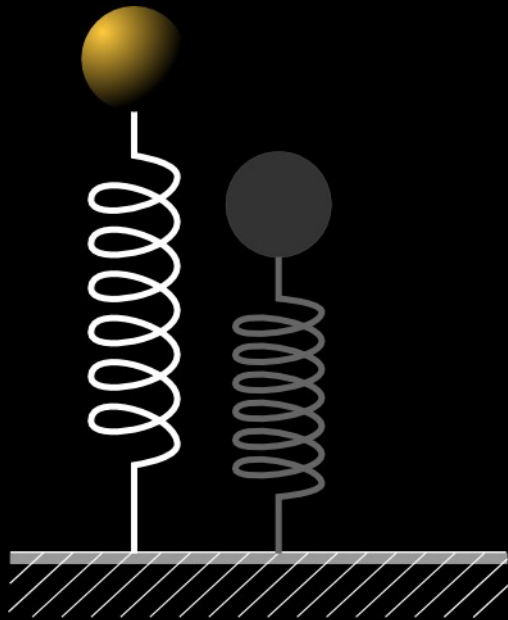
- **Retrograde forces** in both slow and fast for almost all subjects.
- Slow data is noisy and doesn't say much before filtering (future work!).
- Slight asymmetry between going down and going up.
- Change of slope in going down fast.
- Your own?

Retrograde force

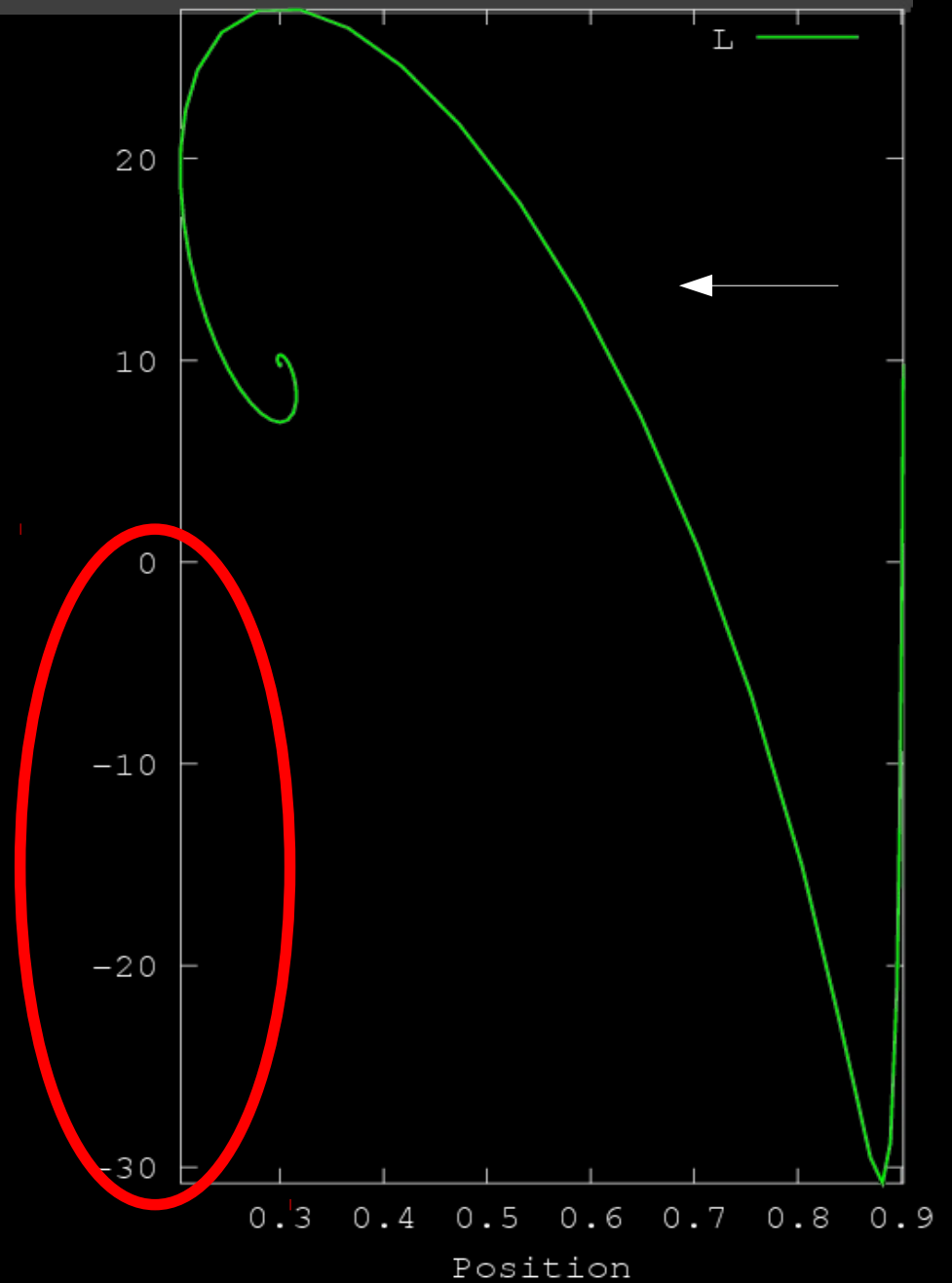
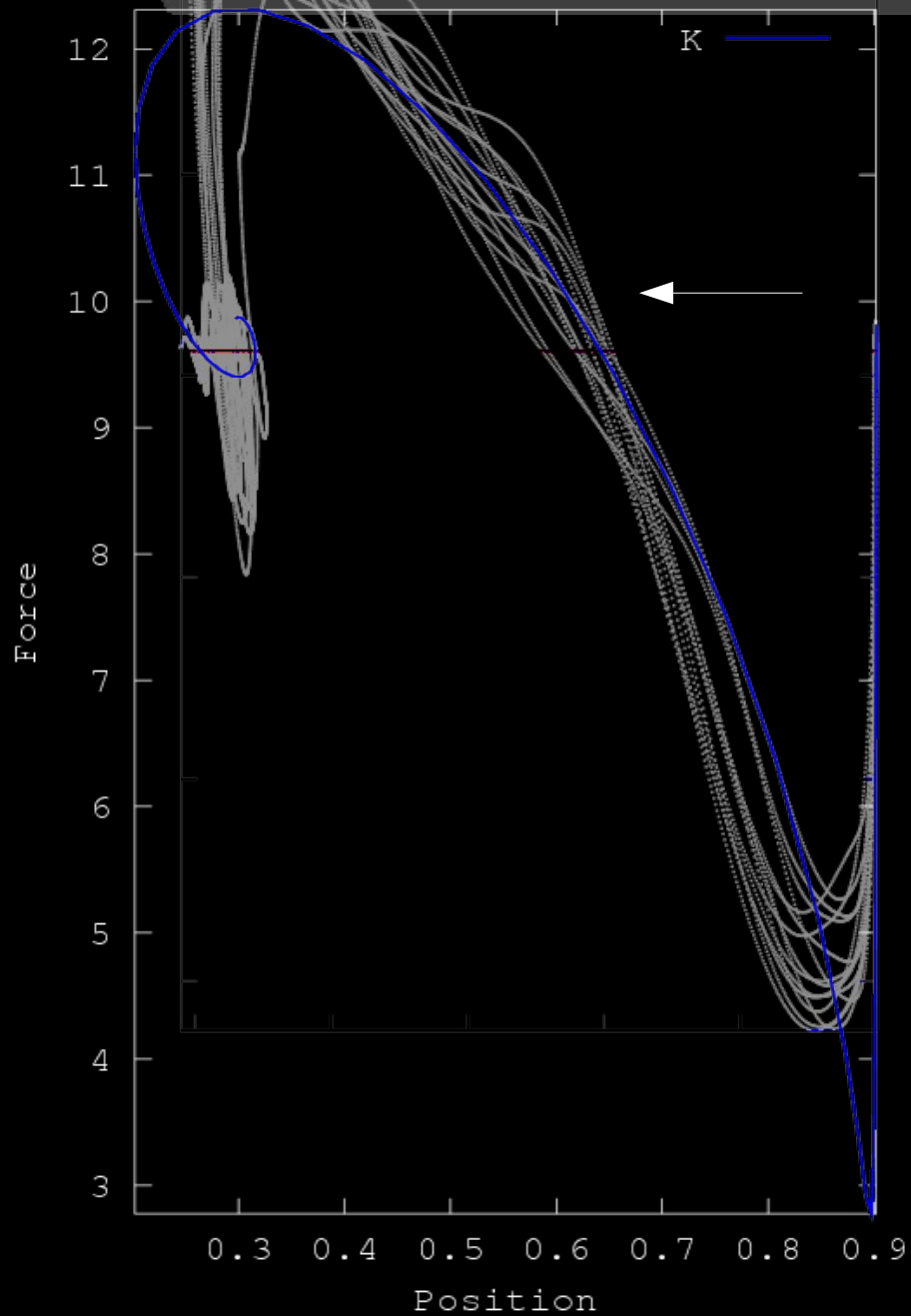
High speed video (*to be analyzed*) while doing one trial on the experimental setup.

Incipient model

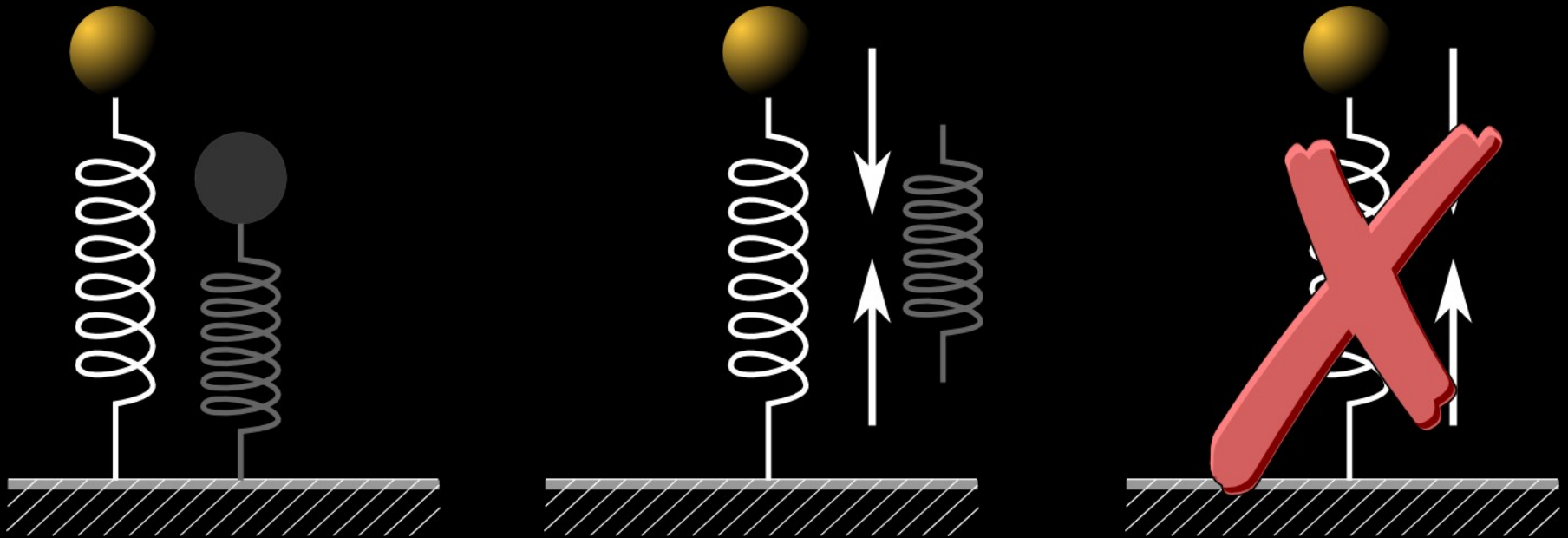
- Linear spring-mass-damper
- Adaptable natural spring length **or**
- Adaptable spring stiffness.



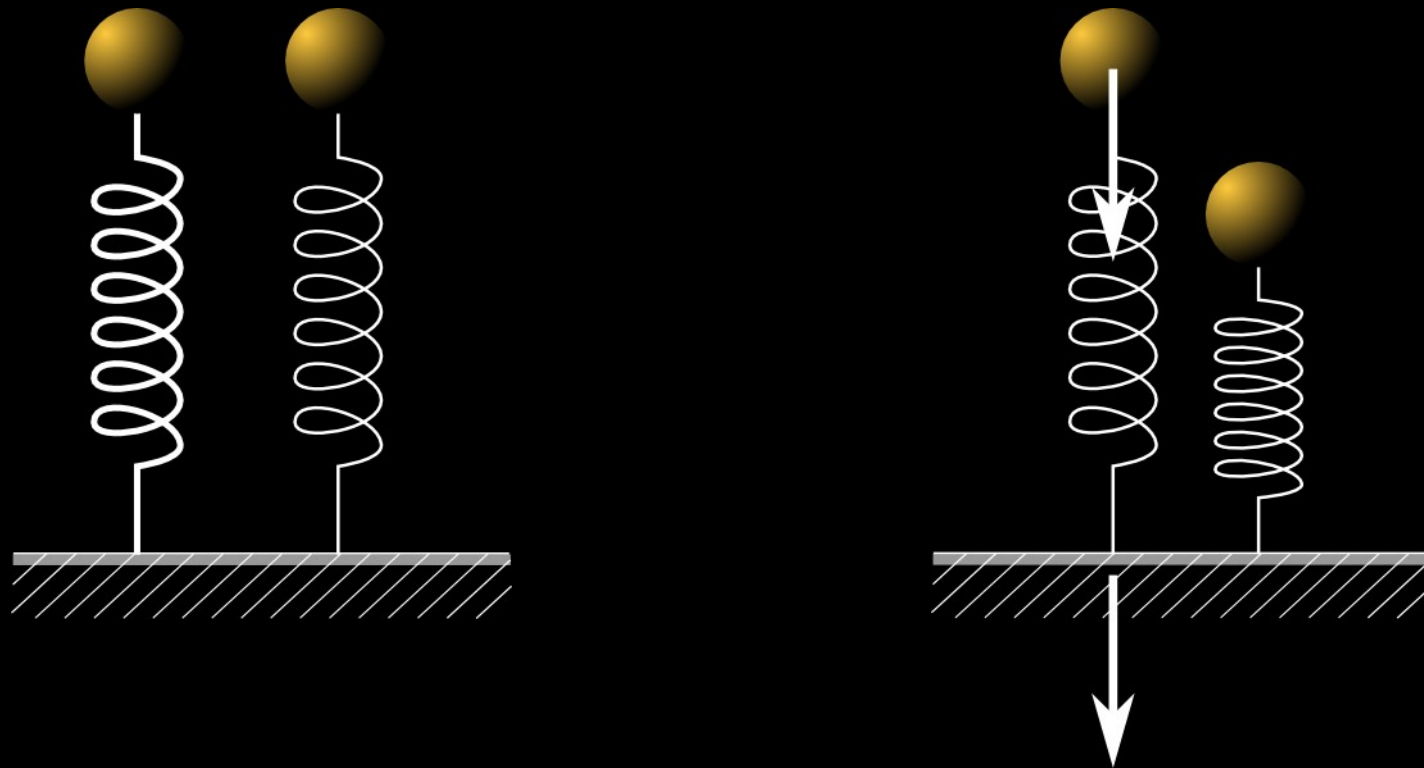
Incipient model



Incipient model



Incipient model



Closing remarks

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Thank you for your time!

Questions?