Programmable Robot Hand

Human Anatomy

a) The brain sends movement signals to arm and finger muscles

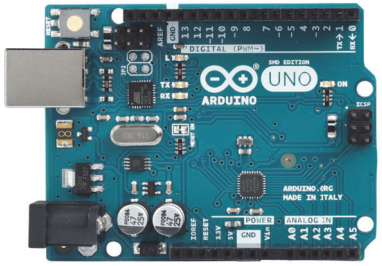
b) Muscles either contract or extend

c) Muscles are connected to tendons, which are connected to fingers and thumb

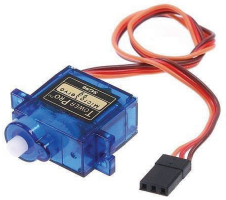
d) The fingers and thumb move accordingly

- Humans have two sets of tendons, one for contractions (flexor tendons) and one for extension (extensor tendons)
- Tendons connect muscles to bones, allowing us to move
- Tendons also allow us to keep the connected bones from moving, providing stability

Robotic Imitation



1. Arduino Uno is programmed to signal servo movement
2. Servos rotate an arm either towards or away from the hand
3. Servos are connected with fishing line to finger/thumb tips
4. Fishing line pulls the fingers, causing them to curl



- Fishing line only mimics flexor tendon movement, the rubber finger straightens itself as tension is reduced on the fishing line
- Fishing line connects servos to fingertips, allowing programmable movement
- Tension in the fishing line is what creates stability for the robotic fingers

By Team XYZ:
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TUG OF WAR

An interactive learning tool that teaches students about net force.

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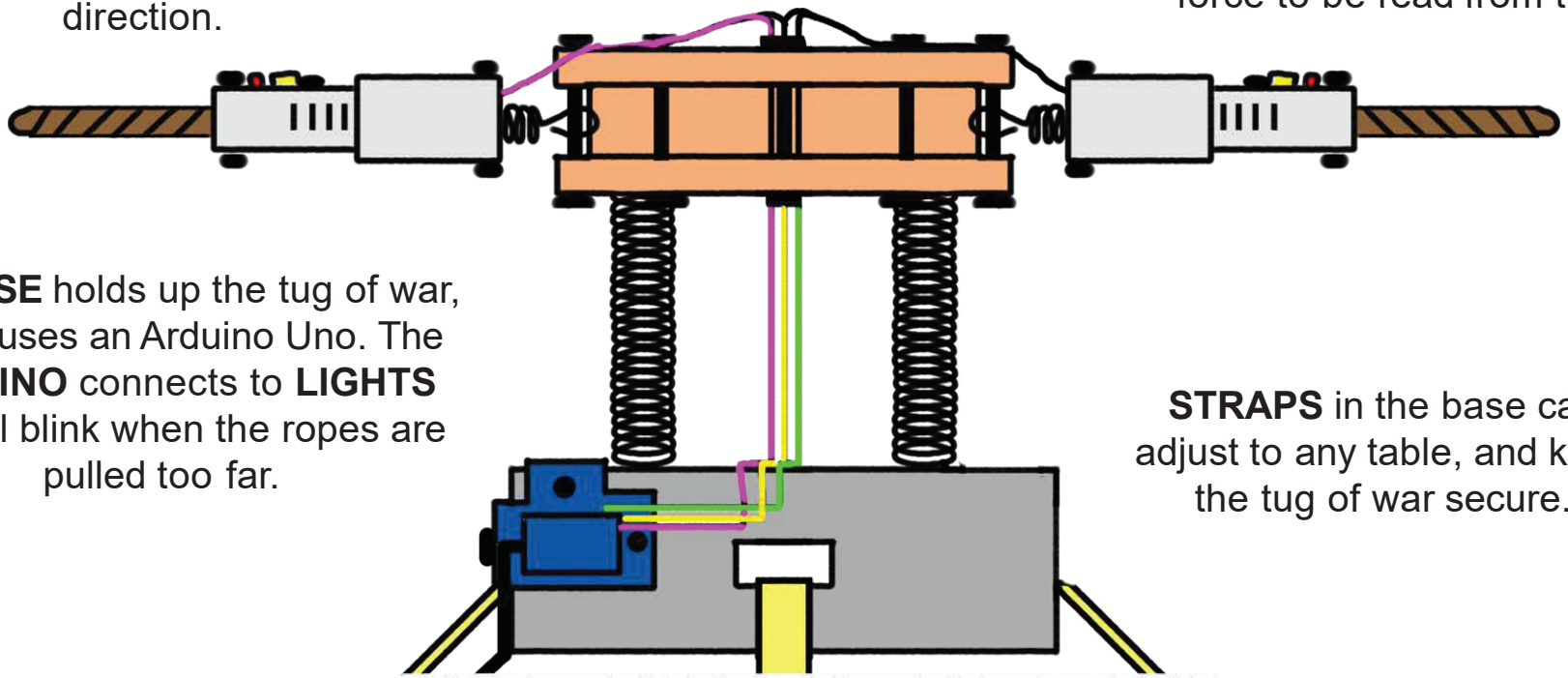
(Using a provided **SPREADSHEET,** students can input the angles and force readings to automatically calculate net force and direction.)

The **CENTRAL HUB** is where everything connects. Attach up to four force sensors at indicated angles and visually track net direction.

These **FORCE GAUGES** stretch as the ropes are pulled, allowing the force to be read from the side.



The **BASE** holds up the tug of war, and houses an Arduino Uno. The **ARDUINO** connects to **LIGHTS** that will blink when the ropes are pulled too far.

STRAPS in the base can adjust to any table, and keep the tug of war secure.

Erosion Explosion

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Goal: Design an interactive tool for Mrs. Houseman and for students grades 3-4, that will help the students be more engaged when learning about erosion.

The top of the tilt table is flat so that a cover can be placed above it to turn it into a normal desk when not in use

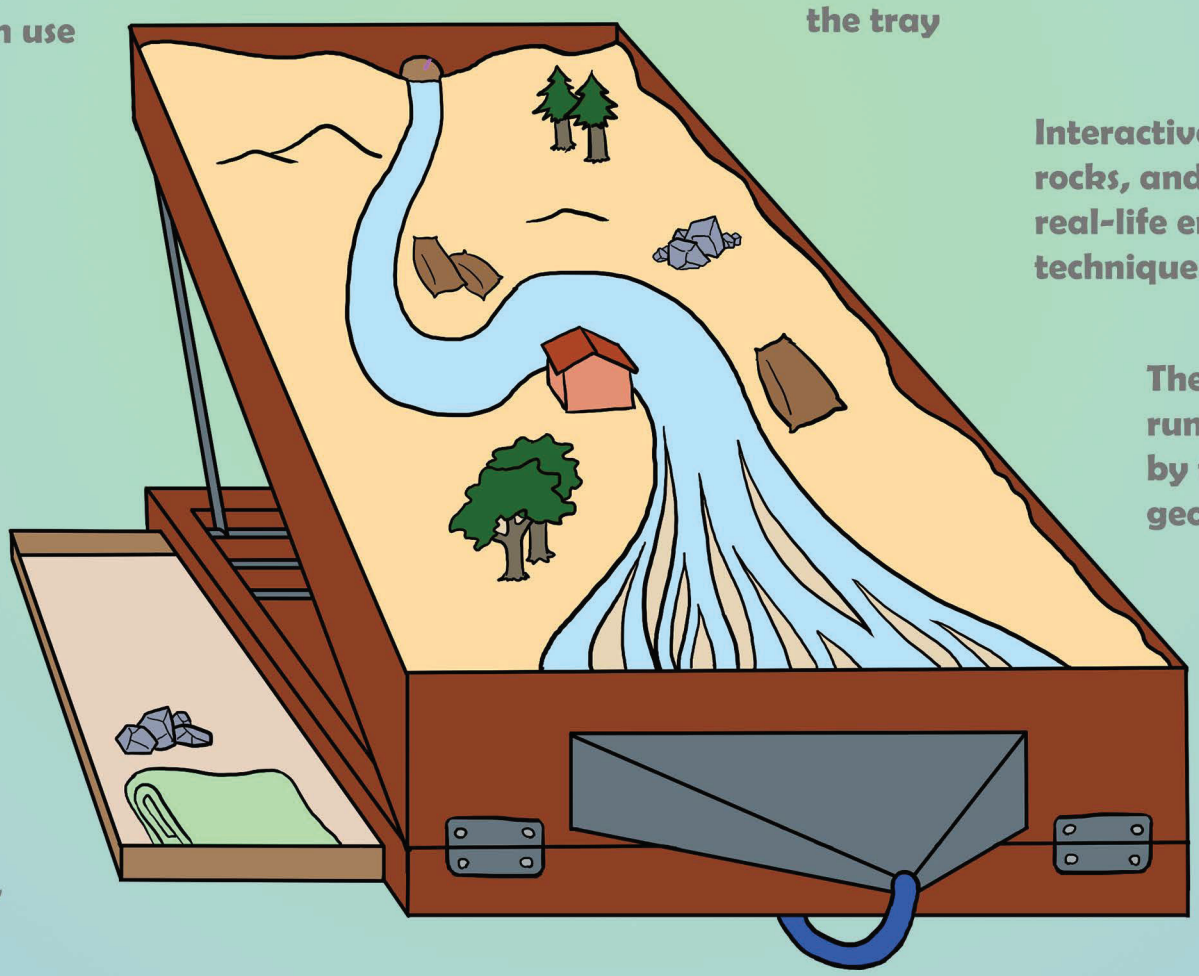
An inlet at the top of the table lets water run onto and down the sand in the tray

The lifting system allows the tilt table to rest at various angles

Interactive props like trees, rocks, and sandbags simulate real-life erosion mitigation techniques

Moisture sensors are placed in different areas in the sand tray - for example, in a house prop - to show what regions are in danger of flooding

The river is formed by the running water and shaped by the various props and geographic features



A drawer below the tilt table allows for easy storage of props, sensors, and cleaning tools

A drain at the bottom of the tilt table allows the water to leave the tray via a pipe and be recycled

GARBAGE to GARDENS

What is Compost?

Composting is the natural process of breaking down organic matter—anything that comes from a plant or animal—into nutrient-rich material called compost. This process is carried out by millions of decomposer organisms like worms, mites, fungi and microscopic organisms. Composting transforms organic waste from an unstable, rotting state to a stable, rich, earthy state.

Composting is as easy as 1-2-3

1. **CHOP MATERIALS** if you want them to break down more quickly.
2. **MIX** "browns" with "greens."
3. **KEEP COMPOST AS MOIST** as a wrung out sponge. Water as needed to maintain moisture balance.

A basic compost pile needs only four ingredients: browns, greens, air and water. Browns are carbon-rich, dry materials like branches, leaves, paper and sawdust. Greens are nitrogen-rich, moist materials like grass clippings, fruits and vegetables.

GREENS

- Fruits and Vegetables
- Breads and Grains
- Grass Clippings
- Hair and Fur
- Coffee Grounds

BROWNS

- Leaves
- Twigs
- Shredded Newspaper
- Cardboard Rolls
- Clean Paper
- Fireplace Ashes
- Nutshells
- Sawdust
- Used Potting Soil
- Hay and Straw

Ideal Conditions

Too Cold
>120 F
Too Little Water
Dry, Breaks Apart in Hand
Too Much Nitrogen
Wet, Slimy, Strong Smelling

Perfect!
Between 120F and 160F
Feels like a "wet sponge"

Too Hot
< 160F
Too Much Water
Soggy, Water Pours When Squeezed
Too Much Carbon
Dry, Fibrous with Little Rotting

WHAT NOT TO ADD:

- Metal, glass, or plastic
- Meat, fish, or bones
- Grease or oils
- Pet Waste
- Seafood Scraps
- Stickers
- Large Branches
- Treated or painted wood
- Large branches

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