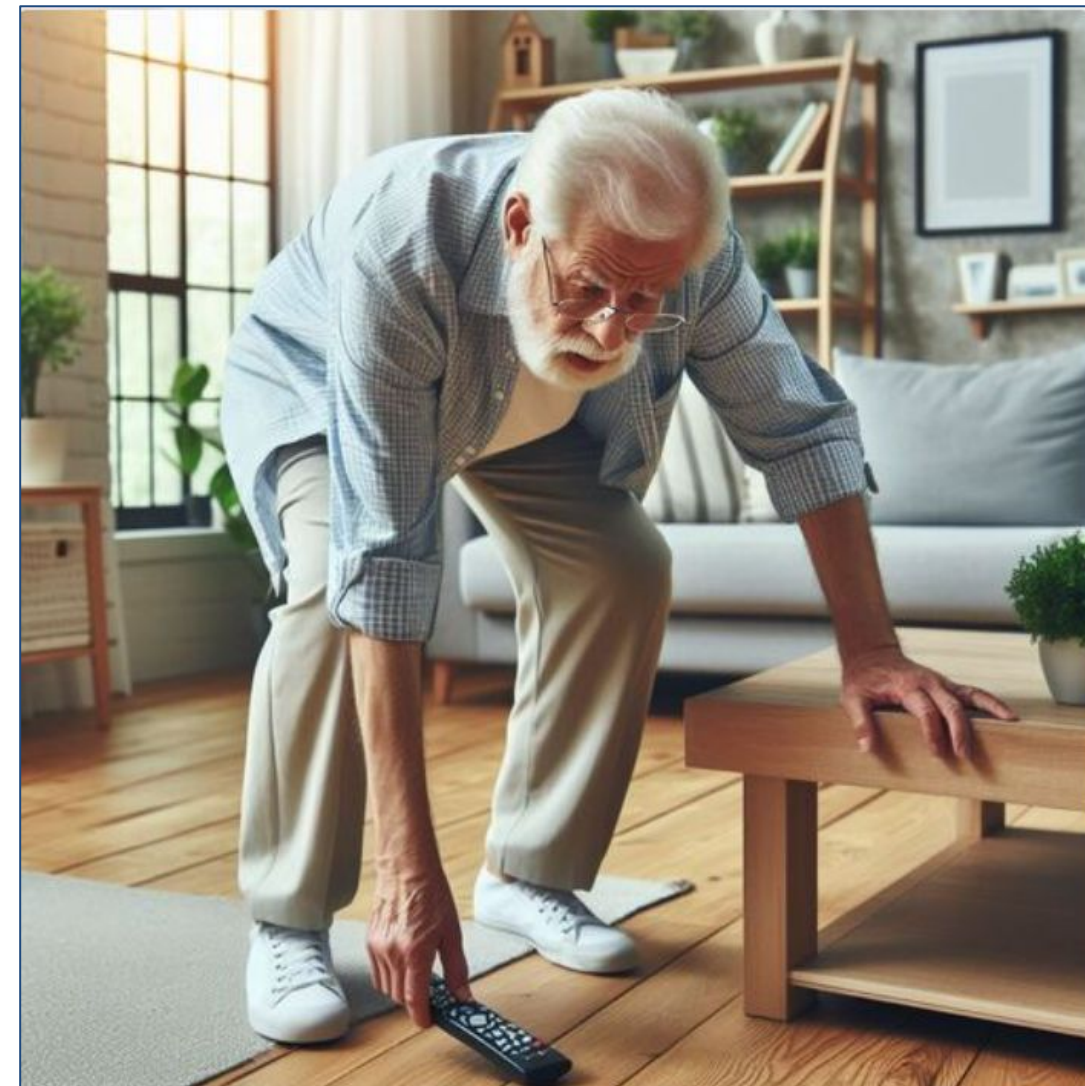


Problem Definition

The elderly have increased difficulty with picking up objects off the floor:

Caused by:

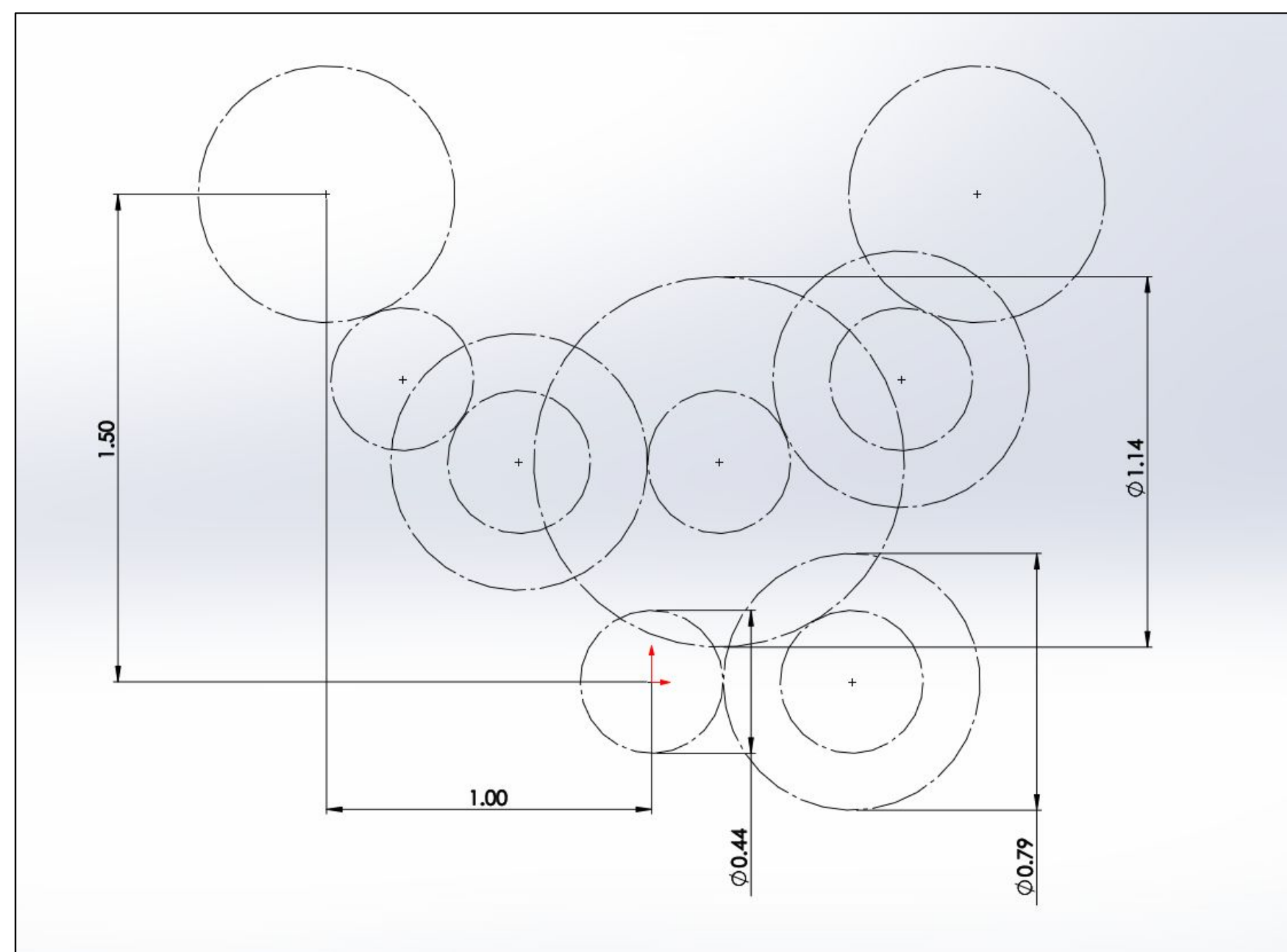
- age-related mobility limitations
- poor balance
- decreased muscle strength



Results in:

- fall risks
- loss of independence
- emotional strain on families

Design Calculations & Analysis



Maximum torque required:

$$(5 \text{ lb object}) \cdot (4 \text{ in jaws}) = 20 \text{ lb-in (2.26 N-m)}$$

Required gear ratio:

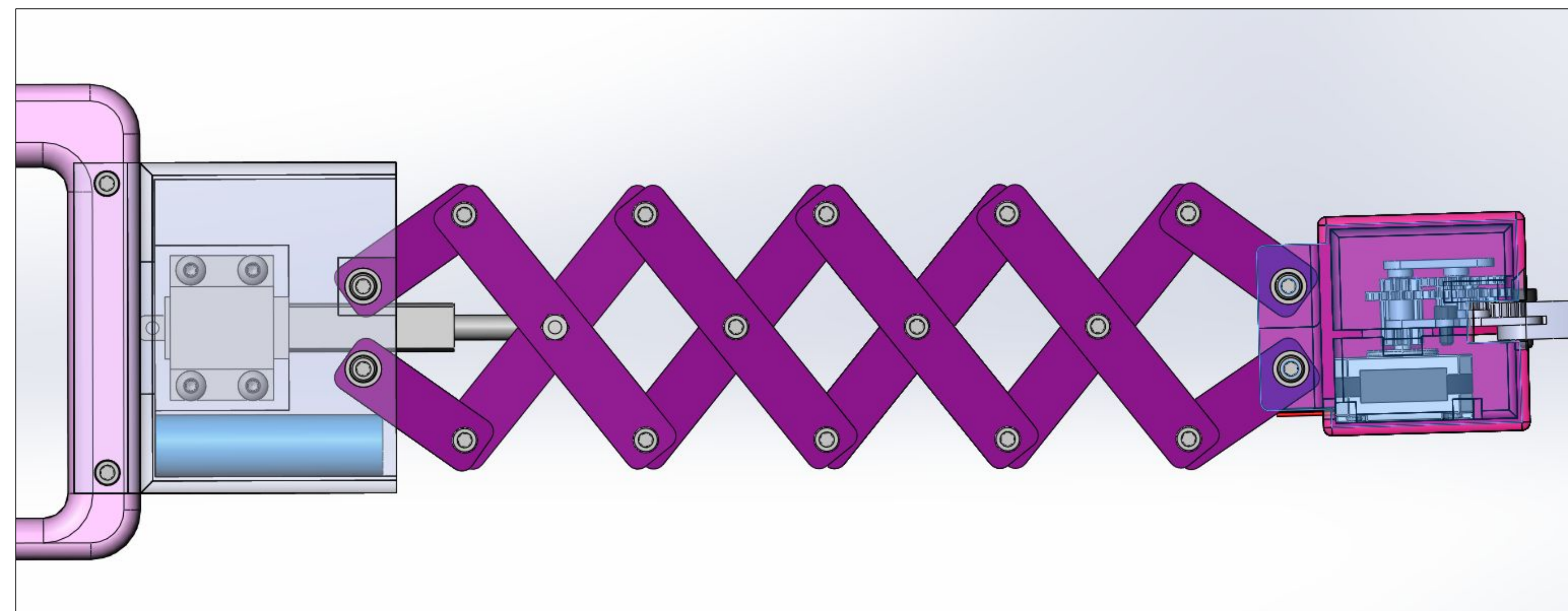
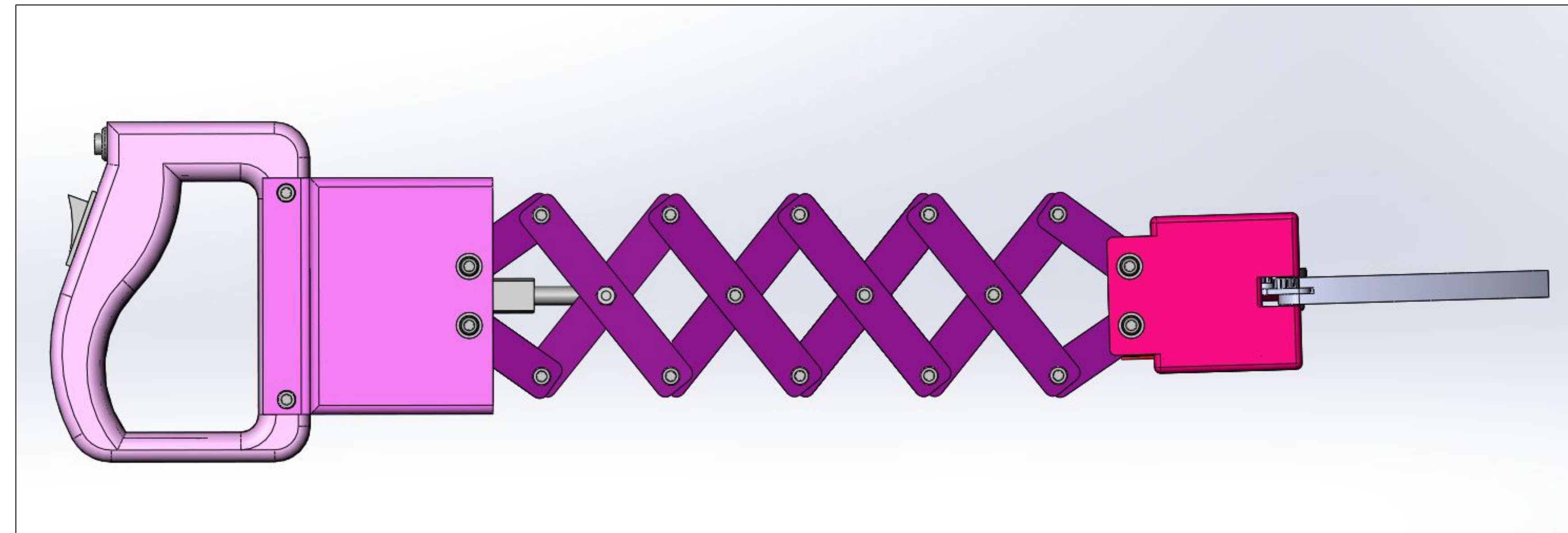
$$(2.26 \text{ N-m}) / (0.16 \text{ N-m holding torque}) = 14.125$$

Gear stacks:

$$(2:1) \cdot (3:1) \cdot (2:1) \cdot (2:1) = 24$$

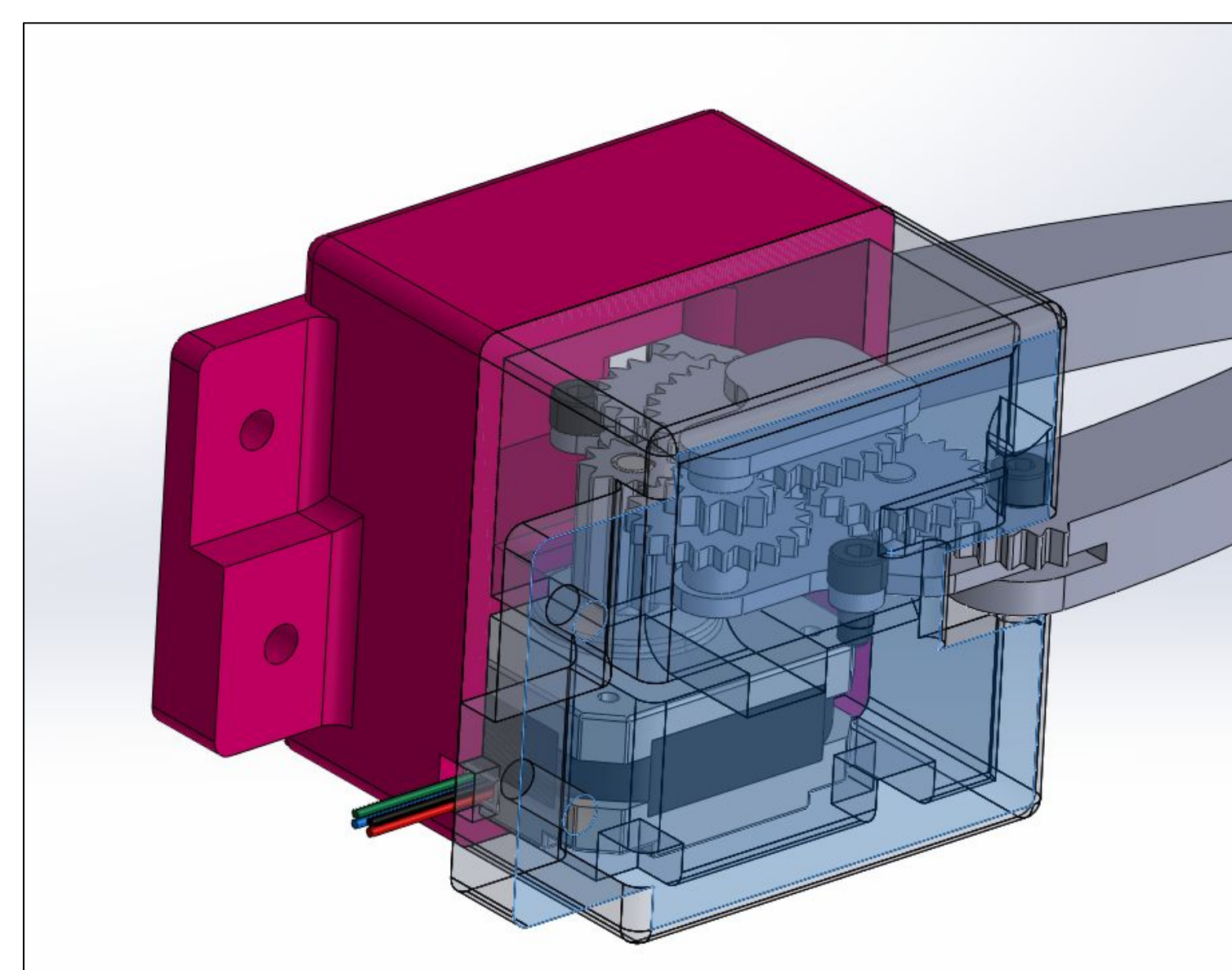
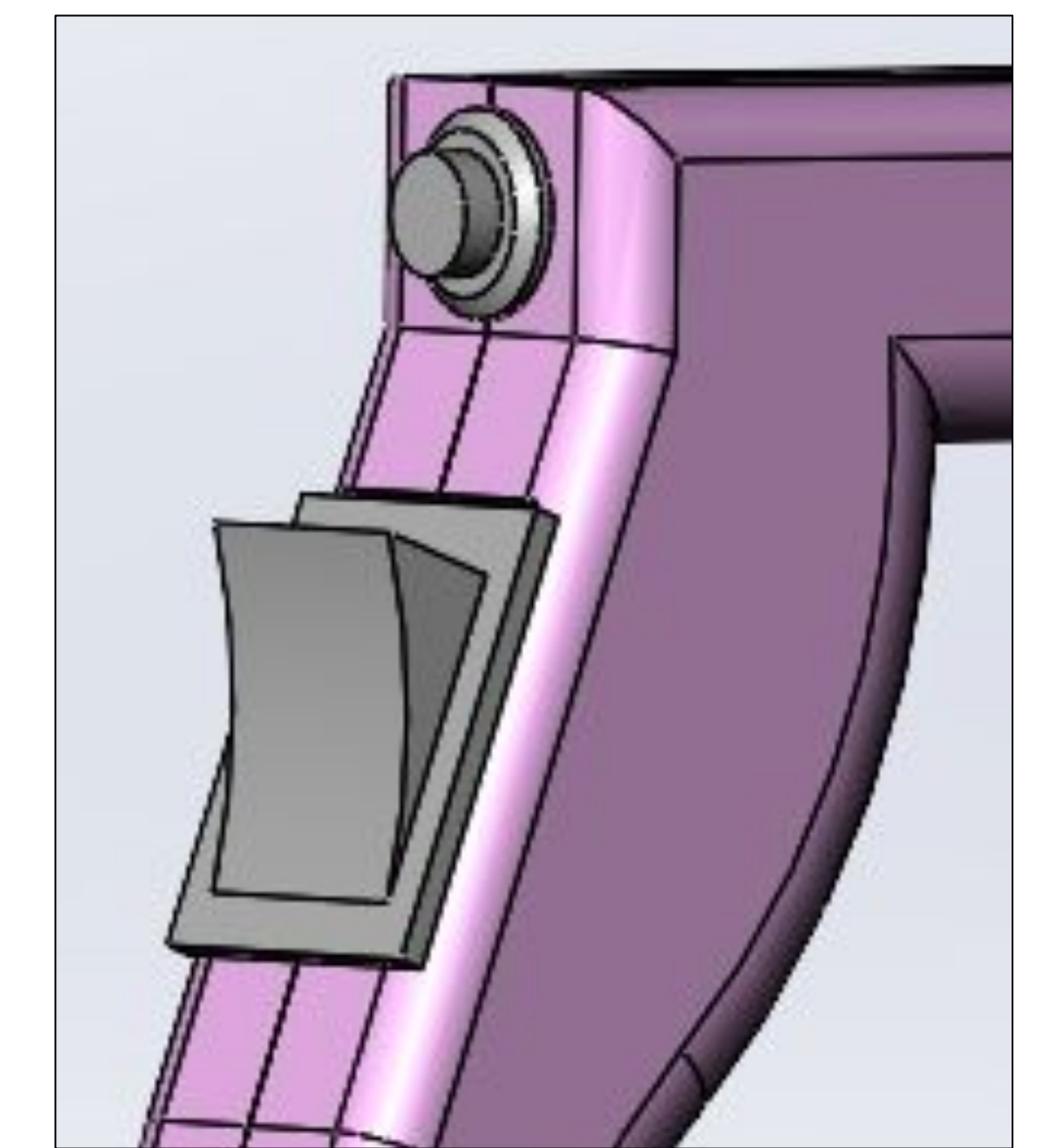
A minimum gear ratio of 14.125 is required in order to provide the 2.26 N-m of torque. The gear ratio in the final design is 24 to ensure this requirement is met.

Final Design



Handheld grabber for seniors

- Momentary switch on the handle controls the linear actuator housed in the connection piece. This allows for the extension and retraction of the main body
- Button on the handle controls the motor that will open and close the jaws



Prototype & Test Results

Testing horizontal placement (x) of linear actuator

- Goal: optimize change in length of the main body while still maintaining structural integrity
- Results: linear actuator is offset 10mm out of the handle connection piece

