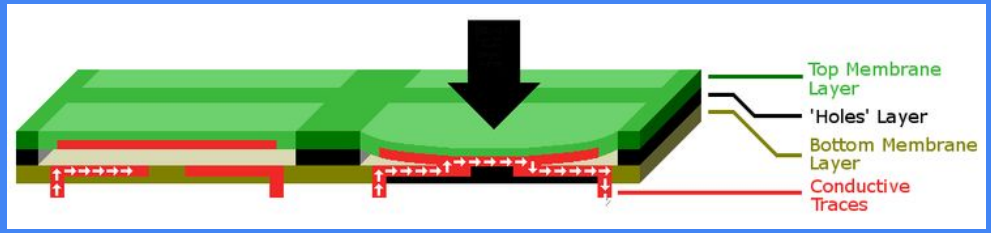
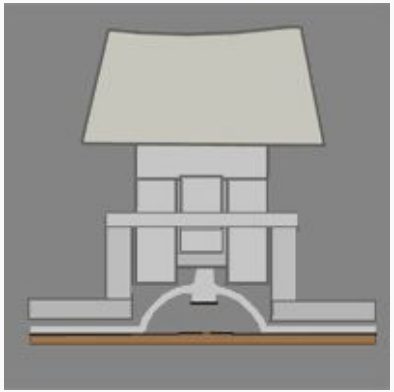
Cherry MX Blue Switch

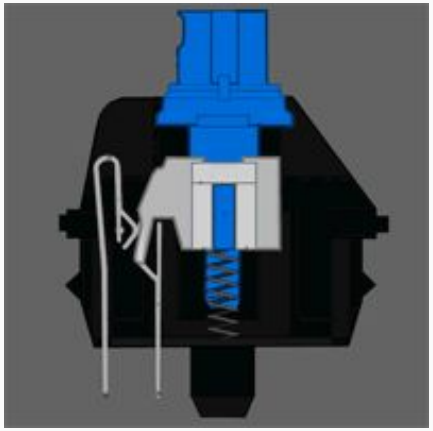
MEEN 431-501
5/1/17
Casey Peterson and Ben Musil

Background



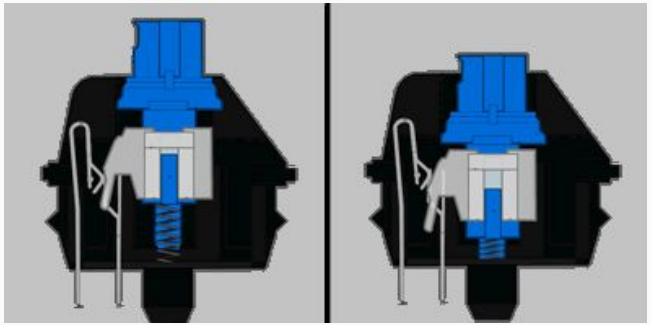
- Mechanical over membrane
  - Comfort/Typing response
  - Durability
  - Customization
  - “Clickity-clackity”
- Types of switch classified by colors
  - Red - linear, low resistance, no feedback
  - Brown - tactile, low resistance, bump feedback
  - Blue - tactile, medium resistance, bump and audible feedback

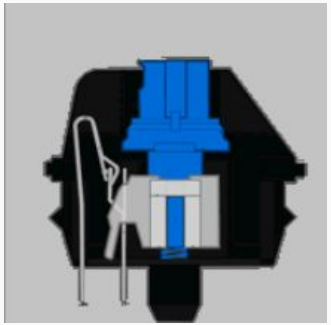




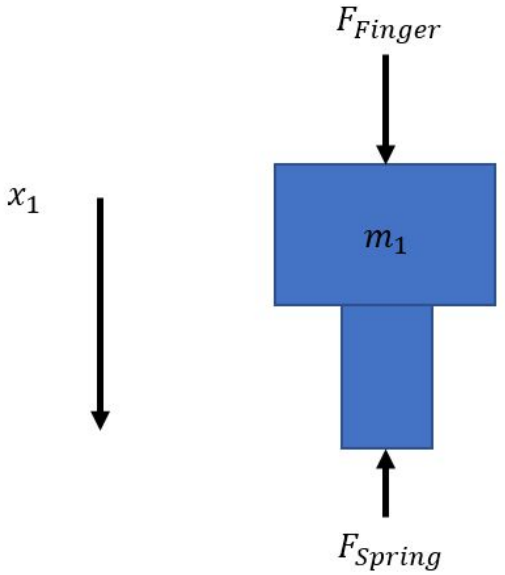
Plan of Action and Deliverables

1. Create a free-body diagram (FBD) of the 3 switch motions
2. Derive equations of motion (EOM)
3. Model and simulate the switch in Unity





FBD’s and EOM’s: 1st Motion

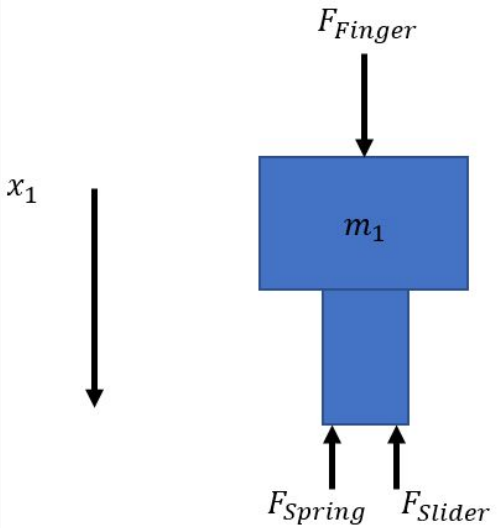


$$\sum F_{x_1} = m_1\ddot{x}_1 = F_{Finger} - F_{Spring}$$

$$F_{Spring} = k_1 x_1$$

$$m_1\ddot{x}_1 = F_{Finger} - k_1 x_1$$

FBD’s and EOM’s: 2nd Motion

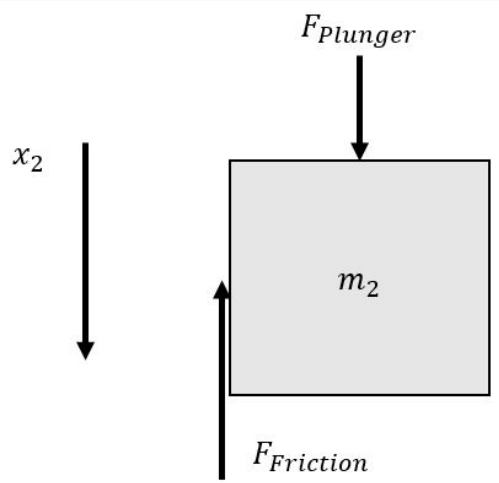


$$\sum F_{x_1} = m_1\ddot{x}_1 = F_{Finger} - F_{Spring} - F_{Slider}$$

$$F_{Spring} = k_1 x_1$$

$$m_1\ddot{x}_1 = F_{Finger} - k_1 x_1 - F_{Slider}$$

FBD’s and EOM’s: 3rd Motion



$$\sum F_{x_2} = m_2\ddot{x}_2 = F_{Plunger} - F_{Friction}$$

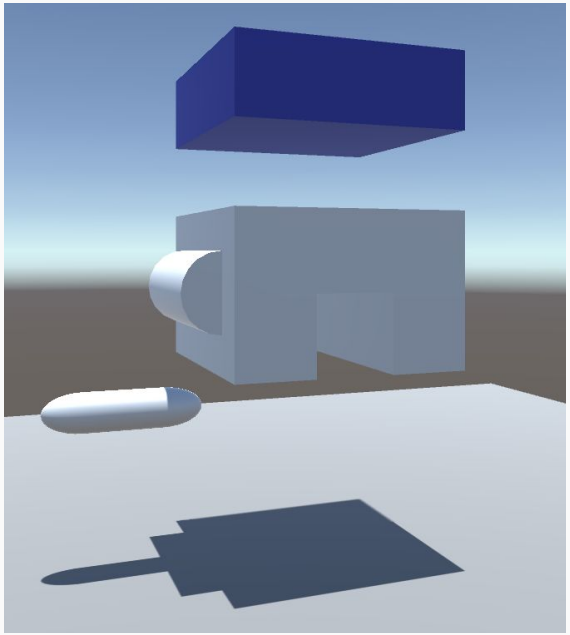
$$F_{Friction} = f(x_2)$$

$$m_2\ddot{x}_2 = F_{Plunger} - F_{Friction}(x_2)$$

$$F_{Plunger} = F_{Slider}$$

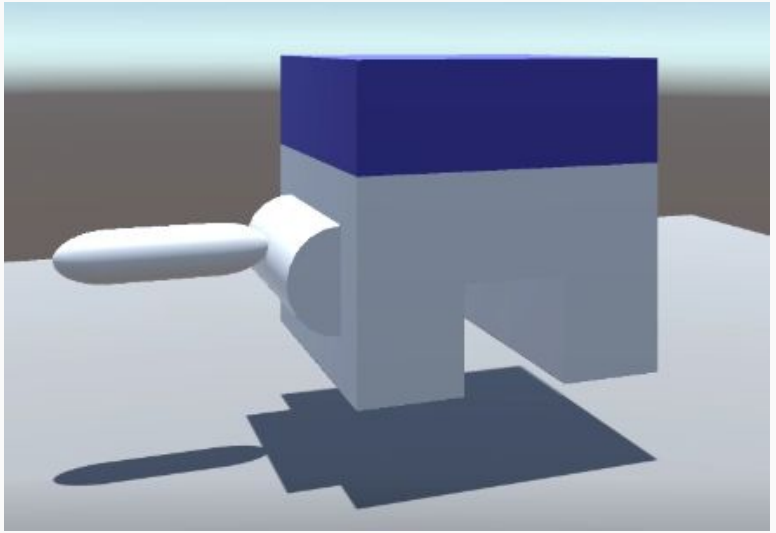
Unity

- Simplified the shapes
- Constrained horizontal and rotational movement of the plunger and switch
- Modeled spring as a spring-driven friction device
- Assumed gravity does not have a significant effect on the plunger and switch



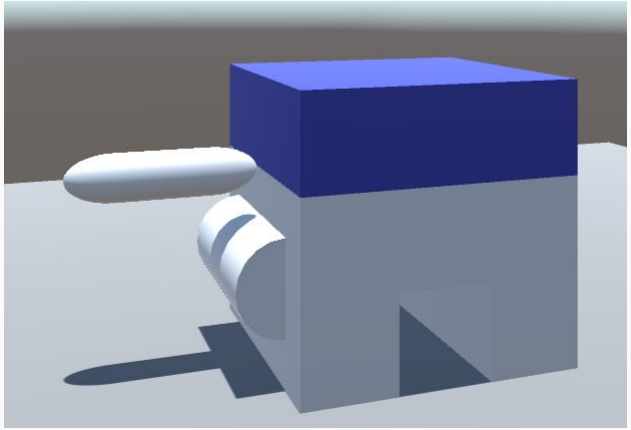
Unity

Partially compressed position



Unity

Fully compressed position



Demonstration

Conclusion

- The mechanical switch is a simple but effective dynamic system
- Unity allows us to model simple systems easily but requires a great deal of experience to model complex physical systems

Questions?