

Mechatronics for the Ages



Studio Background

In this studio, students will take a deep dive into understanding the daily life and hurdles of the aging population and how our society perceives and interacts with the elderly in our community. Students will interview and interact with residents at a local senior home to understand the practical and aspirational challenges of their day, and design assistive devices to help these clients improve their daily lives.

Imagine how you can create a device for writing that may help a former playwright with Parkinson's disease control their hand tremors, or a gardener to water their plants. What does it mean to age and to grow old, and how can we use technology to improve this experience? Students will apply knowledge of human anatomy, mechatronic devices, electronics and product design to directly improve the lives of community members.

Our goals for this journey:

- **Understand** the daily life and hurdles of the aging population
- **Survey** the contemporary landscape
- **Identify** areas for improvement
- **Design** assistive technology for the elderly to improve their life



A suit named AGNES, an acronym for the Age Gain Now Empathy System, is designed to help young engineers understand the physical limitations of older people.

EARPLUGS:
Reduce hearing.

NECK COLLAR:
Limits joint mobility and selection and extension of the spine.

WRIST GUARDS:
Reduce the flexion and extension of the wrists.

GLOVES:
A double layer of rubber gloves to



THE HELMET:
An anchor point for the bungee points that attach to the hip.

GOGGLES:
Mimic the natural yellowing of the eye lenses.

BUNGEE CORDS:
Run from helmet to hip, restricting movement. The tension they create makes spinal extension difficult, meant to mimic curvature of the spine. They also help to reduce the rotation of the spine.

BELT:
Used to anchor the bungee cords and elastic band from hip to wrist.

ELASTIC BAND:
Runs from hip to wrist to reduce shoulder mobility and cause fatigue.

MIT Age Lab

As we age, the way we experience the world around us changes. Getting out of cars, grocery shopping and all of the big and little things that are a part of every day life can become more difficult.

Enter AGNES: MIT Age Lab's Age Gain Now Empathy System. AGNES allows us to better understand how these customers are experiencing life and how we can alter the design of their physical environment, and improve our solutions to better fit their needs.



Stand Assist NuVu Student Project

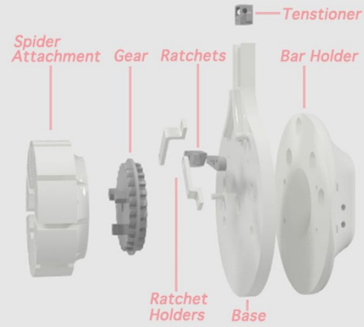
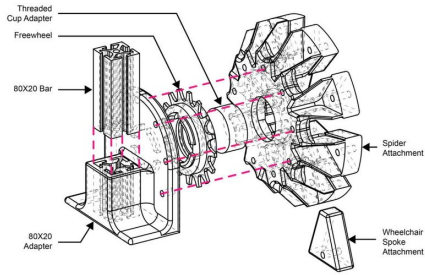
An assistive device to bring more independence to the elderly by helping them stand up from a sitting position with more ease and comfort.



Creative Learning Outcomes

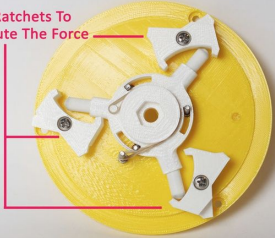
- **Designing with Empathy**
 - Focus on direct application to real-world conflicts
 - Understand the role of design agency
 - Conduct user-specific research
- **Guiding Question:**
 - How will your generation prepare for the future where there are more elderly than caretakers?

Handdrive Assembly Diagram



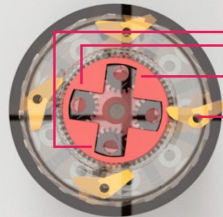
Planetary Ratchets

Three Ratchets To Distribute The Force



Planetary Gears

Planetary Gears Change The Hand Drive To Wheel Ratio To 4-3, Allowing The Wheelchair To Move Faster



Technical Learning Goals

- **Rapid Prototyping & Fabrication Skills**
 - 2D, 3D modeling in Rhino
 - Fusion 360
 - 3D printing and Laser cutting
- **Microprocessor Electronics**
 - External sensors and actuators
- **User Interaction & Experience**