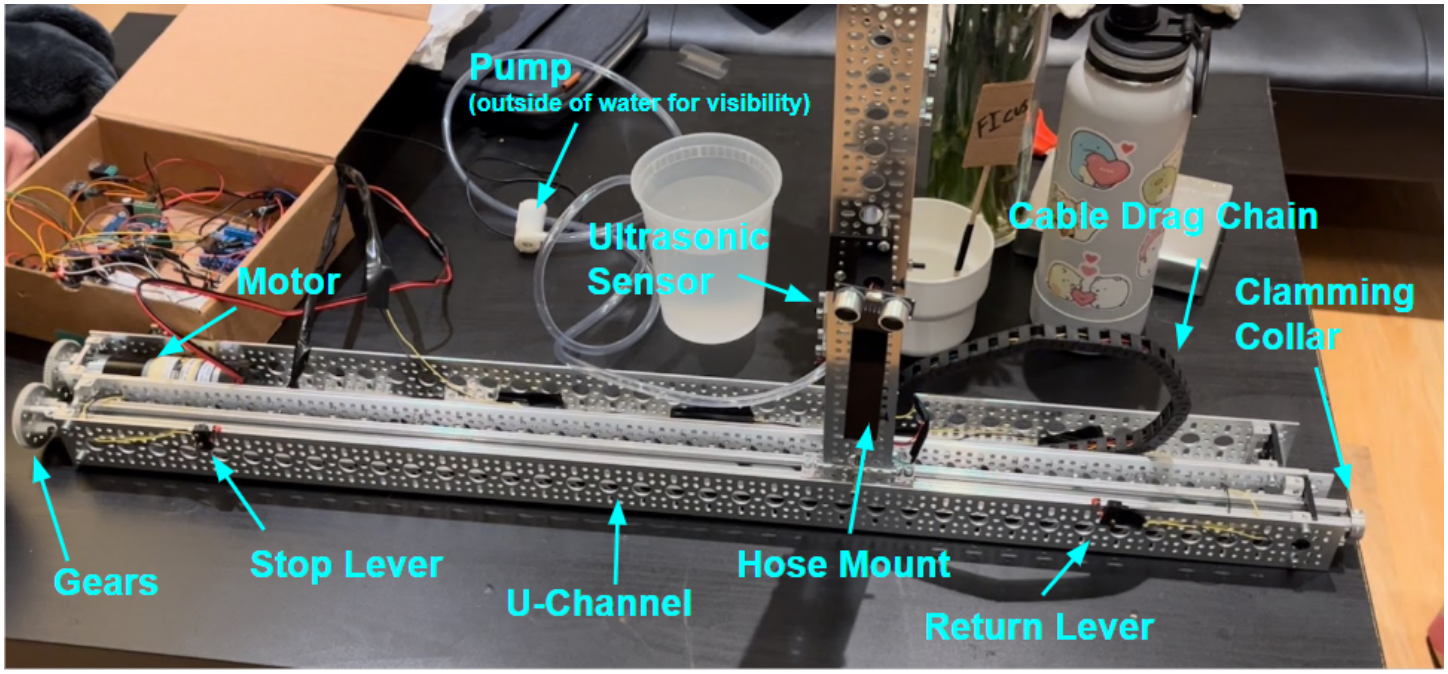
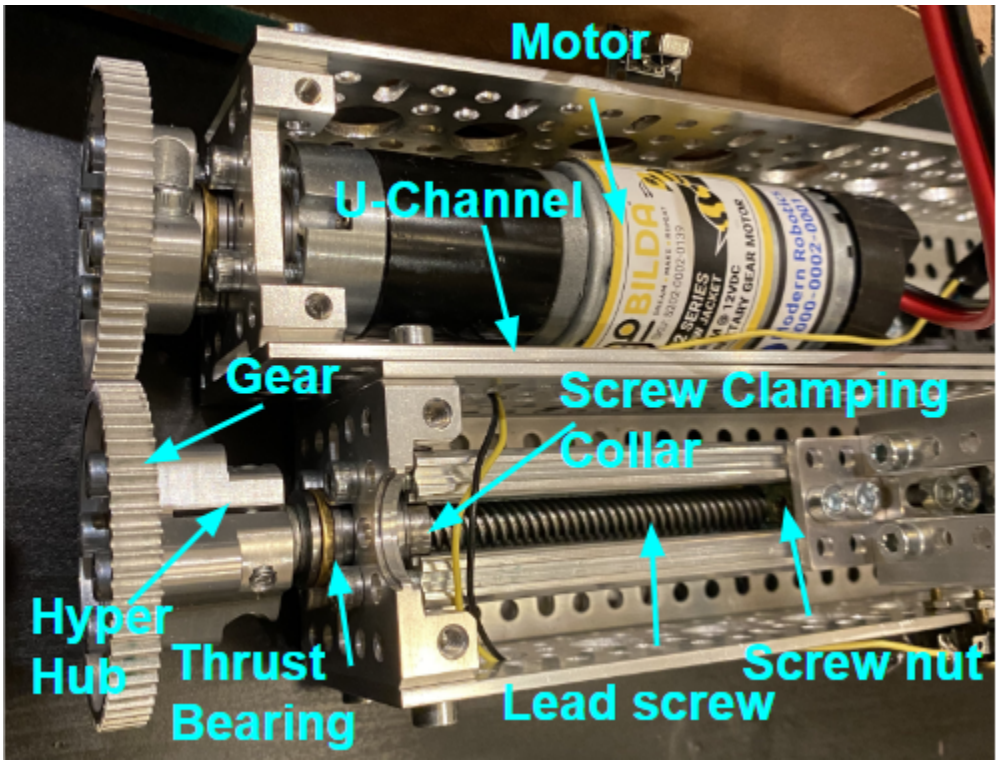
## Planty Bot v.2 Building Logic

Demo video: https://drive.google.com/file/d/1Pqm6aS5IHIIecwT3JiY2JOI2CJu8_f38/view?usp=sharing




***- Function-critical calculations*:**

*Gear Load*:

$$|F_y| = \frac{\tau}{r} = \frac{9\ N{\cdot}m}{48\ mm \cdot \frac{10^{-3}\ m}{1\ mm}} = 187.5\ N$$

$$tan(\theta) = \frac{F_x}{F_y} \rightarrow F_x = F_y \cdot tan(\theta) = (187.5\,N) \cdot tan(20) = 68.24\,N$$

$$F = \sqrt{F_x^2 + F_y^2} = \sqrt{(187.5\,N)^2 + (68.24\,N)^2} = 199.532\,N$$

*Torque required to move the body through the thread*:

$T_R = \frac{F \cdot d_m}{2} \cdot \frac{l + \pi\mu d_m}{\pi d - \mu l}$, where $F$ is the force applied to each gear teeth, μ is the coefficient of static friction between the gears, $d_m$ is the diameter of the gears, and $l$ is the length of the thread.

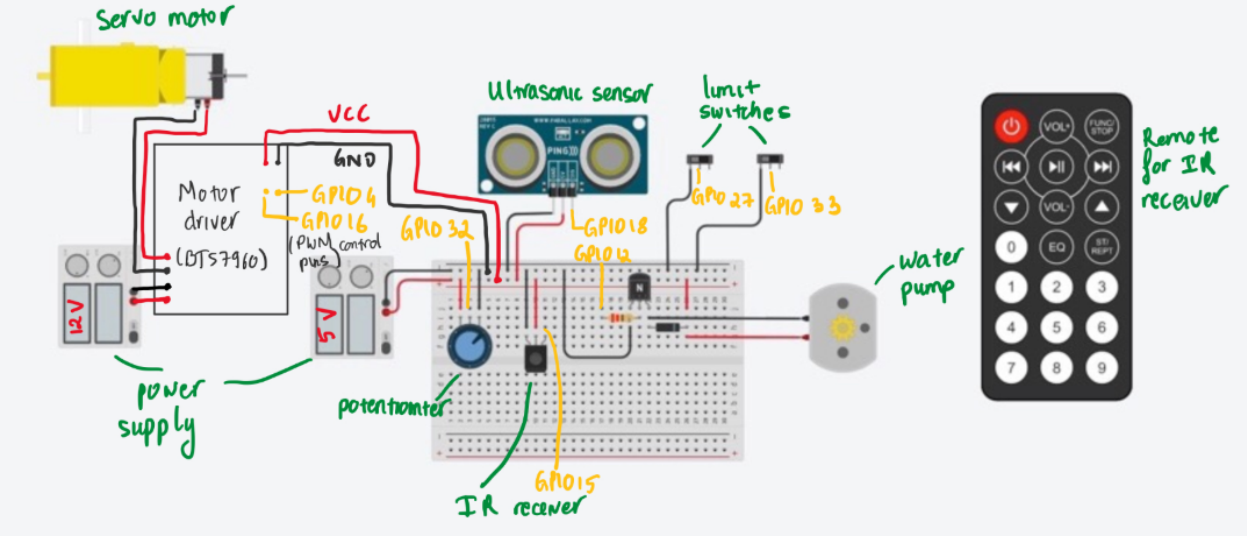
$$T_R = \frac{F \cdot (8\times10^{-3})}{2} \cdot \frac{38.1 \times 10^{-3} + \pi \times 0.8 \times (8\times10^{-3})}{\pi \times 8\times10^{-3} - 0.8 \cdot (38.1 \times 10^{-3})} = (0.03\,m) \cdot F = 0.0435\,m \cdot 199.532\,N$$

$T_R = 8.689\,N \cdot m$. This torque value will produce a force value of 300 N on the lead screw threads, which won't bend/break the threads.

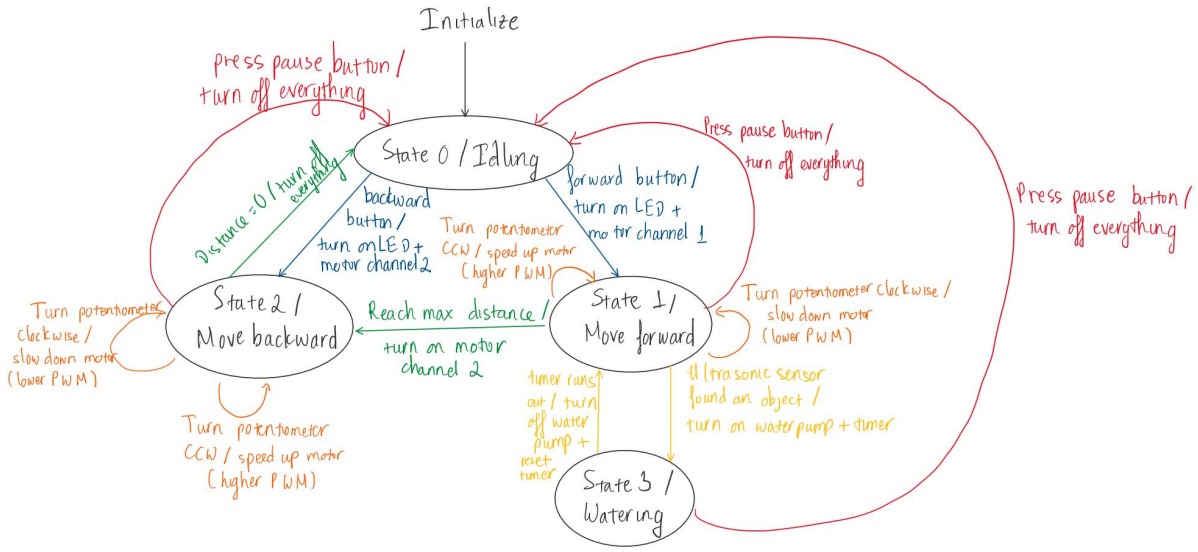
The lead screw thread gives 8 mm of linear movement per rotation. By experimentation, we get a result of a linear velocity of 8 mm per 1.5 seconds. Therefore, we get 1/1.5 = 2/3 revolutions per second.

$rpm = \frac{Linear\,Velocity}{Lead} = \frac{8/1.5\ mm/s}{8\ mm/rotation} = 40\,rpm$, where this value is the result of maximum voltage of 12 V.

**- *Circuit and State-Transition Diagrams*:**

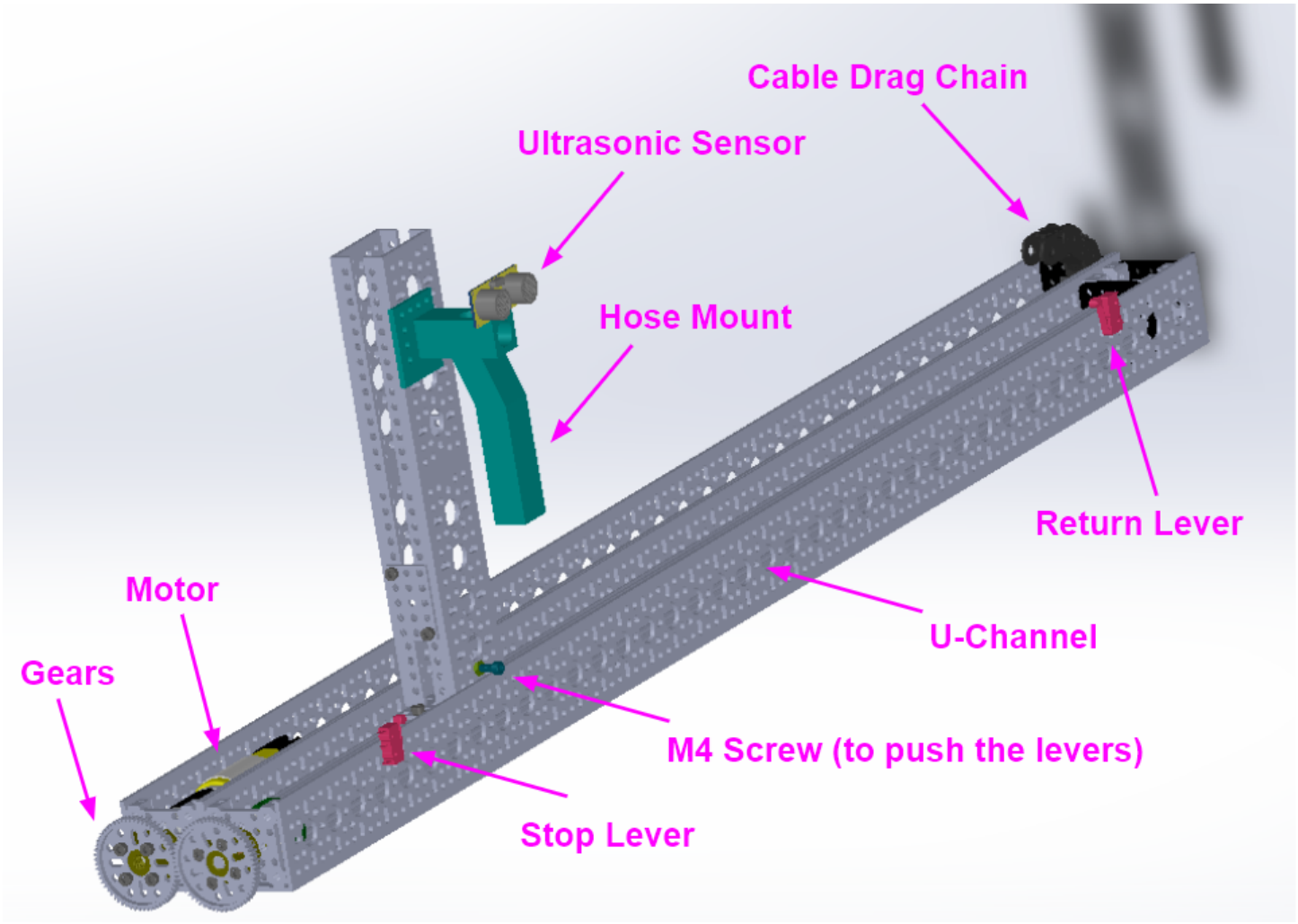


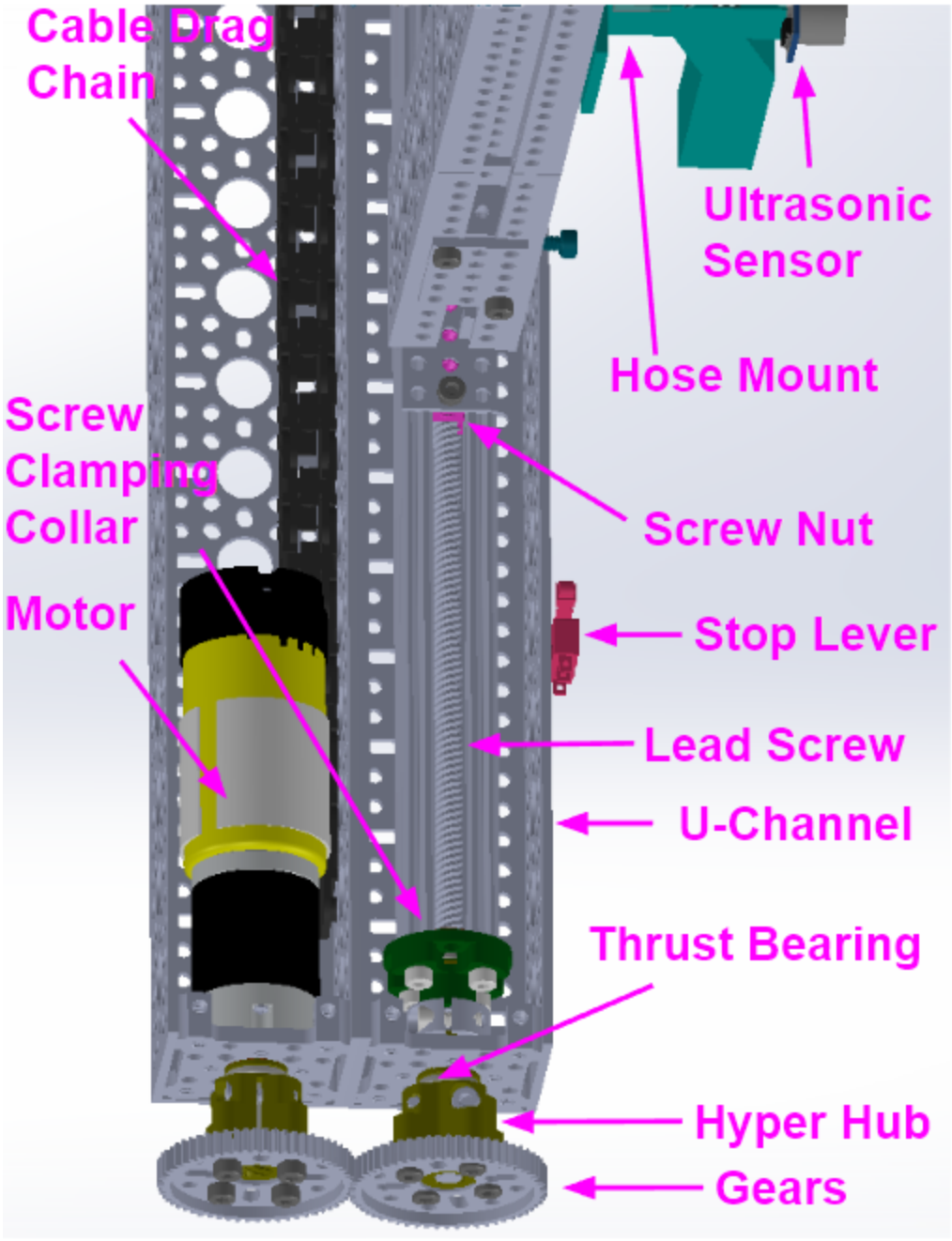

*Circuit Diagram*

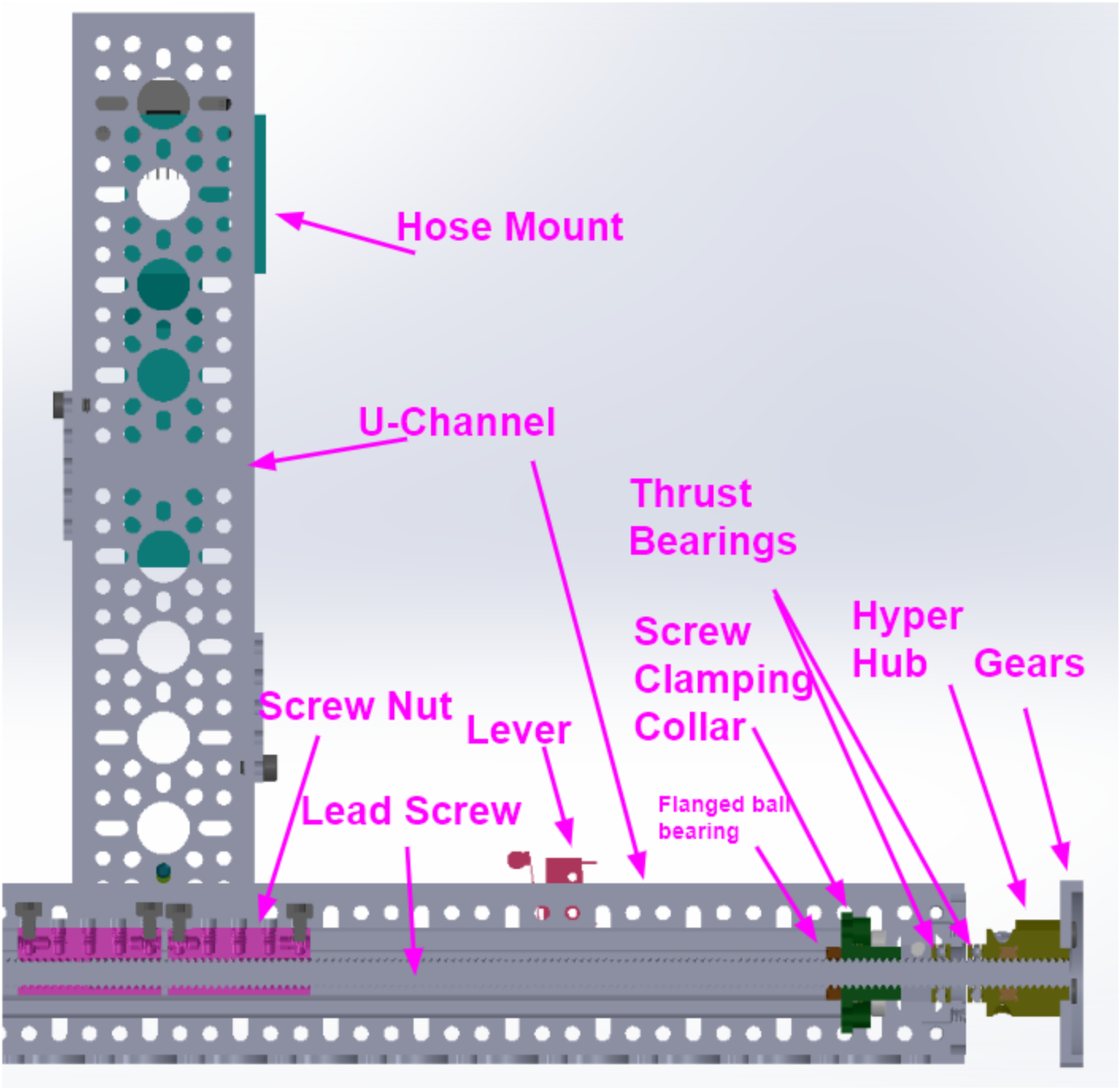



*State-Transition Diagram*

***Images of the CAD***:




Cable Drag Chain
Ultrasonic Sensor
Hose Mount
Screw Clamping Collar
Screw Nut
Motor
Stop Lever
Lead Screw
U-Channel
Thrust Bearing
Hyper Hub
Gears


Hose Mount
U-Channel
Thrust Bearings
Hyper Hub
Gears
Screw Clamping Collar
Screw Nut
Lever
Lead Screw
Flanged ball bearing