

Product Overview

The Gaitkeeper is a bodyweight support system that employs a motorized winch and I-beam trolley along a ceiling-mounted I-beam track to lift a patient for rehabilitation and allow them to use an elliptical stepping machine. The design utilizes a Raspberry Pi for its computing power, allowing an Android tablet to communicate via Bluetooth to permit the user to set various parameters and weight offsets for the rehabilitation session. The localization of electronics and control systems on the I-beam trolley promote a reduced footprint of the machine and more manageable interfacing of all working components. The implementation of an overhead cable and frame limit any chance of the patient colliding with the support system and let the trainer be up close and personal with the rehabilitation patient.

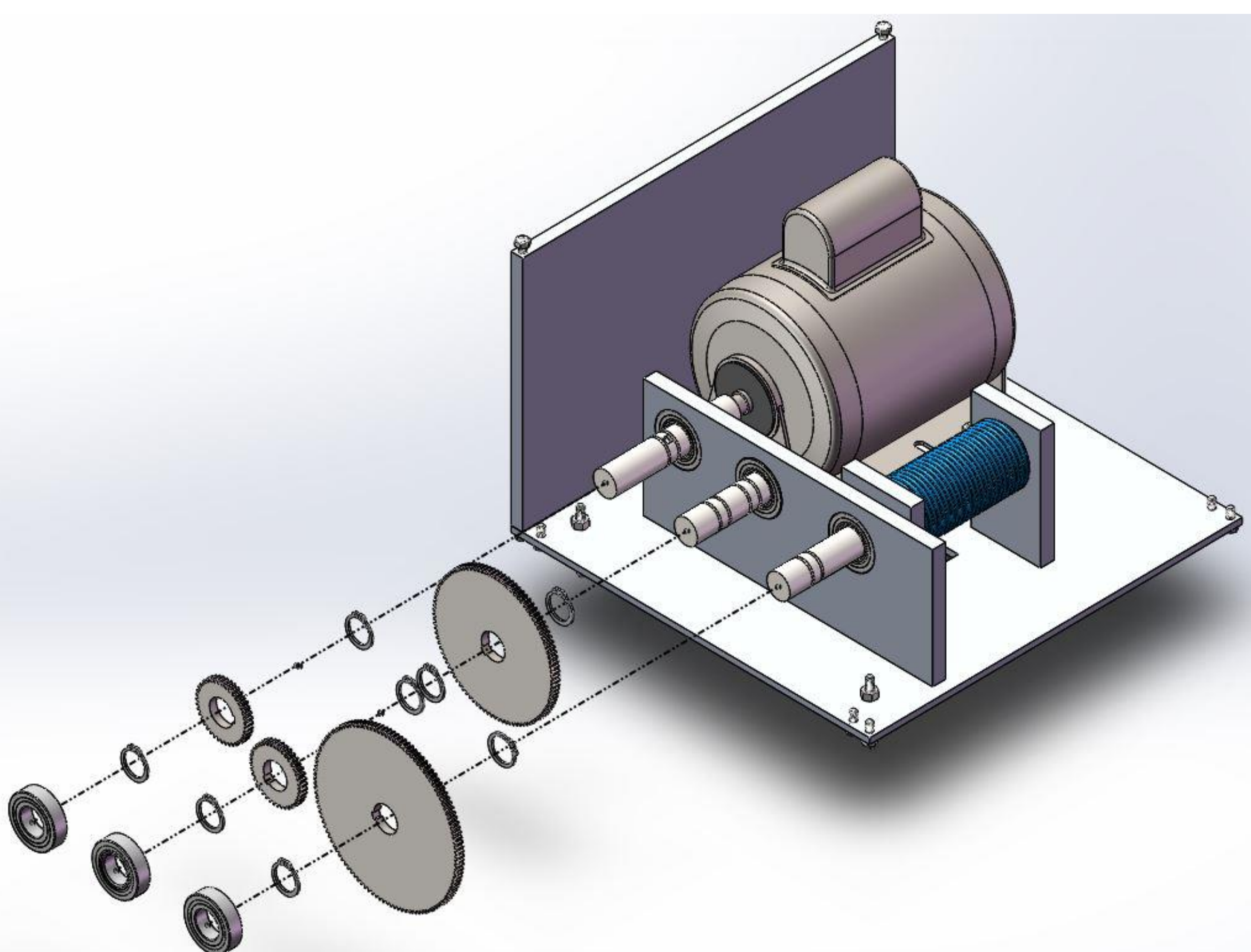


Fig. 2
 Exploded view of the **controller mechanism** gearbox, showing the bearings, retaining rings, gears, motor, and winch that make up the majority of the controls system. The blue cable coiled around the winch will extend beneath the box, attaching to the patient.

Acknowledgments

Thank you to our sponsors, Cummins and Northrop Grumman, for supporting our design work and creativity.

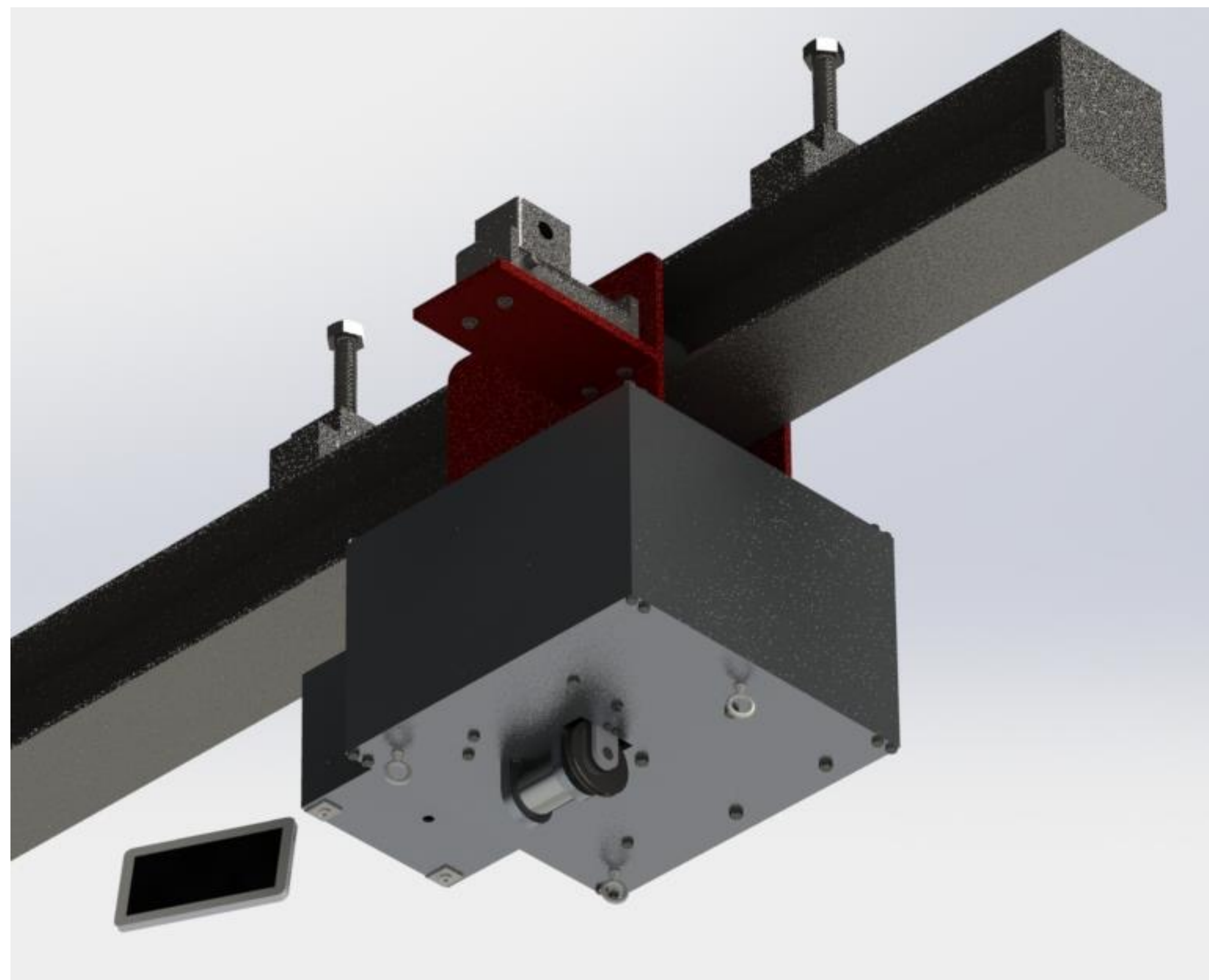


Fig. 1
 Full assembly rendering in Solidworks of The Gaitkeeper. The full assembly shows the I-beam, moving mechanism, and controller mechanism box. A tablet can be seen in the bottom left that will be used to communicate with the machine. While not seen in the rendering, a cable extends downward that attaches to a harness in which the patient is placed.

Product Functionality

The Gaitkeeper is installed into the ceiling above the elliptical machine. The attendant controls the rehabilitation system through an Android tablet that communicates with a Raspberry Pi which commands the various subsystems. The patient is placed directly underneath the I-beam, behind the elliptical. The two-point harness is then lowered to the patient, and the attendant safely secures the patient within it. The motorized winch is then activated by the attendant on the tablet, slowly lifting the patient and maneuvering them in conjunction with the trolley until they are safely over the elliptical and strapped into the boots. The patient can then begin their rehabilitation session, with the attendant carefully observing and using the tablet. The attendant can also ensure the system slowly transitions to a preset offset weight after the patient is securely in the elliptical. Further offset weights can be changed at any time with the tablet.

Product Costs

- OTS: \$2,465.84
- Raw Materials: \$1,138.91
- Energy and Labor Cost: \$310.07
- Assembly Cost: \$80
- Total Cost: \$3994.90



Fig. 3
 Two point shoulder harness that the patient will act as the **holding mechanism**. Cable conversion from two points to a single point prior to attaching to the bottom of assembly.



Fig. 4
 Braided polyester and Dyneema SK78 rope that is used in The Gaitkeeper as the lifting and holding cable. Can also be seen pictured in Figure 2 spooled around the bottom of assembly.

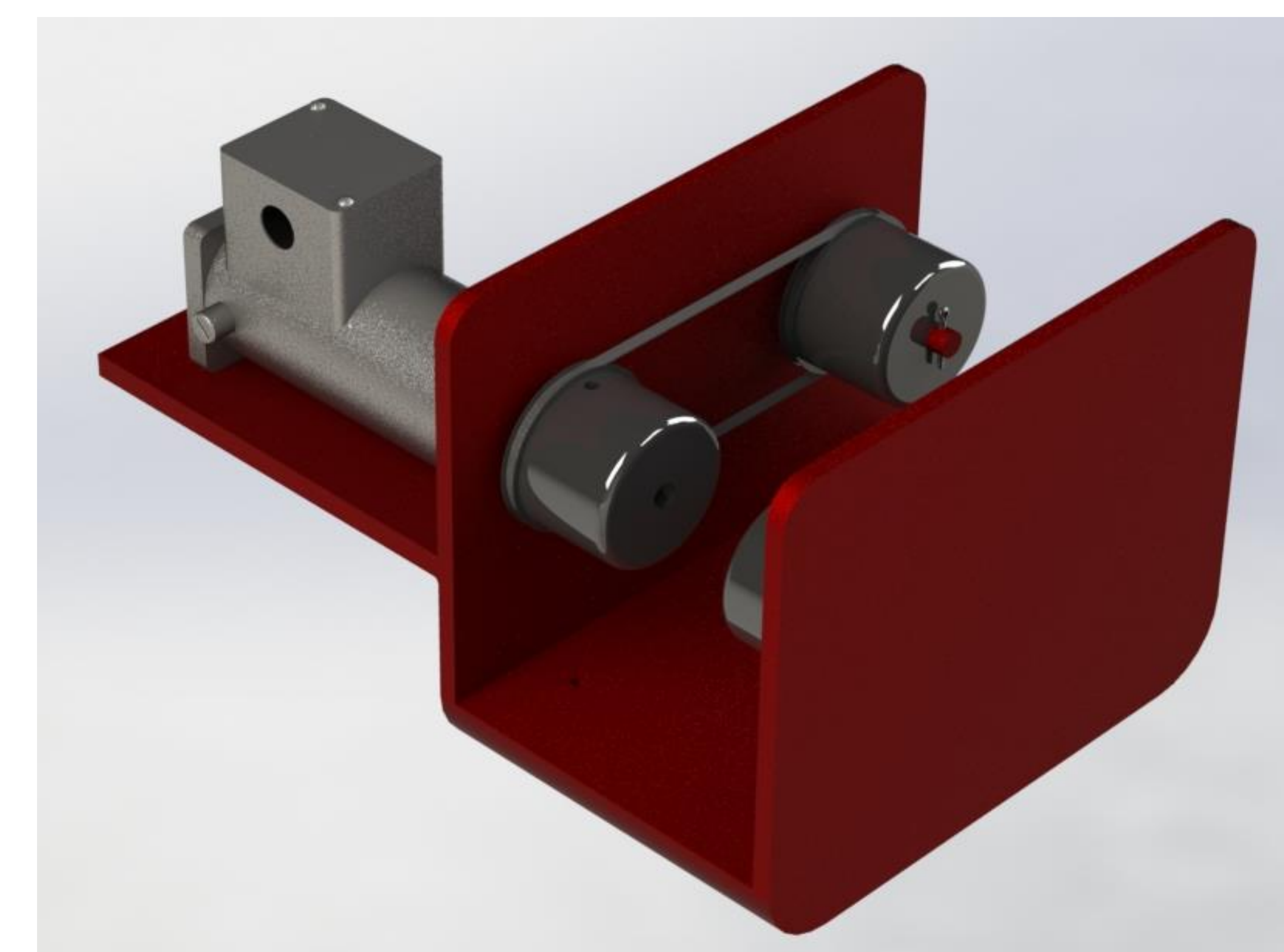


Fig. 5
 Rendering of the **moving mechanism**, showing the full motorized I-beam trolley and its two sets of wheels. The belt between one set of wheels can be seen, helping the motor better distribute force among the trolley.

