Product Design Capstone

MECHENG 4906.01 + 4906.02

Annie Abell & Dan Wisniewski

The Ohio State University

What is ME Product Design Capstone?

Students experience a human-centered design project that emphasizes understanding the users' needs. Focus on user research to clearly understand a problem before tackling the design challenge.

Instructor permission is required to enroll

To take this capstone, you must be enrolled in 5682.01 Product Design Tech Elec!

credit for 5682.01 in a prior semester is also ok

Schedule

AU2023: ME 4906.01

Prof Abell

M + W 12:45-2:05pm

W 3:00-4:50pm

Prof Wisniewski

T + R 12:45-3:00pm

***pre- or corequesite: ME 5682.01*

SP2024: ME 4906.02

TBD – likely similar

What's This Capstone's Specialty?

Our focus is on the user-centered design process, we include topics that don't typically make it into engineering design classes:

Conducting User Research: go talk to real people! Understand them!

Framing the Problem: work with the people to define the opportunity at hand, and spend a significant amount of time framing the challenge

Open-Ended Projects: you define the project direction & solutions

Entrepreneurial Mindset: developing skills to share your work with non-technical audiences and making idea pitches

DESIGN STARTS HERE...

NOT HERE

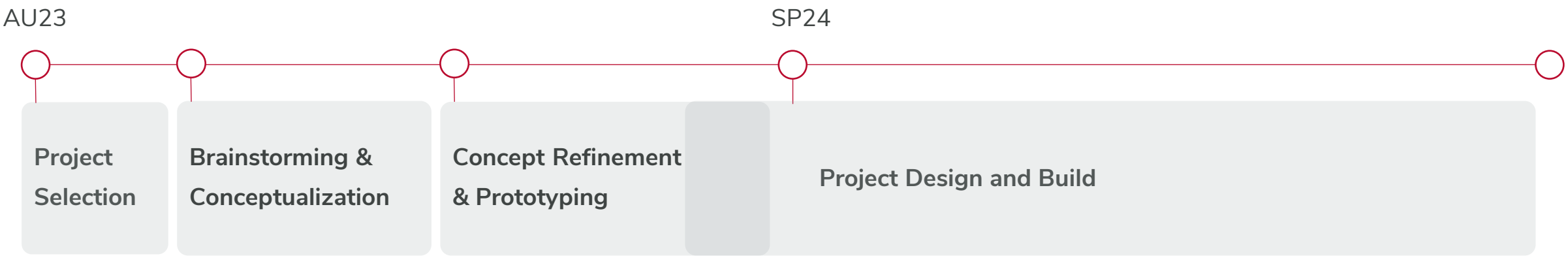
How are the Projects Structured?

Teams start by choosing a user group or project goal– **NOT** a specific product to design

You get to choose many aspects of your project focus and suggest possible project topics

Teams of 3-6 people

Funded by department or industry sponsored



This Course's Design Intent

You will be able to understand the following, at a deep level:

The **problem** you're trying to solve

The **needs** of everyone who interacts with or depends on the potential solution for that problem

How the **design decisions** you make affect how the product is manufactured

Goals

Gain a better understanding of the product design process and how to balance constraints and user needs.

Focus on your visual communication skills. (presentations and portfolios)

Improve on storytelling and communicating your ideas.

Create a comfortable and safe speaking environment

Gain industry insights by learning prototyping, project management, presentation & testing skills

Help you grow as engineers, professionals and people.

Past Projects

Projects students have done in the past?

musicians to improve transport and storage of fragile instruments

firefighters to design a hose management system

beekeepers to design a device to more effectively weigh beehives

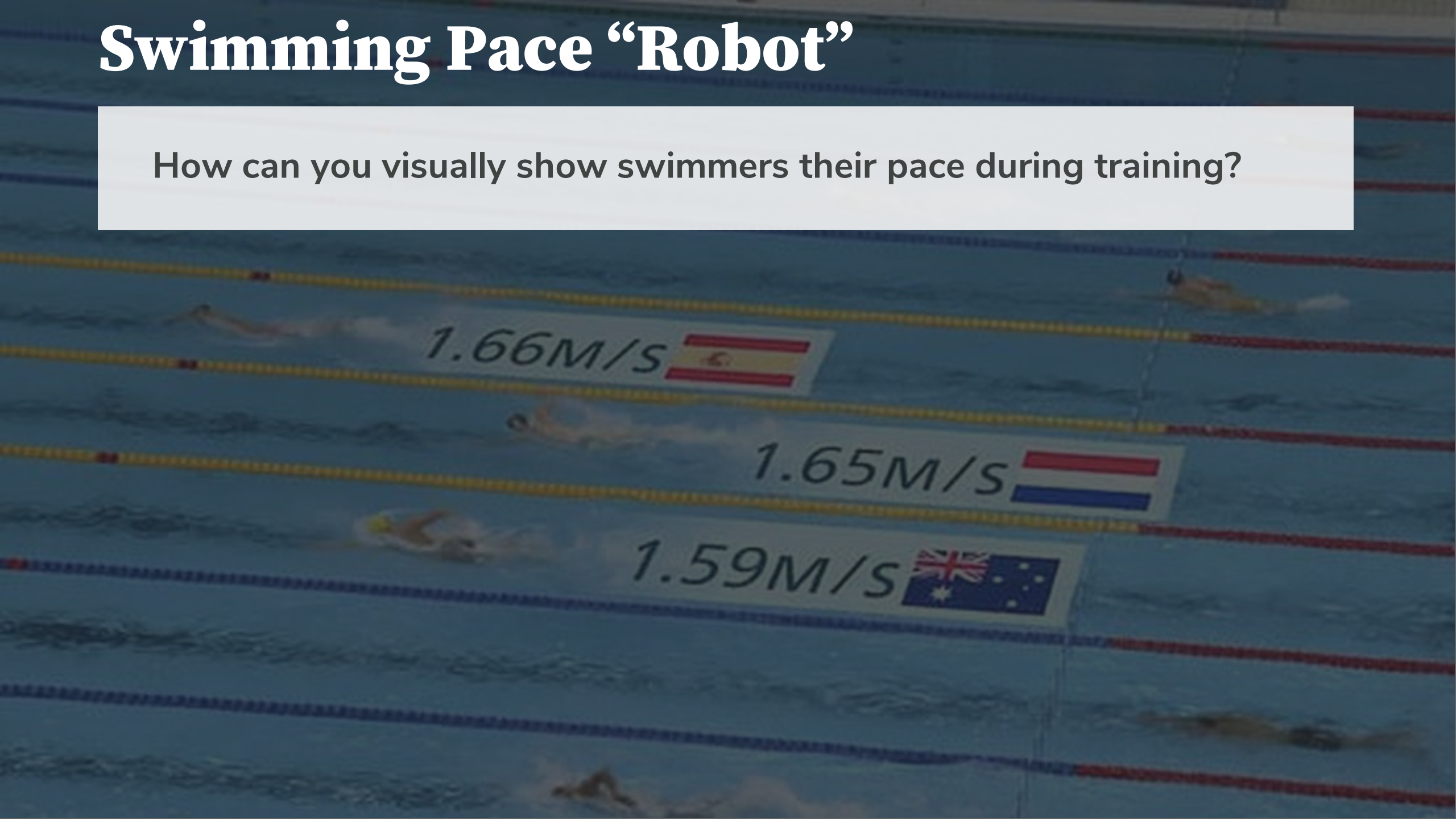
The Cincinnati Zoo to develop an enrichment device for Asian Elephants

Mid-Ohio Food Bank to develop a rainwater collection system for urban farms

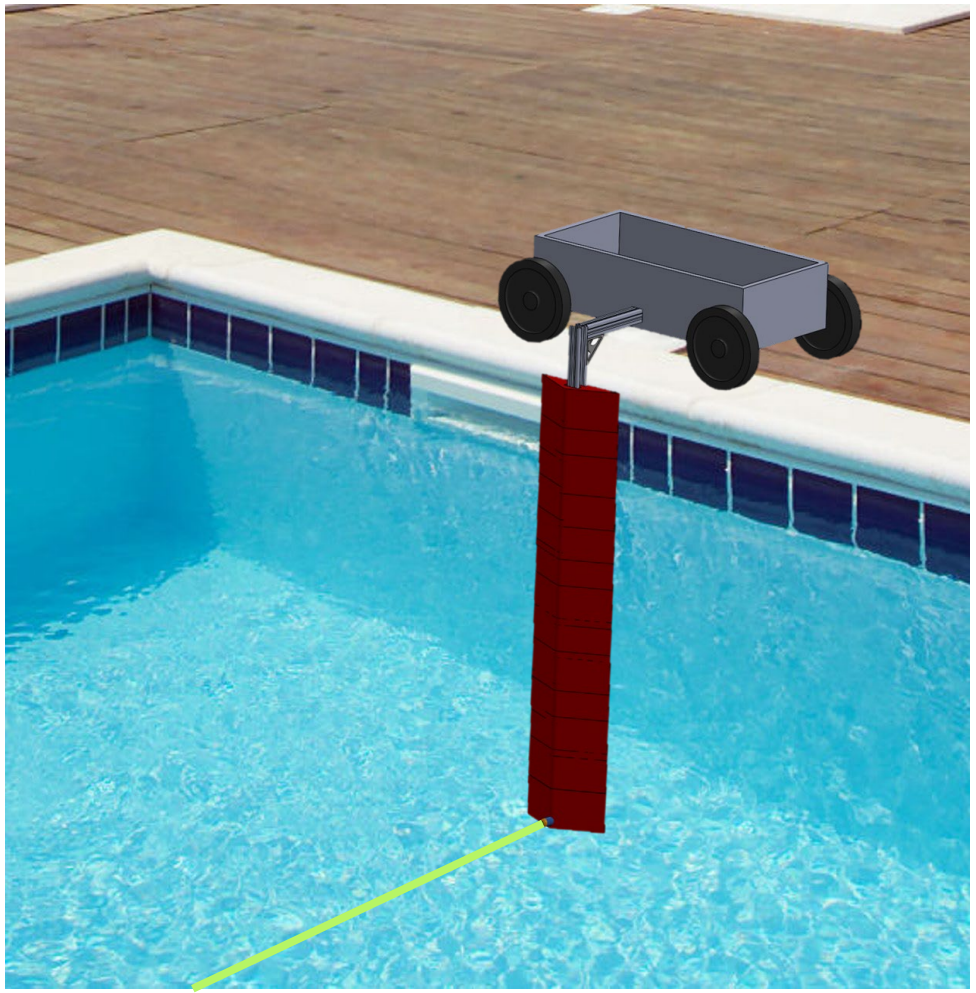
... many more!

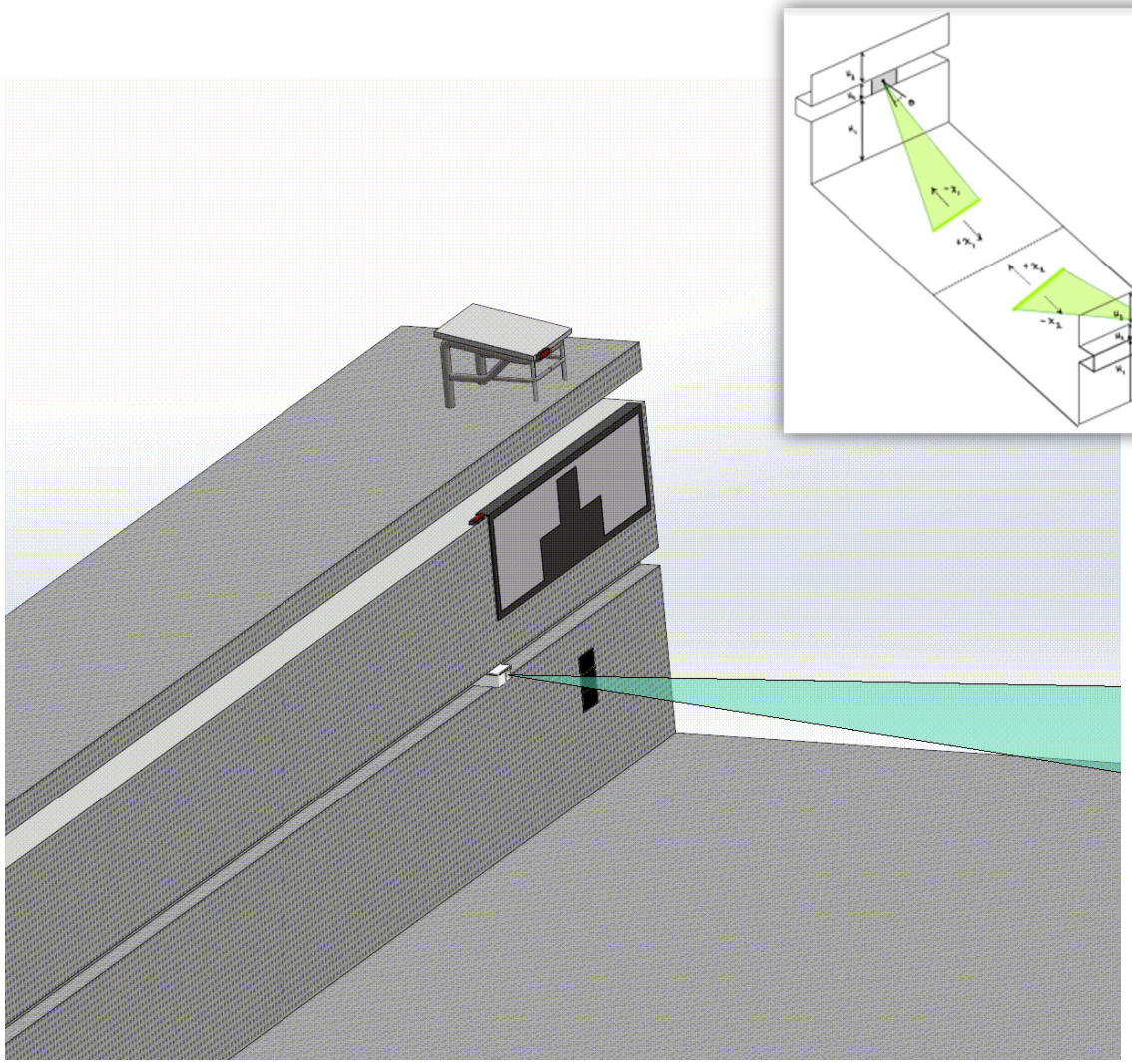
Swimming Pace “Robot”

How can you visually show swimmers their pace during training?



Swimming Pace “Robot”

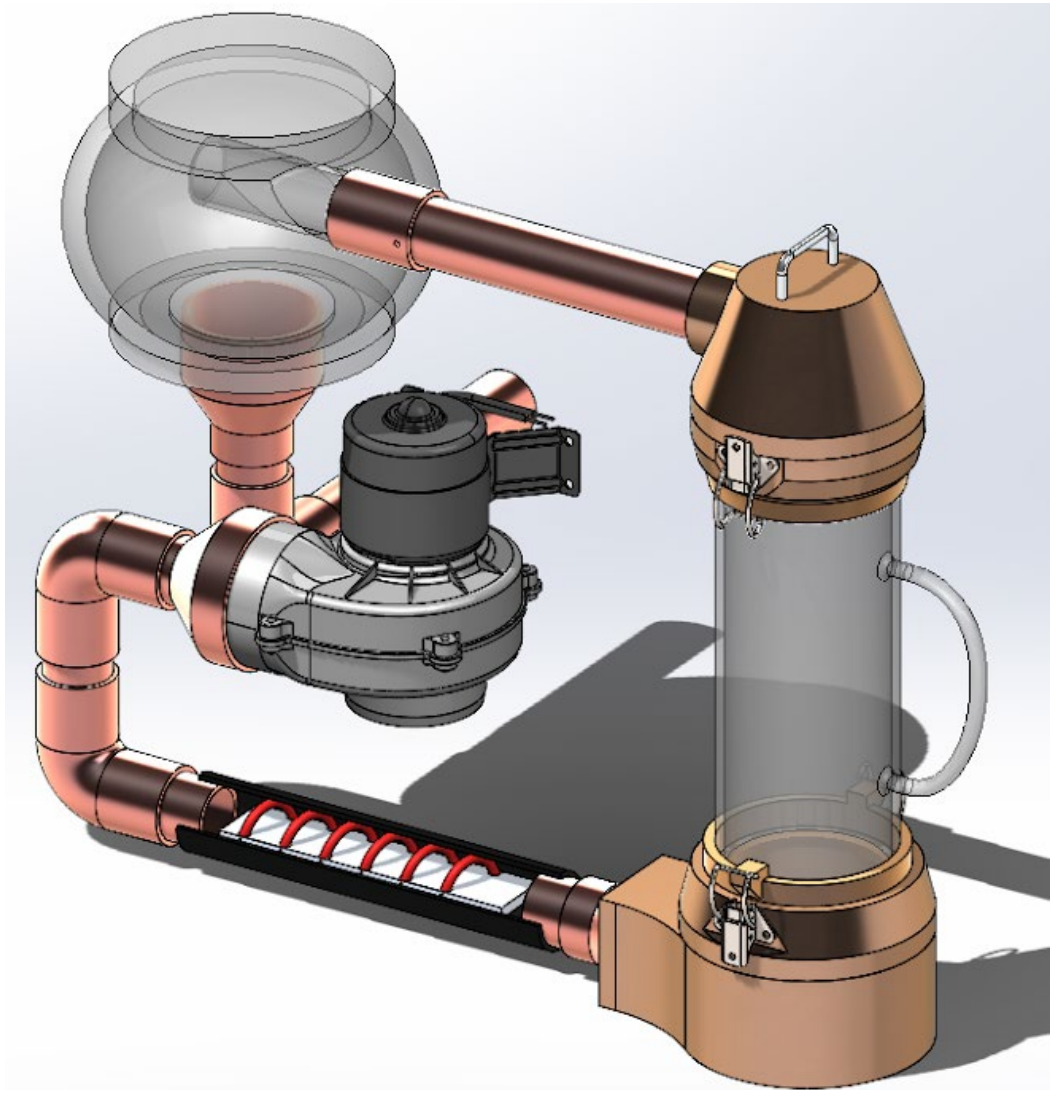


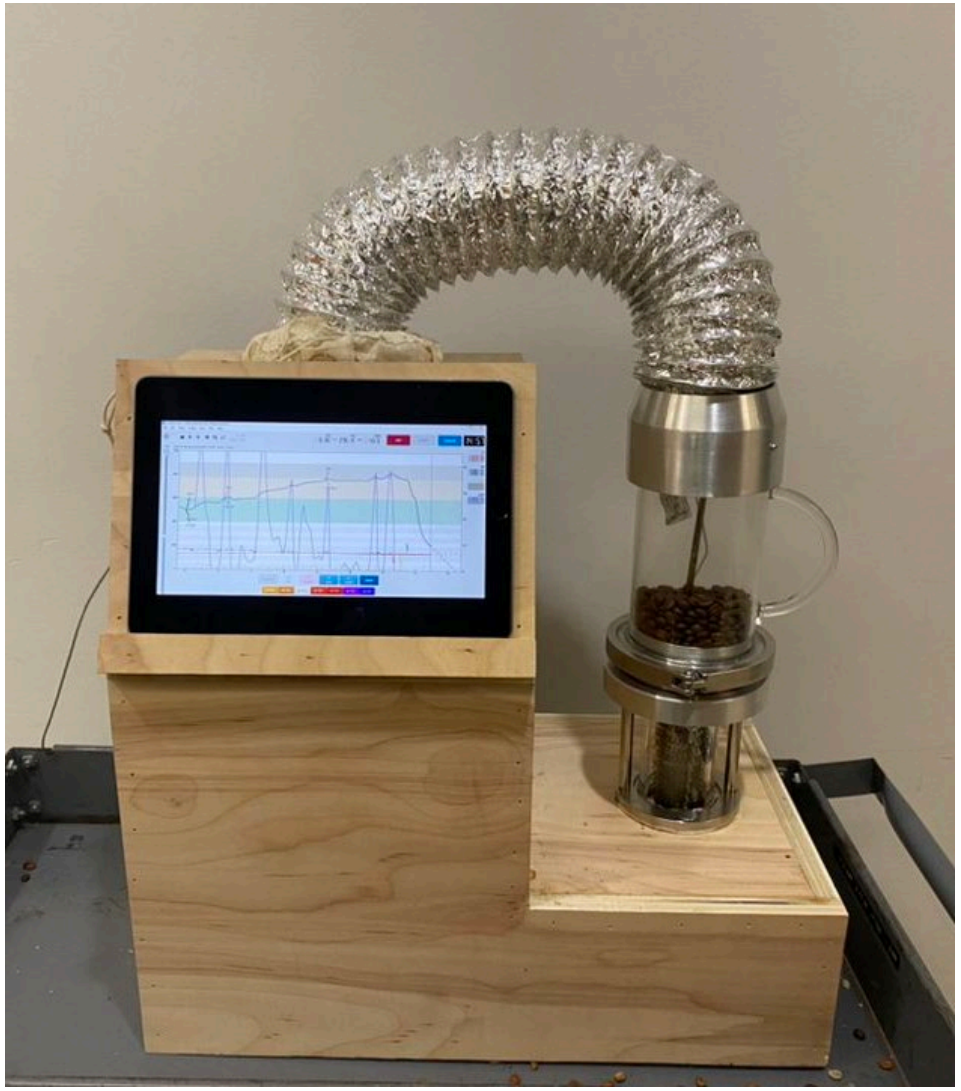


Hobbyist Coffee Roaster

Countertop coffee roaster for small batch home roasters

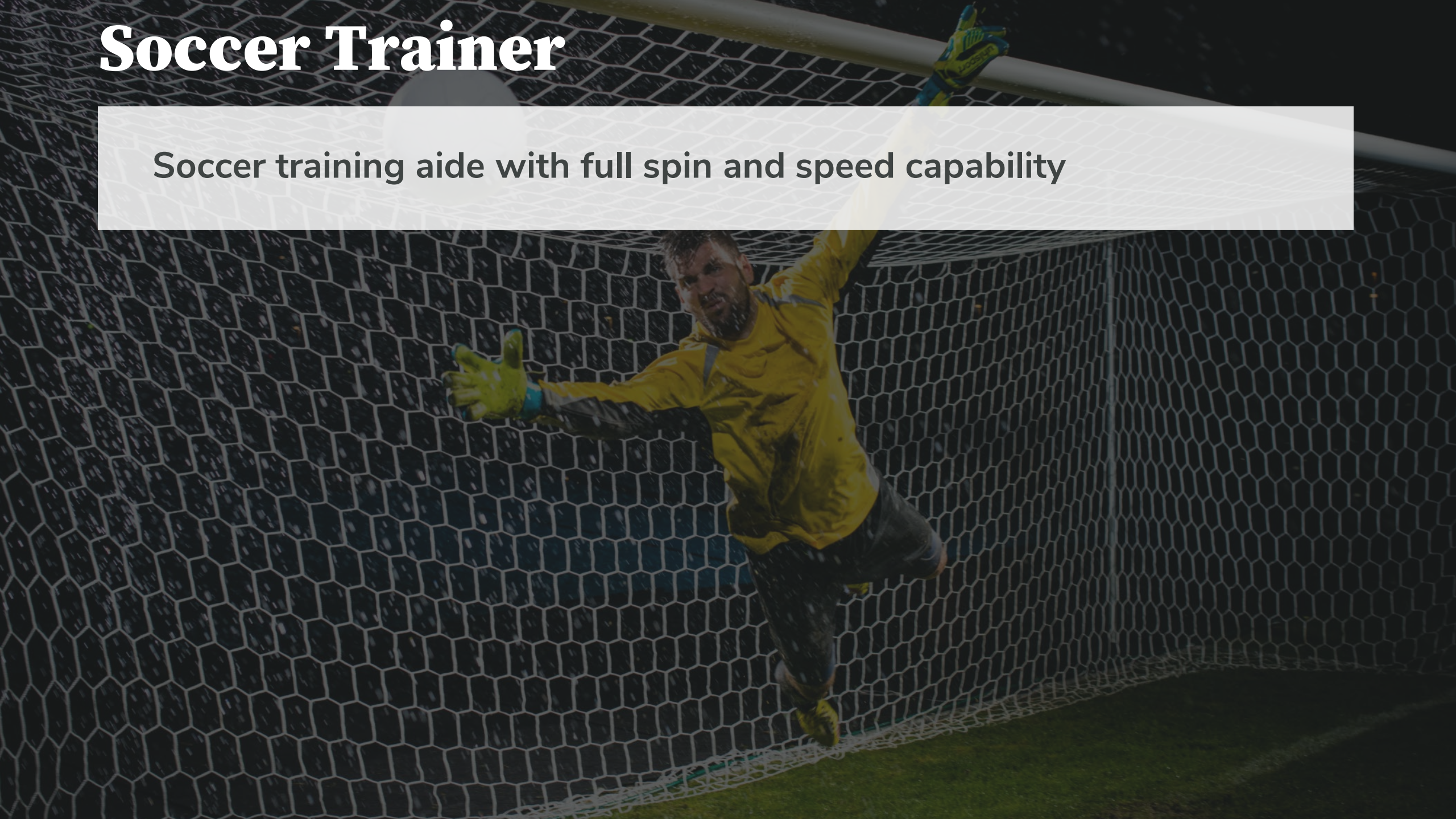
Hobbyist Coffee Roaster



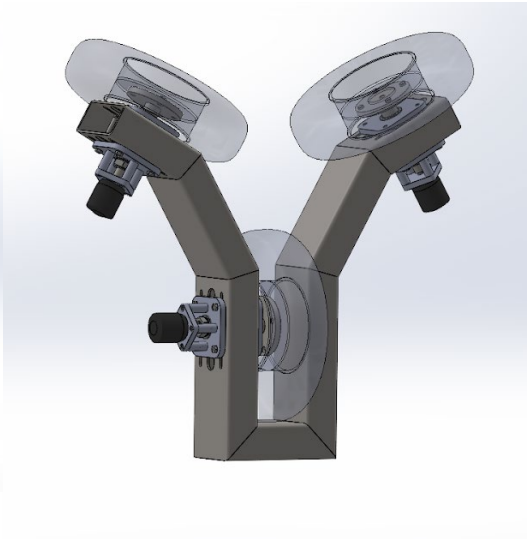


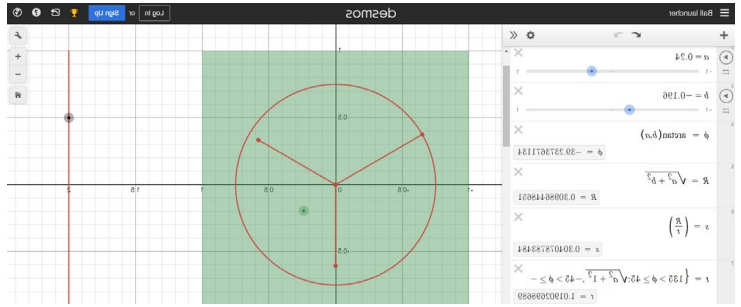
Soccer Trainer

Soccer training aide with full spin and speed capability



Soccer Trainer

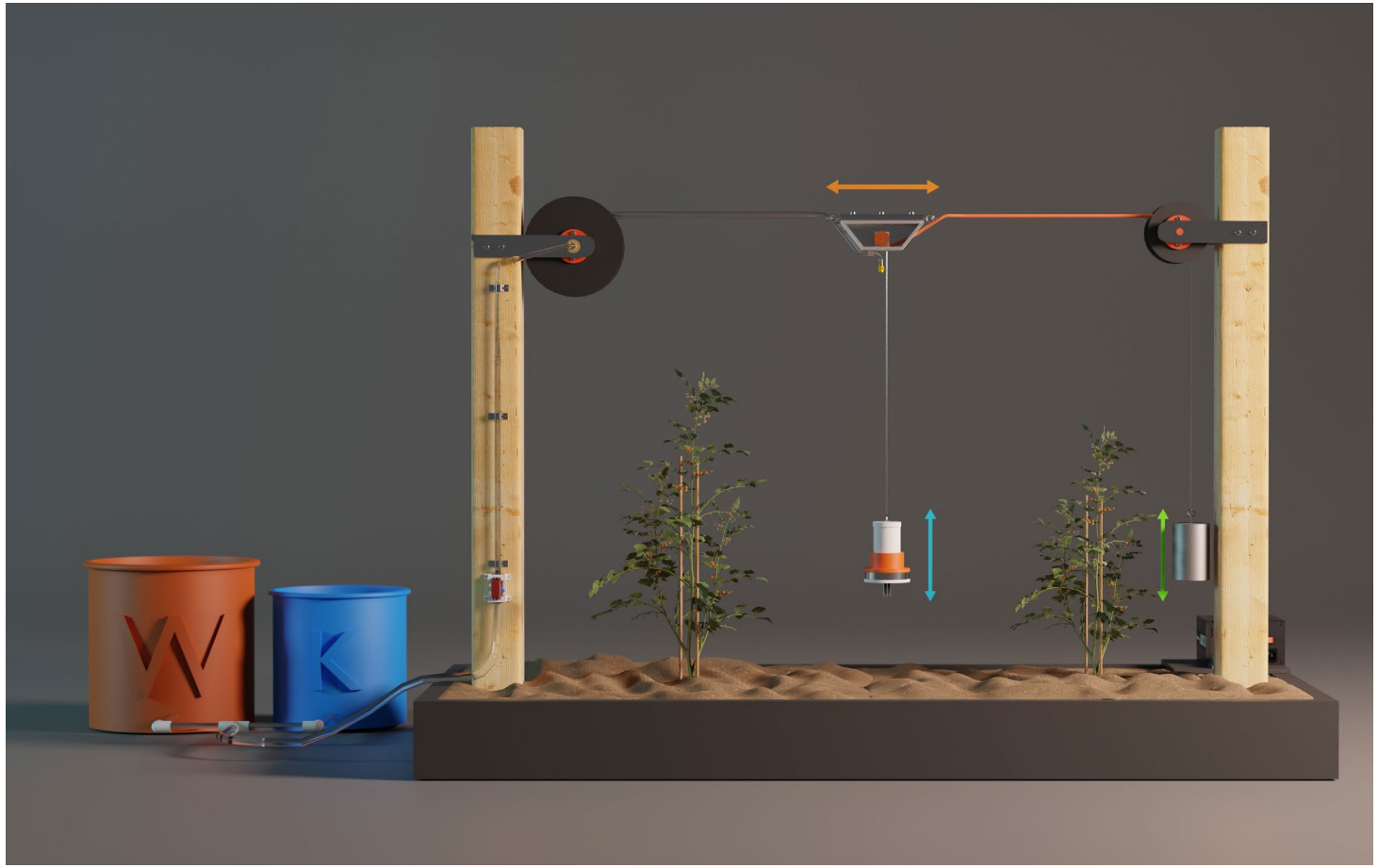


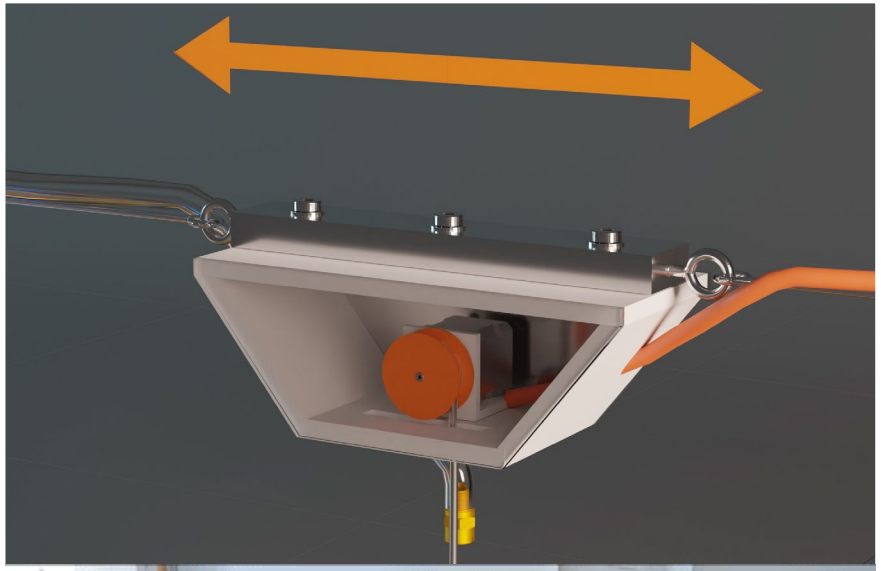


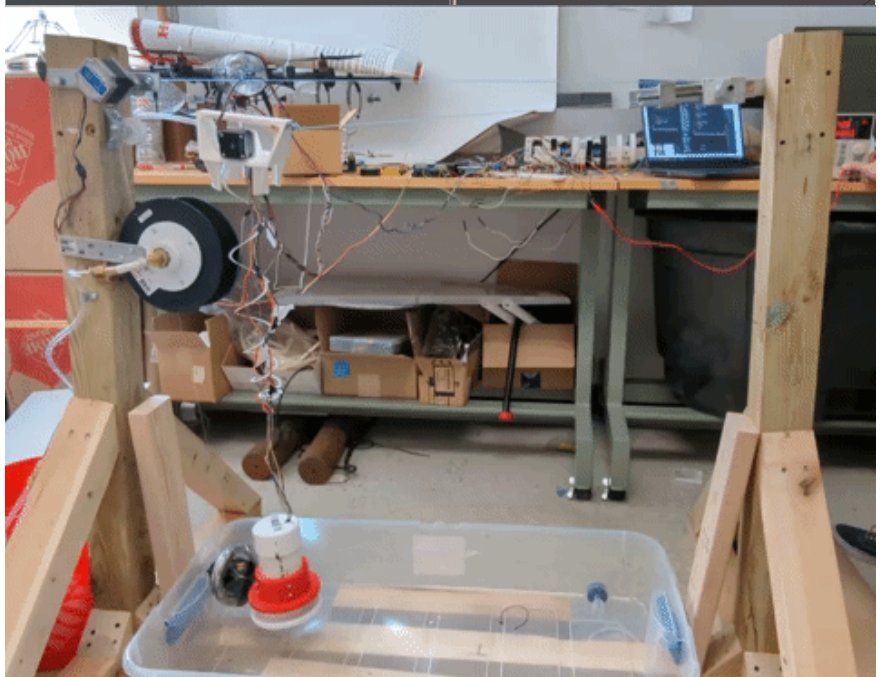
Automated Plant System

Self watering and nutrient delivery system to improve plan yield.

Automated Plant System



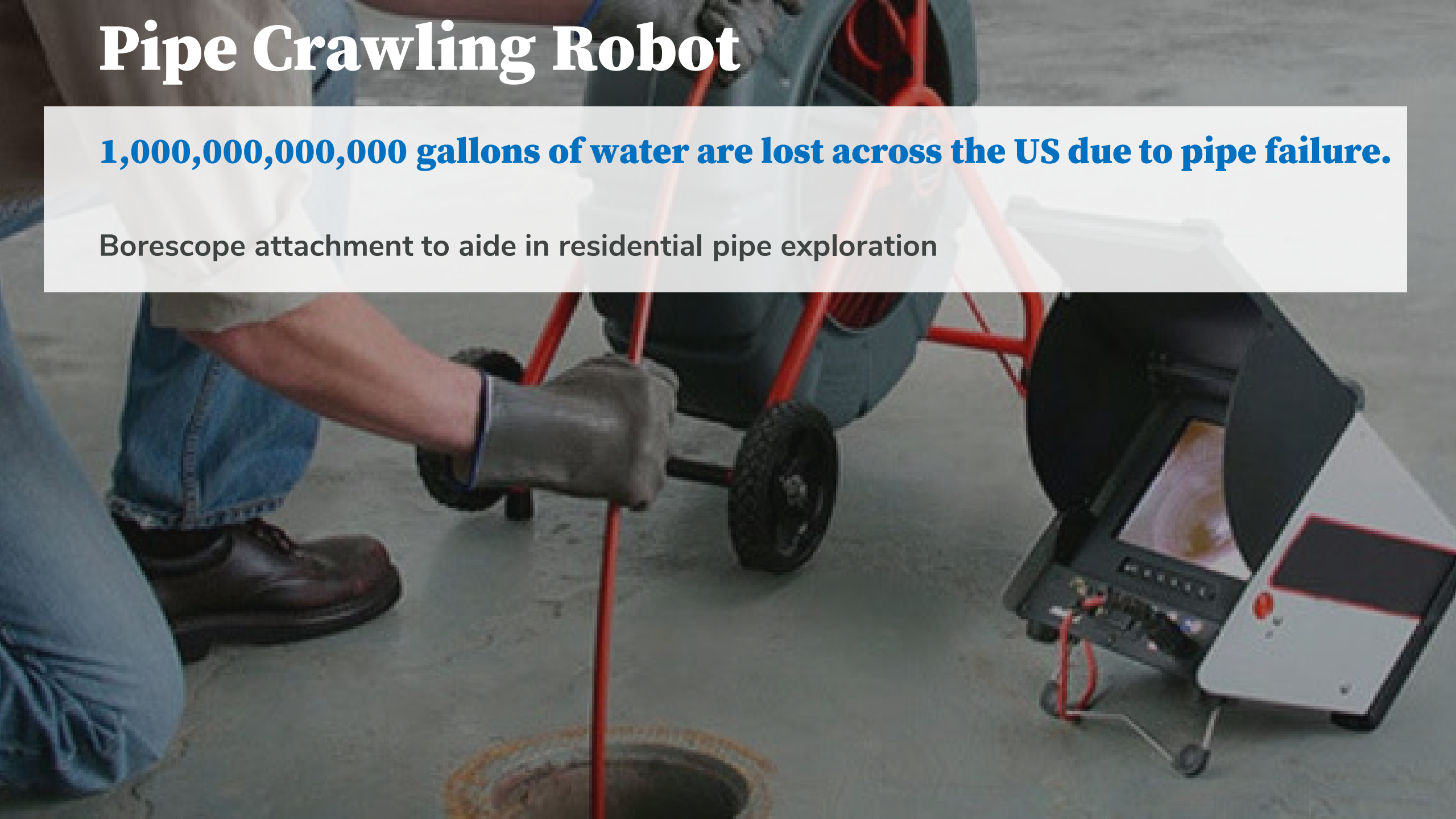




Pipe Crawling Robot

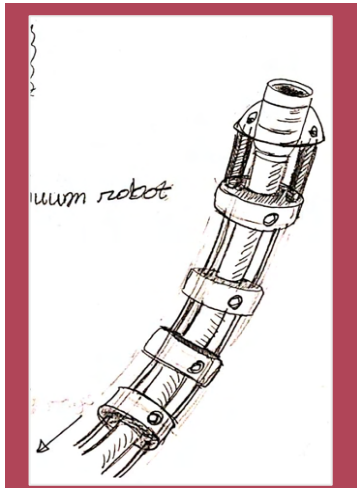
1,000,000,000,000 gallons of water are lost across the US due to pipe failure.

Borescope attachment to aide in residential pipe exploration

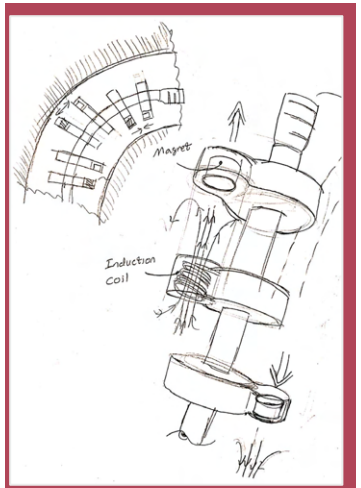


Pipe Crawling Robot

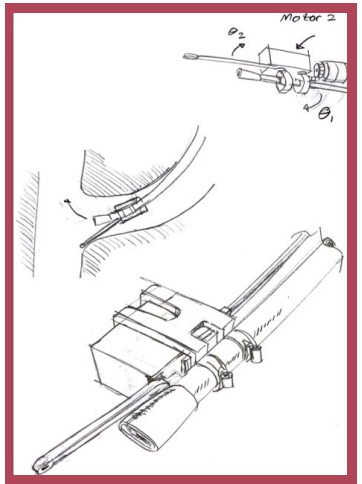
INITIAL CONCEPTS



Continuum Robot

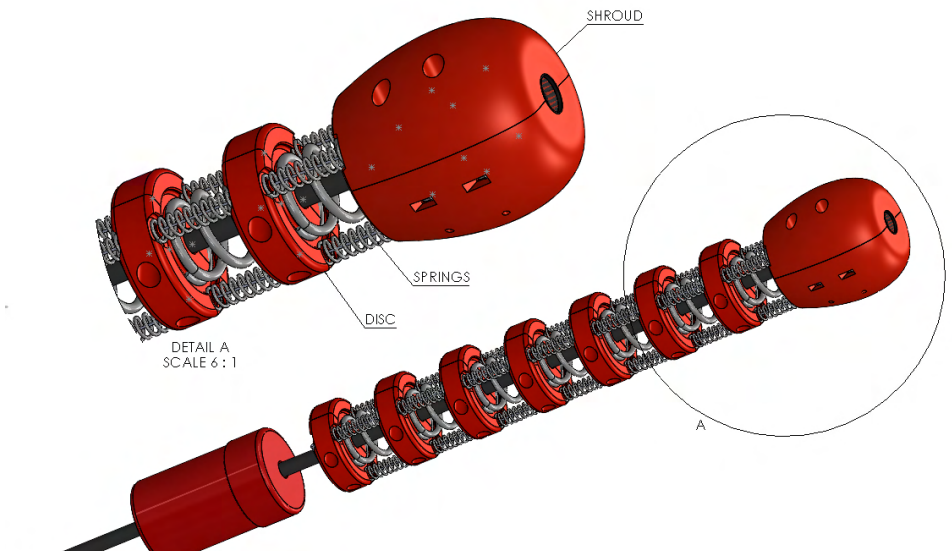


Magnetic robot

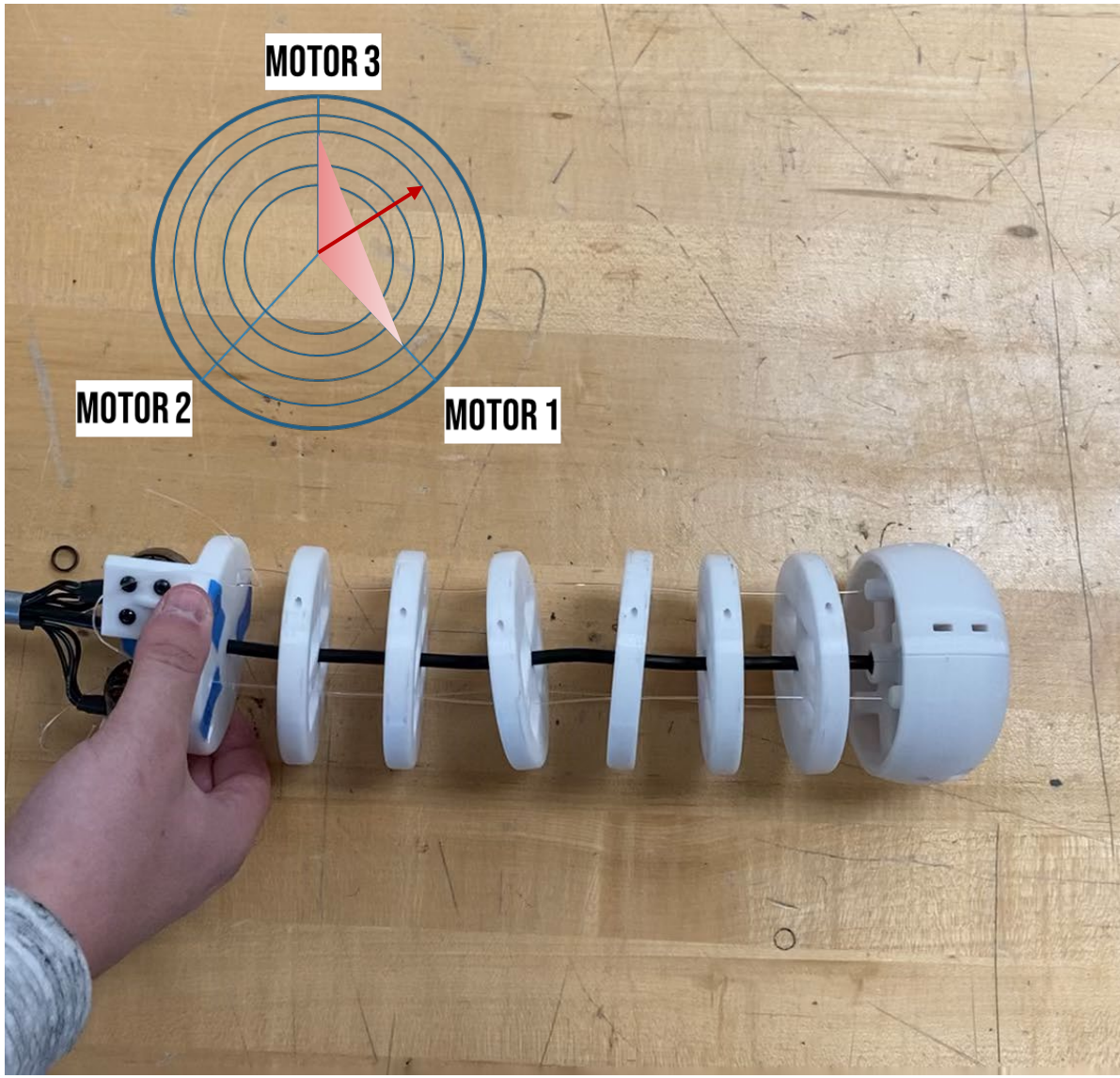


Servo robot

CAD

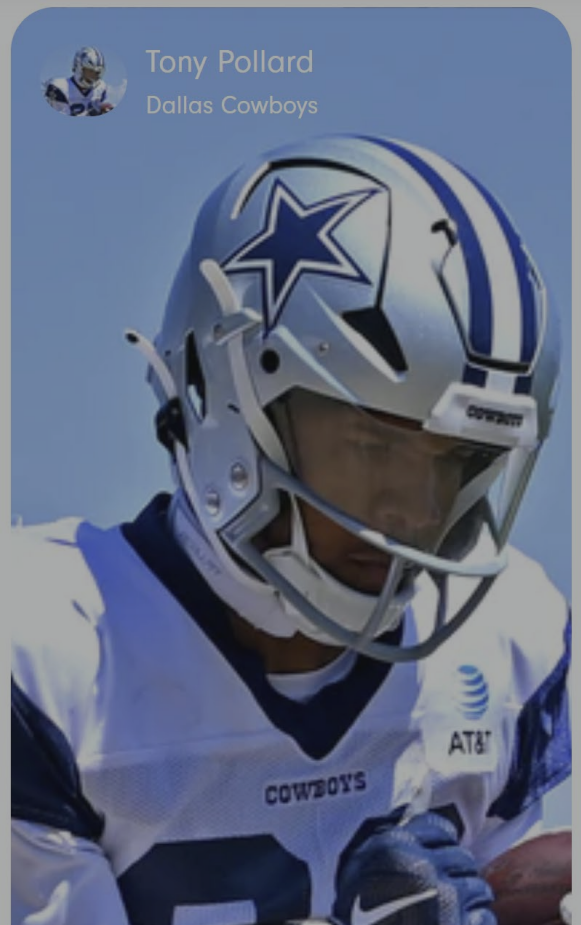


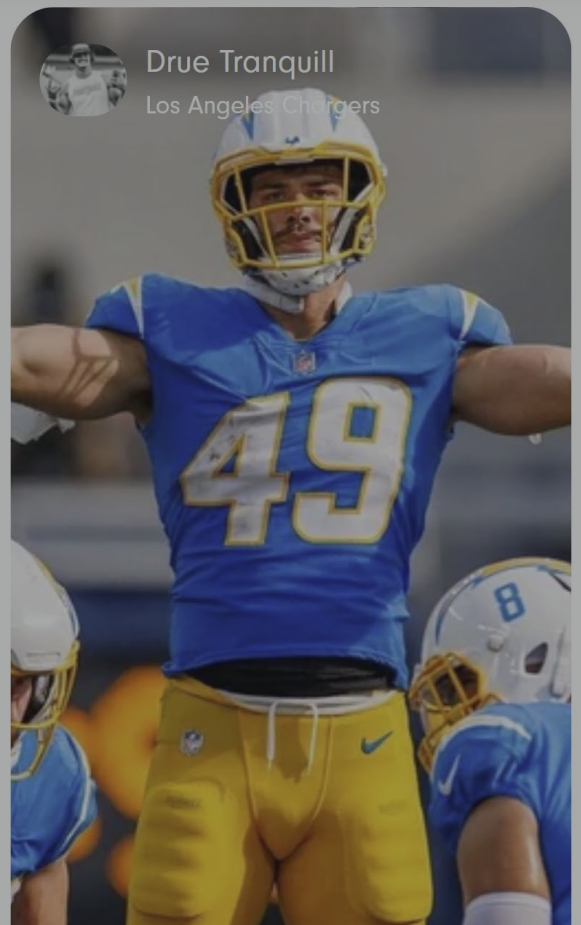
FINAL PROTOTYPE



Q30

The Q-Collar helps protect the brain from the damage caused by repetitive head impacts that can alter brain tissue. Athletes who were not wearing the Q-Collar were three times more likely to have significant changes in their brain tissue.





Q30

Q30

INTEGRATED BIOMETRICS

Collar Integration

Removable Accessory

Sleeve Integration

INTEGRATED BIOMETRICS

Sensor Types

- Collar/Pod Pressure
- GPS/Position
- Non-GPS location
- Accelerometer(S)
- Heart Rate
- Skin Galvonic
- Temp Sensor
- Hydration
- Breathing rate
- HRV (Heart Rate Variability)
- Communications (military)
- Misc. Attachments
- Biofeedback (vibratory, audible)

Collar Function

Collection of sensors that provide data related to collar size, fit, function, performance, etc

Brain Injury Prevention

Collection of sensors that provide data related to detection or prevention of brain injury

Athlete Performance

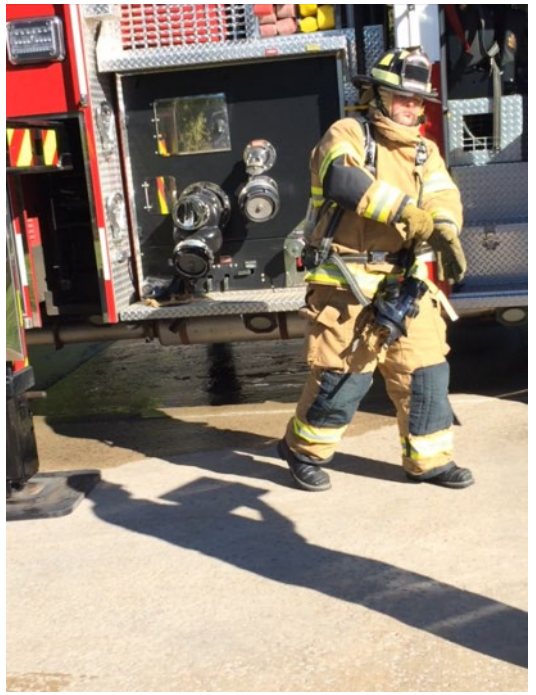
Collection of sensors that provide data related to athlete physical performance.

Athlete Health

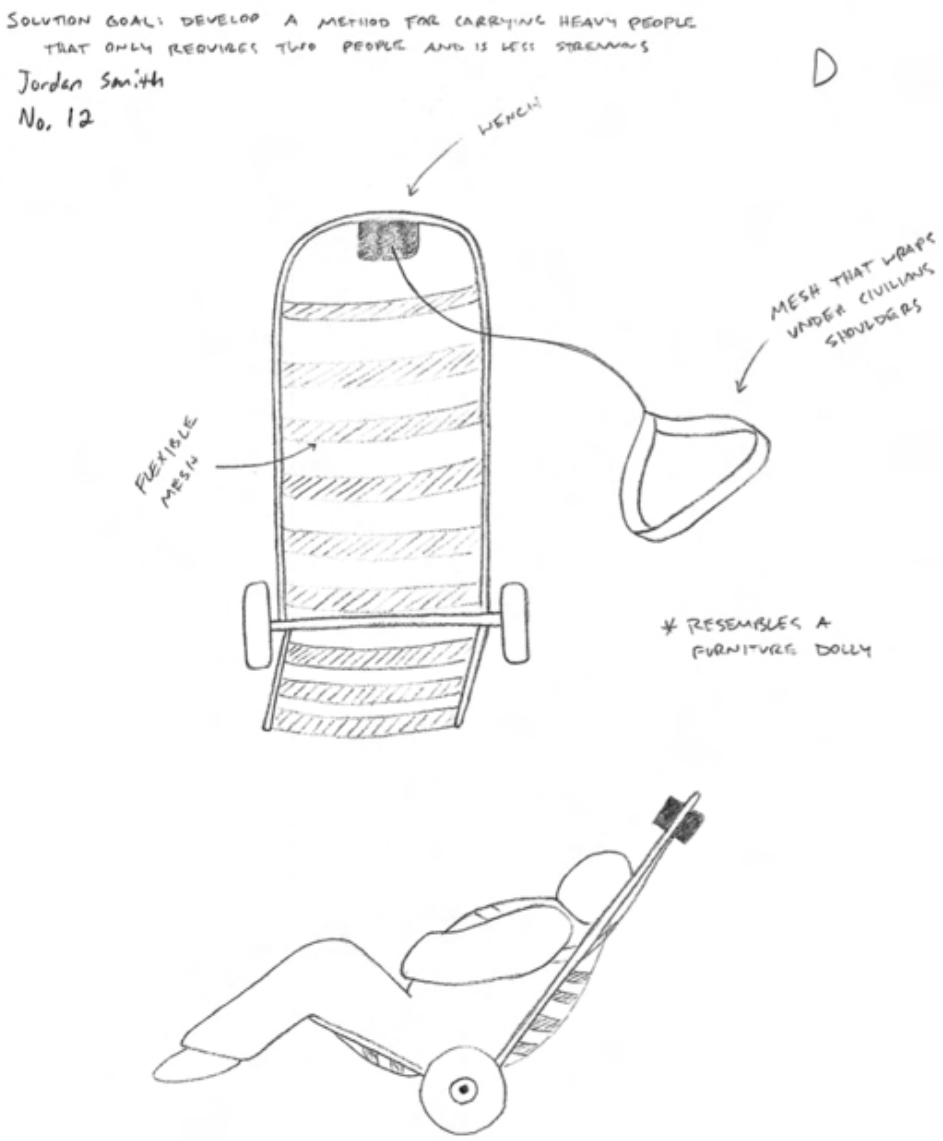
Collection of sensors that provide data related to athlete health and biometrics.

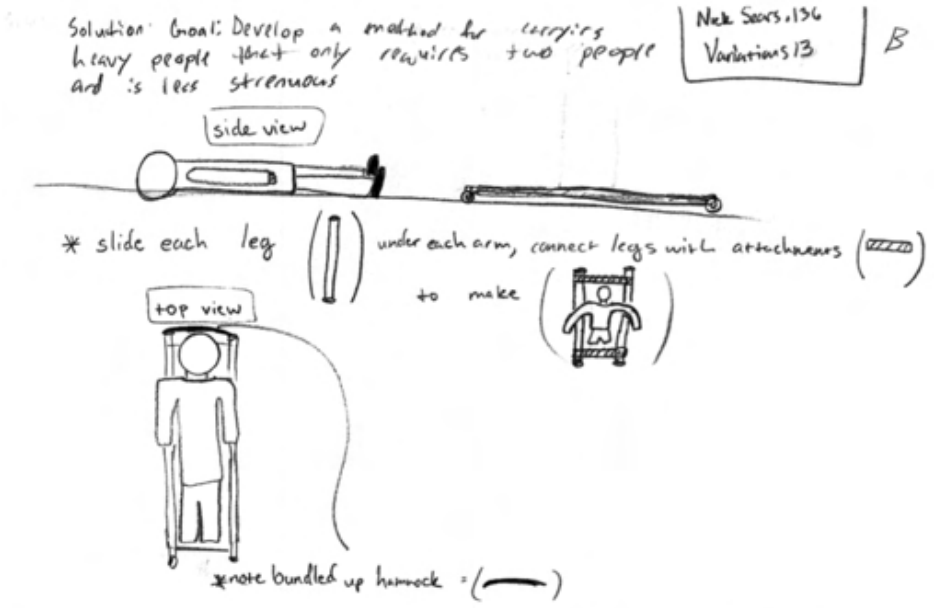
	Sensor Type	**Athlete Performance** (Physical Metrics, speed)	**Bran Injury Prevention** (Contributing Factors)	**Athlete Health** (Biometrics)	**Misc. Markets** (Military/Custom)		**Collar Function** (Is collar working)
1	Collar Force/Pod Pressure					Need	X
2	Biofeedback (Light, audible, vibratory)		X			Want	X
3	Temperature (ambient)	X	X	X	X	Optional	X
4	GPS/Position	X					
5	Non-GPS Location (3 pt)	X					
6	Accelerometer	X (body)	X (head)				
7	Gyroscope	X	x				
8	Barometric Pressure		X				
9	Barometric Altimeter		X				
10	Heart Rate (optical, conductive,)		X	X			
11	Temperature (body)		X	X			
12	Hydration		X	X			
13	HRV (heart rate variability)			X			
14	ECG			X			
15	Skin Galvonic			X			
16	Breathing Rate			X			
17	PO2 sensor (Oxygen level)			X			
18	Communications (miltary)				X		

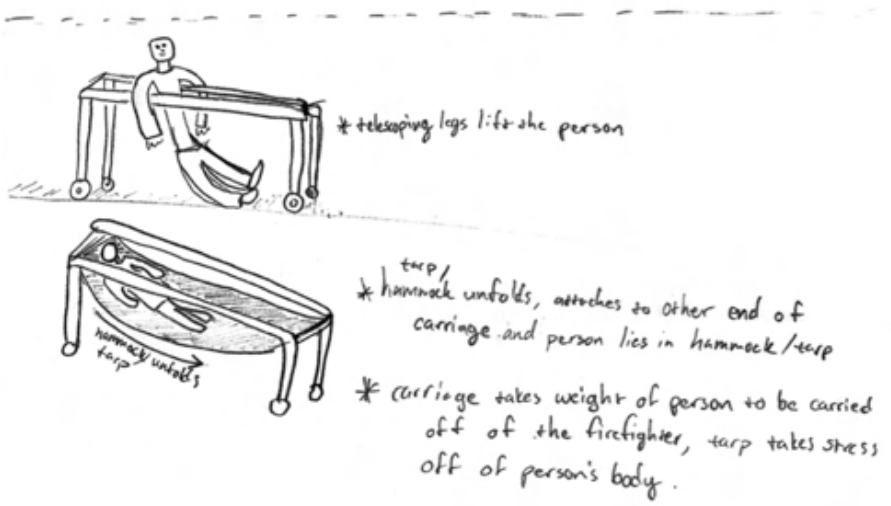
Example: On-the-scene shadowing of firefighters at a training exercise



Example: Visual Idea Generation







Example: Low-Resolution Prototypes

What do past students say about 4906.01

"It takes a very wholistic approach to design. We start from the beginning!"

"YOU define the problems you are going to address"

"It gives us a better understanding of how to solve real world problems"

"You get to come up with your own project & explore your creativity"

"It challenges you to go out and figure things out for yourself"

"The independence is awesome!"

"You get to go very in depth with the product design process"

What do past students say is CHALLENGING?

"Not jumping ahead to solve the problem before you define it"

"You are responsible for your own fate. You must manage time to be successful"

"There are almost no constraints initially, so it can be daunting to figure out what you need to do to solve a problem"

"Keeping things on schedule- your own schedule"

"Being diligent about working & meeting with your teammates"

"Trying to figure out the true root cause of a user's problem"

This all sounds great! How do I proceed?

Enrollment is by permission of instructor

Fill out Form to express interest & request permission to enroll

https://forms.gle/oMj5q8YqiVDeBxeo9

Please share:

- why you want to join product design capstone
- which section you are interested in
- if you are enrolled in 5682.01
- your favorite personal project

When will enrollment be confirmed?

You will be notified of enrollment by April 7th

Is your course registration window before April 7th ??

Proactively enroll in your 2nd choice capstone to hold your second-choice place

Proactively enroll in the 5682.01 Product Design elective to hold your place

Thanks…
Any Questions?

Annie Abell, Assistant Professor of Practice
Office: W292B Scott Lab
Email: abell.9@osu.edu

Dan Wisniewski, Assistant Professor of Practice
Office: E413 Scott Lab
Email: Wisniewski.28@osu.edu