Device to perform pinching, tapping and grasping

Overview
Charcot-Marie Tooth (CMT) disease is an inherited neurological disorder that affects the proteins involved in peripheral nerve function, causing nerve degeneration and severe atrophy of muscles, usually in the arms, legs, hands, and feet. Marty Kester, an individual affected by CMT, has been rendered unable to pick up and hold thin items. The objective of this project was to design an assistive device for Marty Kester that can perform basic pinching, grasping, and tapping motions enabling him to use his credit card at gas pumps and hotel room keys.

Objectives
The team designed two devices, one of which provides a simple clamping mechanism to fulfill the pinching requirement and another designed using a thermoplastic splint that houses the grasping and tapping components.

Approach
- The team met with both Dr. Hills, the sponsor of the project, and Marty, the patient who will use the device, in order to gather customer input.
- Following the initial meetings, the team agreed on target specifications and customer needs for the design, namely the portability, ease of use, aesthetics of the device, and lightweight.
- The team designed an initial device that included a slide bolt mechanism to create a clamp that could lock in the open position. However, Marty felt it was too heavy and wasn’t aesthetically pleasing.
- Next, the team designed a final device that includes a binder clip attached with a small elbow and screws to an activated spring-loaded latch, providing a low-force mechanism for locking the clip in the open position satisfying the ease of use customer need. Additionally, a friction hinge was added attaching the two pieces of polycarbonate basing together, providing the device with a 90-degree range of motion.
- The device was tested for practicality by the group and demonstrated a 95% success rate at a card reader, an average loading time of between 4.6 s and 8.3 s, and a force required for changing orientations of the hinge much less than Marty’s comfortable limit.

Outcomes
- The spring-loaded latch final design was successful and met most, if not all, of the customer needs.
- The total cost of the device was $54.38. However, many of the components came in bulk making mass production a cost effective and viable option.
- The device can greatly help Marty on an everyday basis with pinching task, such as picking up a credit for use at any card reader.