Large Swing Mechanism Design Document

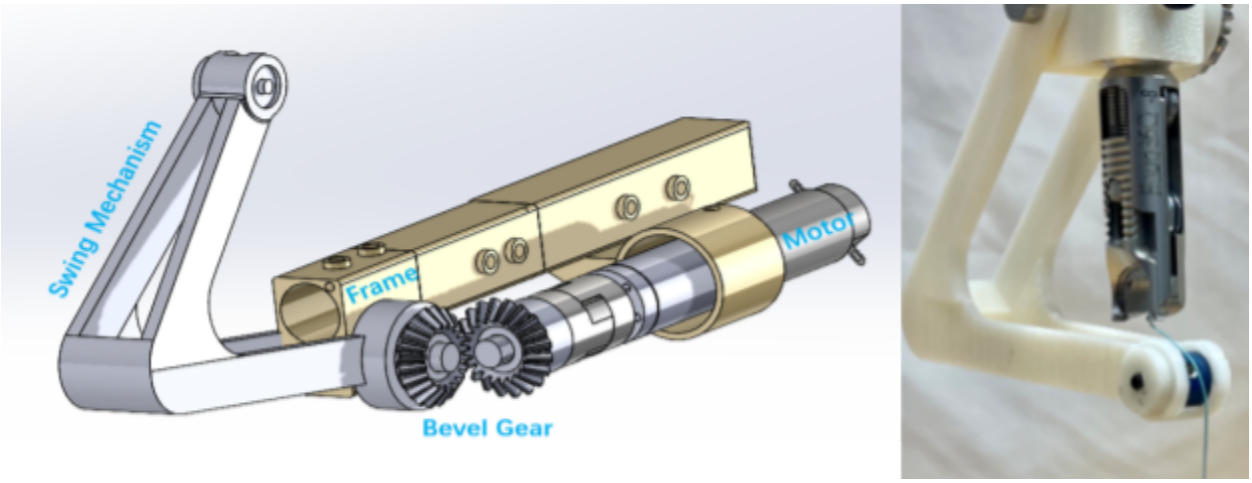

Figure 1a (Left) Large swing mechanism CAD model. 1b (right) Large swing mechanism mounted on the STAR robot.

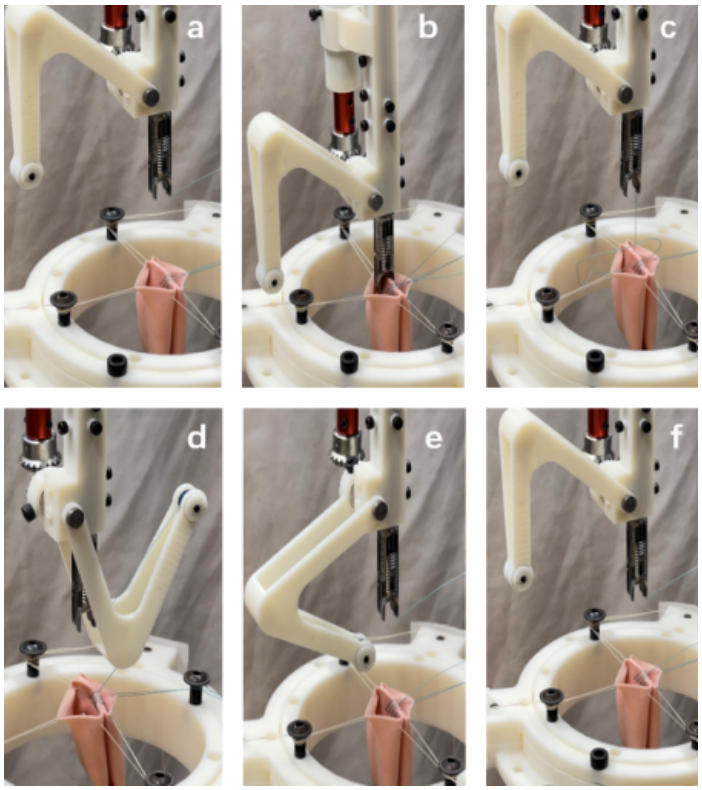

Figure 2. Suturing workflow of the large swing mechanism.

The cylinder in the frame encloses the suturing arm of the STAR robot as shown in figure 1b. As shown in figure 2a, the STAR approaches the tissue to suture with the swing mechanism in its back position. STAR then places the stitch (Fig. 2b) and pulls away from the tissue (Fig. 2c with the swing mechanism still in its back position. Then, to suture the thread (Fig. 2d) the motor is actuated which causes the swing mechanism to swing through its full range of motion and catch the thread on the way, allowing it to tension the thread. Once the thread is tensioned, the swing mechanism then retreats from the suture (Fig. 2e) to get out of the way of the suturing end effector. The STAR system is now back at its initial configuration (Shown in fig. 2a and 2f) with the swing mechanism out of the way so that the suturing end effector can place the next stitch.

The purpose of this large design was to serve as a proof of concept for single arm suture tensioning management. This design does not meet our design requirements of being capable of operating within a 10cmx10cmx10cm workspace nor our requirement to fit within a 25mm diameter hole when entering the laparoscopic field, meaning that this device would not be capable of functioning in a laparoscopic workspace. Therefore, this prototype serves as a first iteration to our project which we will continue to scale down by implementing cable-driven mechanisms.