CONALL DEMPSEY

PRODUCT DEVELOPMENT ENGINEER

PORTFOLIO

INNOVATION DRIVEN BY USER INSIGHTS

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ABOUT ME

THE PRODUCT DEVLOPMENT ENGINEER

Passion. I am passionate about developing human-centered products with purpose and high-impact potential.

Curiosity. I like to try new things, forge new connections, pick up new skills, eat new foods and think about new ideas.

Energy. I thrive in highly collaborative and dynamic design cultures.

I'm a creator, a product developer and a mechanical engineer -- but outside the office I'm an all-around athlete, cook and explorer. I write with my left and bat with my right, and I love an afternoon drive in my ’75 Corvette.

EMBRACE

CHALLENGE

A social enterprise aiming to help vulnerable infants in the developing world, Embrace is designing a low-cost infant-warming device.

Embrace tasked me with investigating, designing and evaluating product elements to mitigate the risk of infants being overheated in the Infant Warmer.

Embrace
embraceglobal.org
India – 2010

PROCESS

STRUCTURING THE APPROACH

Defining Project Scope

Establishing Safety and Design Guiding Principles

Field + Stakeholder Research

Synthesis + Insights

Product Use Flow Mapping

Concept Development

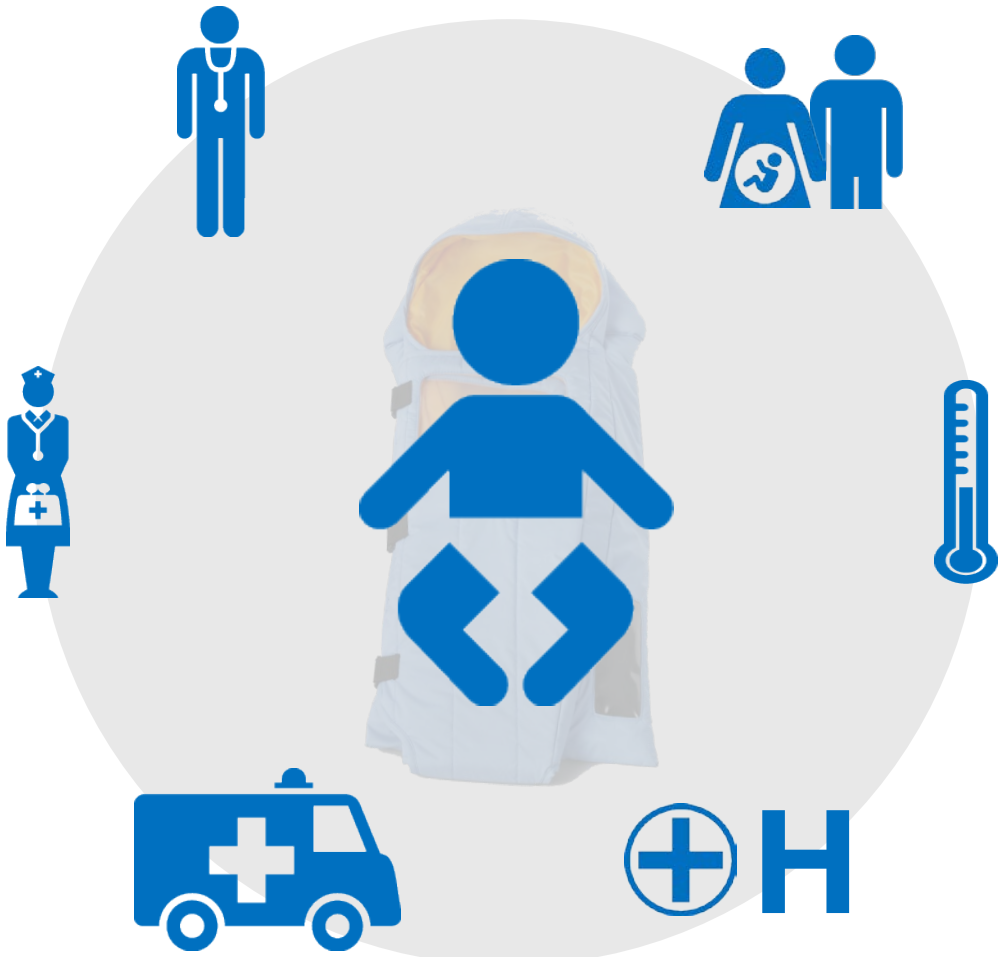
Prototyping and Refinement

Field visits to urban and semi-urban clinics were critical to understanding the context.

The Infant Warmer would be operating in very low-resource neonatal environments.

In just 18 months, ambulance staff in one Indian state delivered over 6,000 babies en route to the hospital.

FIELD + STAKEHOLDER RESEARCH



BUILDING EMPATHY

Hours spent **interviewing and observing end-users** enabled me to know the situation from their perspective and understand their needs and medical procedures.

INTERVIEWS + OBSERVATIONS

Doctors

Nurses

Mothers

Hospital Directors

Clinic Staff

Ambulance Drivers

Emergency Medical Technicians

SYNTHESIS + INSIGHTS

HEATING SAFETY

Medical personnel make **discretionary decisions** about the urgency and treatment when an infant's temperature falls outside the optimal range.

Users often mistakenly perceive a correctly heated Infant Warmer as **not warm enough**.

Users typically **touch** the infant's hands and feet to check temperature.

EASE OF USE

Users need to **eliminate** the risk of cross-contamination between infants.

Users need to keep the infant **securely and comfortably** in place without risking injury.

Users need a **simple, consistent and intuitive** method to gauge temperature.

The Warmer must enable easy visual and tactile access to the infant while sustaining minimal heat loss.

Working with nurses in context informed a design that matched users' conceptual models.

Bringing the interdisciplinary team together incorporated insights from all of Embrace's experience.

Controlled studies with newborn infants highlighted safety and comfort concerns.

CONCEPT DEVELOPMENT

USAGE SCENARIO MAPPING

Mapping the **product use flow** through multiple clinical use scenarios revealed areas where the product design might introduce overheating risks.

PRODUCT IN CONTEXT

In a major milestone for Embrace, I supervised the **debut of the Infant Warmer** in delivering heat to newborn babies.

This was the initial introduction of the product into a **critical-care environment**, with infants being placed in the Warmer within an hour of birth.

PROTOTYPING

SHAPE AND FIT

Enlarged facial opening to allow infant to turn head without suffocation risk.

Softened seam using a wrap to avoid abrading infant skin.

Implemented **tapered shape** to achieve a tight swaddle around the infant, preventing sliding down into the bag.

TEMPERATURE INDICATOR

Redesigned LCD indicator to enable non-medical users to correctly assess Infant Warmer temperature.

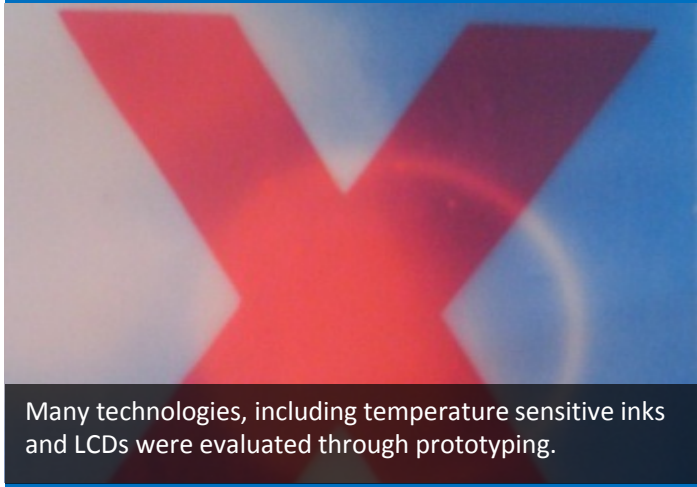
In certain situations, touch may be the best available method to determine an infant's temperature. The redesigned sleeping bag includes **easy touch-access** to the infant's hands and feet while minimizing heat loss.

HEATING POUCH INSULATION

Conducted extensive temperature controlled testing to select **ideal insulation amount**.

Insulated top of sleeping bag around infant, to direct all heat-flow to infant compartment.

Building prototypes side-by-side with a tailor led to real-time updates and manufacturing insights.



Many technologies, including temperature sensitive inks and LCDs were evaluated through prototyping.

Testing the fit with a variety of infant mannequins aided rapid and robust iterations through prototypes.

A SAFER DESIGN

Keeps the infant warm and comfortable, while allowing the doctors, nurses and family close access.

HEAT POUCH ACCESS
Vertical slide-in uses gravity to help properly position the heating pouch

FACE OPENING
Added a hood and wider sides to improve comfort and movement

DIRECTED INSULATION
Thick insulation on back and sides forces heat to flow through infant compartment

SECURE FASTENING
Tapered wrap and tension straps allow quick and secure infant swaddling

TEMPERATURE INDICATOR
Simple LCD display made larger and visible from above.

QUICK FINCH

CHALLENGE

Research and identify an opportunity for a new product in the bird feeder market and design a viable prototype.

Carnegie Mellon University
Pittsburgh – Fall 2011

RESEARCH

MARKET RESEARCH

Existing markets

Competitive products

Feeder features

Users : humans + birds

INTERVIEWS + OBSERVATIONS

Introductory interviews

Product use observations

Artifact-centered interviews

Research competitive product features, materials, functionality and pricing.

Time, effort and difficulty involved with filling conventional feeders are major issues.

Observations and interviews with users and their bird feeders in context.

USER NEEDS

Focusing on the interactions between the users and product revealed five key needs:

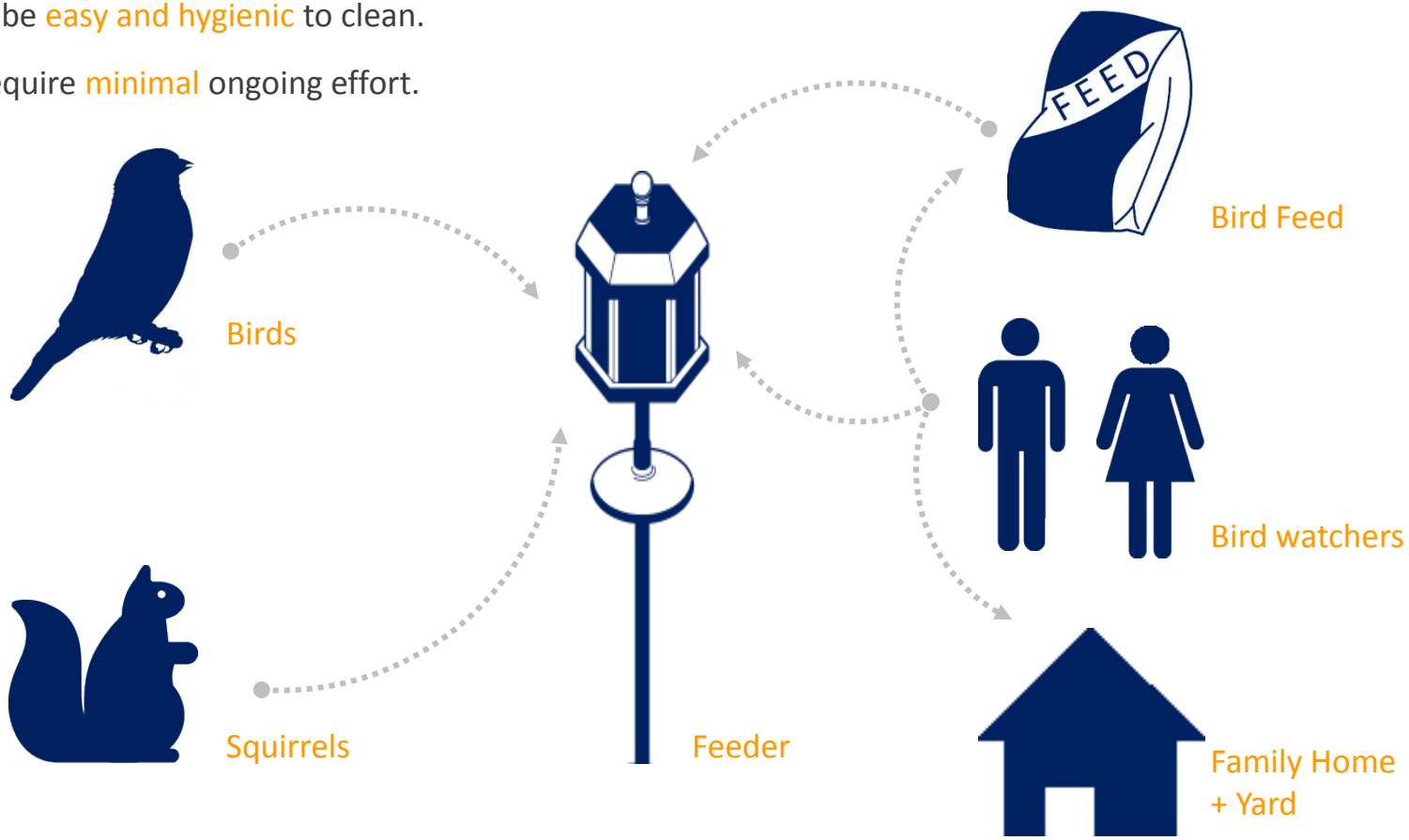
Feed should be accessible only to the targeted birds.

Feed and feeder should be protected from squirrels.

Feeder should be quick and intuitive to fill.

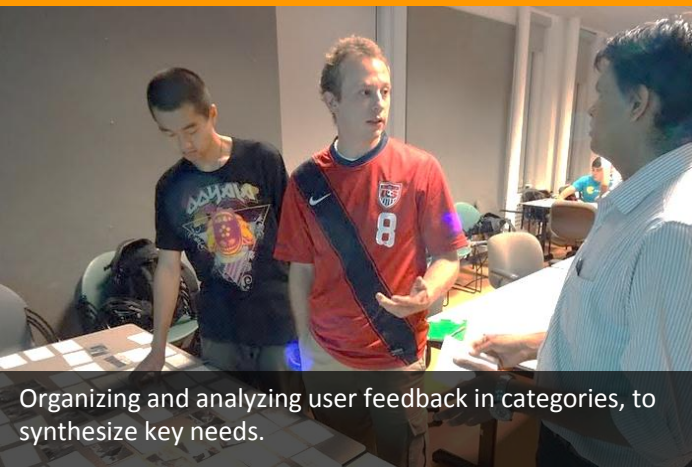
Feeder needs to be easy and hygienic to clean.

Feeder should require minimal ongoing effort.



Bird feeder owners offer reactions to rough prototypes, guiding the refinement process.

Users interact with product artifacts to inform shape and material decisions.



Organizing and analyzing user feedback in categories, to synthesize key needs.

CONCEPT EXPLORATION

INSPIRATION

Finches

Land directly on a screen

Can feed through a screen

Perceive feeder as flower seed head

Nyjer seed

Not eaten by squirrels

No husks, which reduces mess below feeder

Heat sterilized, so dropped seeds will not sprout

INITIAL CONCEPT

Modular seed canister which snaps in and out of stand, to expedite refill

No transfer of loose seed from bag to feeder, so no spilling

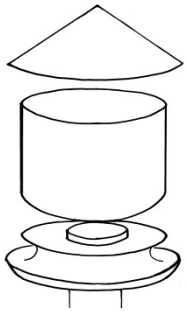
Owner keeps spare canisters inside, reducing time outside in cold weather

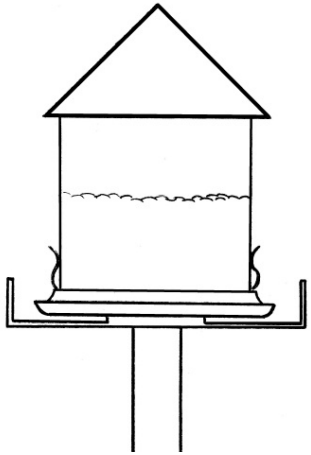
SKETCHING AND MODELING

EVOLUTION 1

Speedily replaced seed canister

Fixed stand



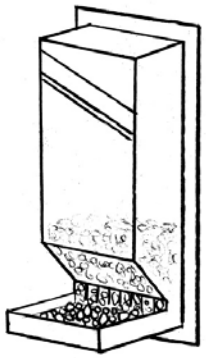


EVOLUTION 2

Disposable

Impulse purchase

Easy to hang

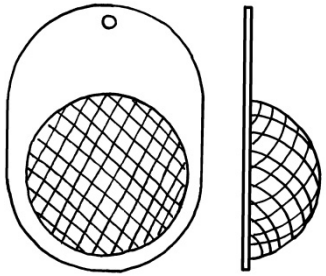


EVOLUTION 3

Target feeding finches

Use Nyjer seed

Wire mesh seed holder

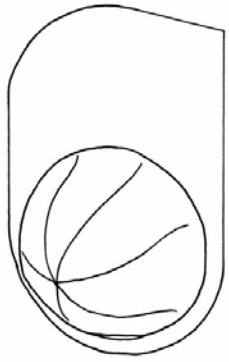


EVOLUTION 4

Recyclable materials

Simplified construction

Aesthetic shape



DESIGN FOR MARKET

TARGET USERS

People who want to feed birds, but do not want to put in much effort or make a long-term commitment

USERS WANT

A convenient and inexpensive instrument for feeding birds

To introduce kids to feeding

To see colorful birds

A feeder which does not require yard space

FEATURES

Pre-filled

Low-cost

Available at major retail chains

Includes versatile mounting for wall or deck post

Single-use and easy to recycle

Primarily attracts gold finches

Does not attract squirrels

Small, easy to fit on the rack, and inexpensive, the Quick Finch is a natural fit in checkout lanes

FINAL DESIGN: QUICK FINCH

Easily affixed to any vertical wall or post, the Quick Finch can be set up in seconds

HANGER
Store rack mount can also function as rack for hanging at home

BACKING
Recycled cardboard used for feeder backing

PRODUCT INFORMATION
Key product information prints directly on the label, with directions included on the back

LABEL
Printed label can be easily customized

SEED HOLDER
Aluminum mesh seed container can be easily separated for recycling

ARDUINO TOY

CHALLENGE

Build a physical, interactive and amusing device using the Arduino platform

Carnegie Mellon University
Pittsburgh – Spring 2011

PROCESS

APPROACH

Dream: Expand the reach and capability of human arms

Design: Separate action and re-action to illustrate interplay

Develop: Create one sensor arm and one action arm

Debug: Ensure long wires and LEDs do not overpower circuit

Document: Photograph device, label wiring and comment code

Demonstrate: Mount to a backpack for mobile demonstration

PHYSICAL TOOLKIT

Arduino Uno + Breadboard

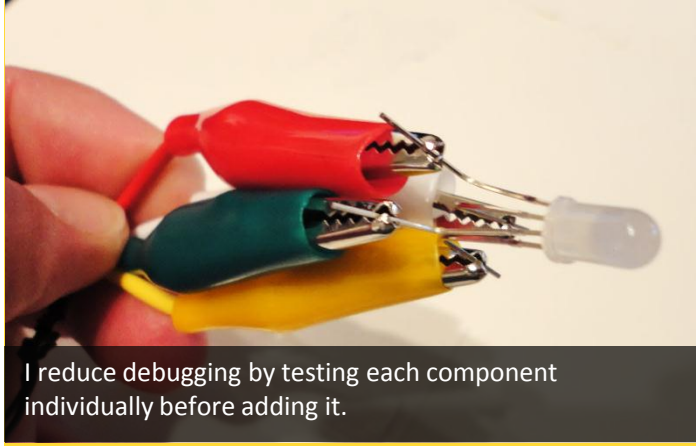
RGB LEDs

Buttons + Switches

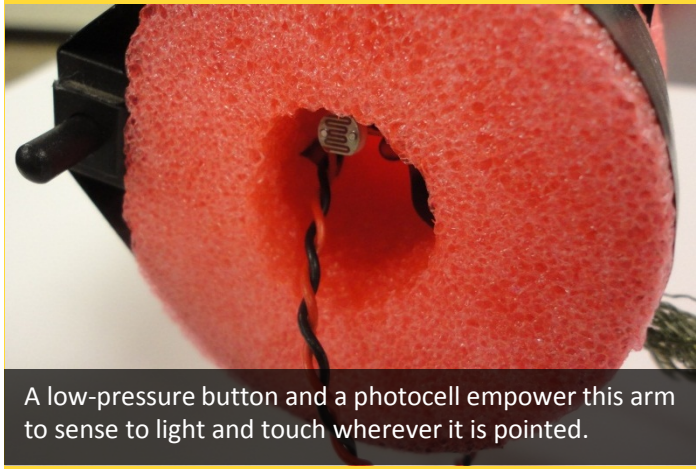
Photocell

DIGITAL TOOLKIT

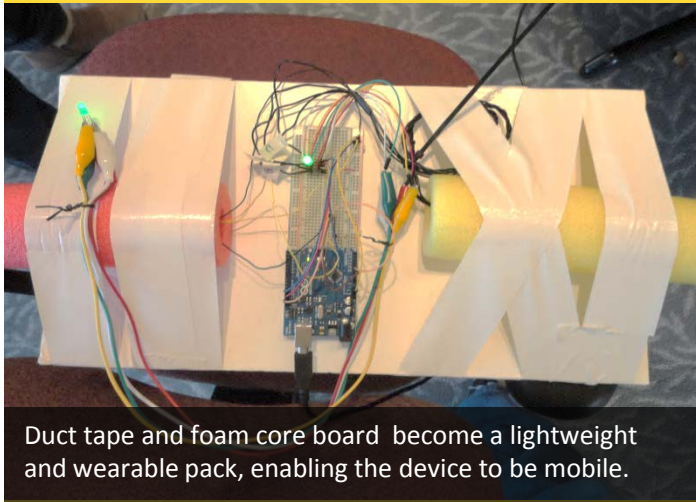
Arduino + Processing



I reduce debugging by testing each component individually before adding it.



A low-pressure button and a photocell empower this arm to sense to light and touch wherever it is pointed.



Duct tape and foam core board become a lightweight and wearable pack, enabling the device to be mobile.

ARM EXTENDERS

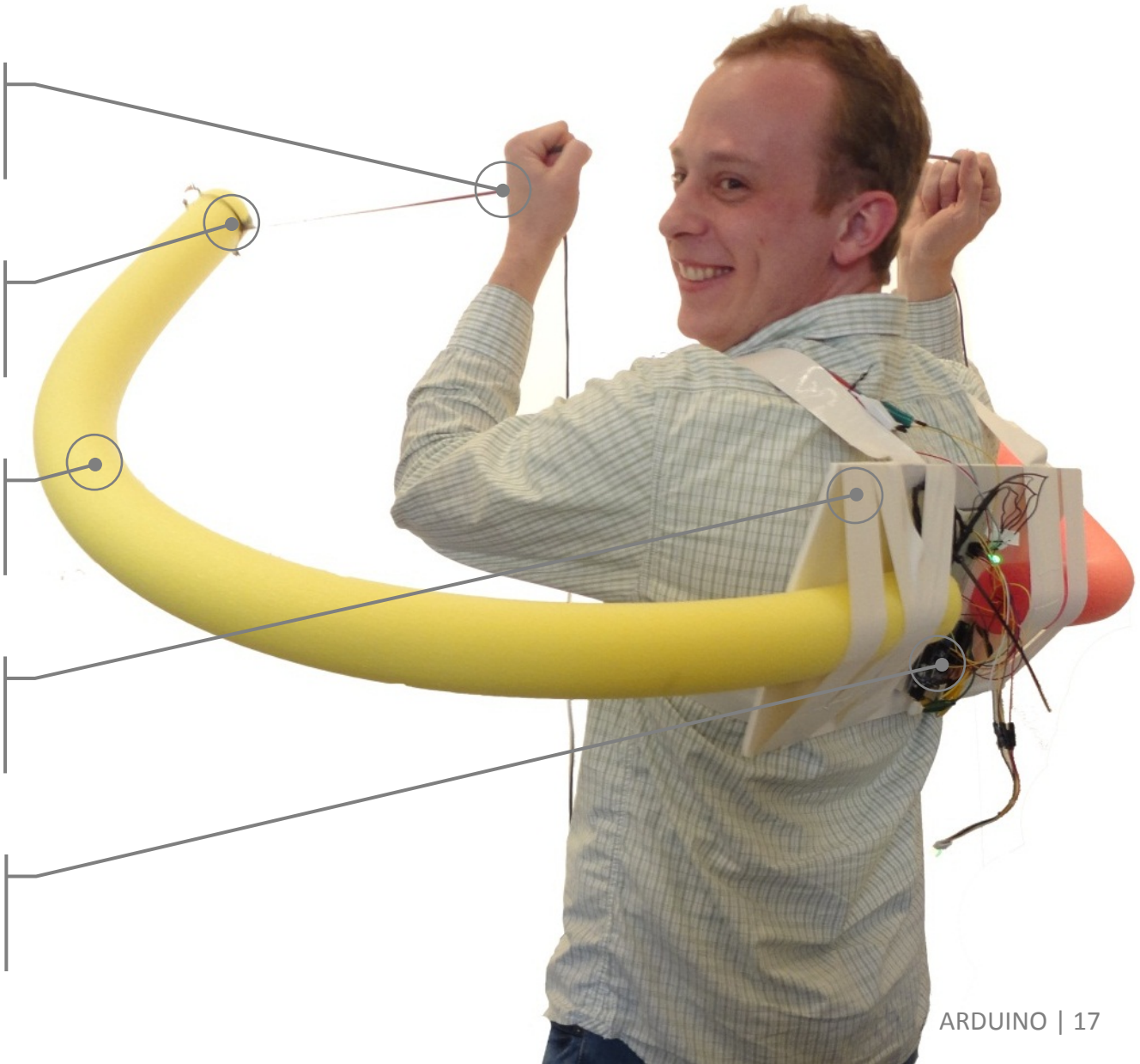
CONTROL STRINGS
Each arm is directed by the wearer, using strings

ACTION POINTS
Each arm can interact with the environment using sensors, lights and buzzers

FLEXIBLE ARMS
Pool noodles provide the appropriate amount of flexibility and softness

BACK MOUNT
Mounting the device to a wearable pack brings the concept to life

PROCESSOR
Arduino Uno is used to control system inputs and outputs



SALAD TONGS

CHALLENGE

Cut and form two salad tongs out of a single piece of poplar wood

Carnegie Mellon University
Pittsburgh – Spring 2011

PROCESS

APPROACH

Explore multiple forms with foam prototypes

Apply **pattern** to sides of block

Cut pattern on one side of block

Temporarily **reassemble** block

Cut pattern on other side of block

Power sand shapes to smooth surface

Hand shape wooden tongs to final shape

TOOLKIT

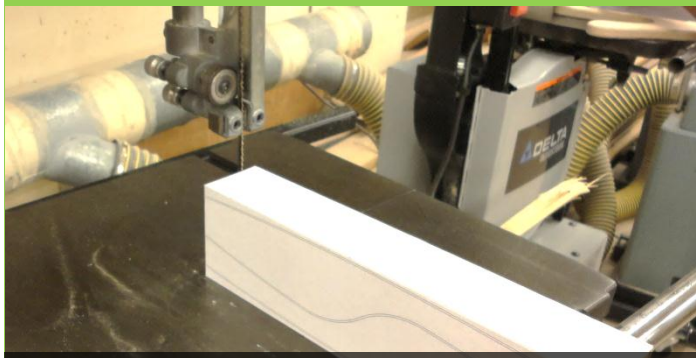
Band Saw

Belt Sander

Disc Sander

Oscillating Spindle Sander

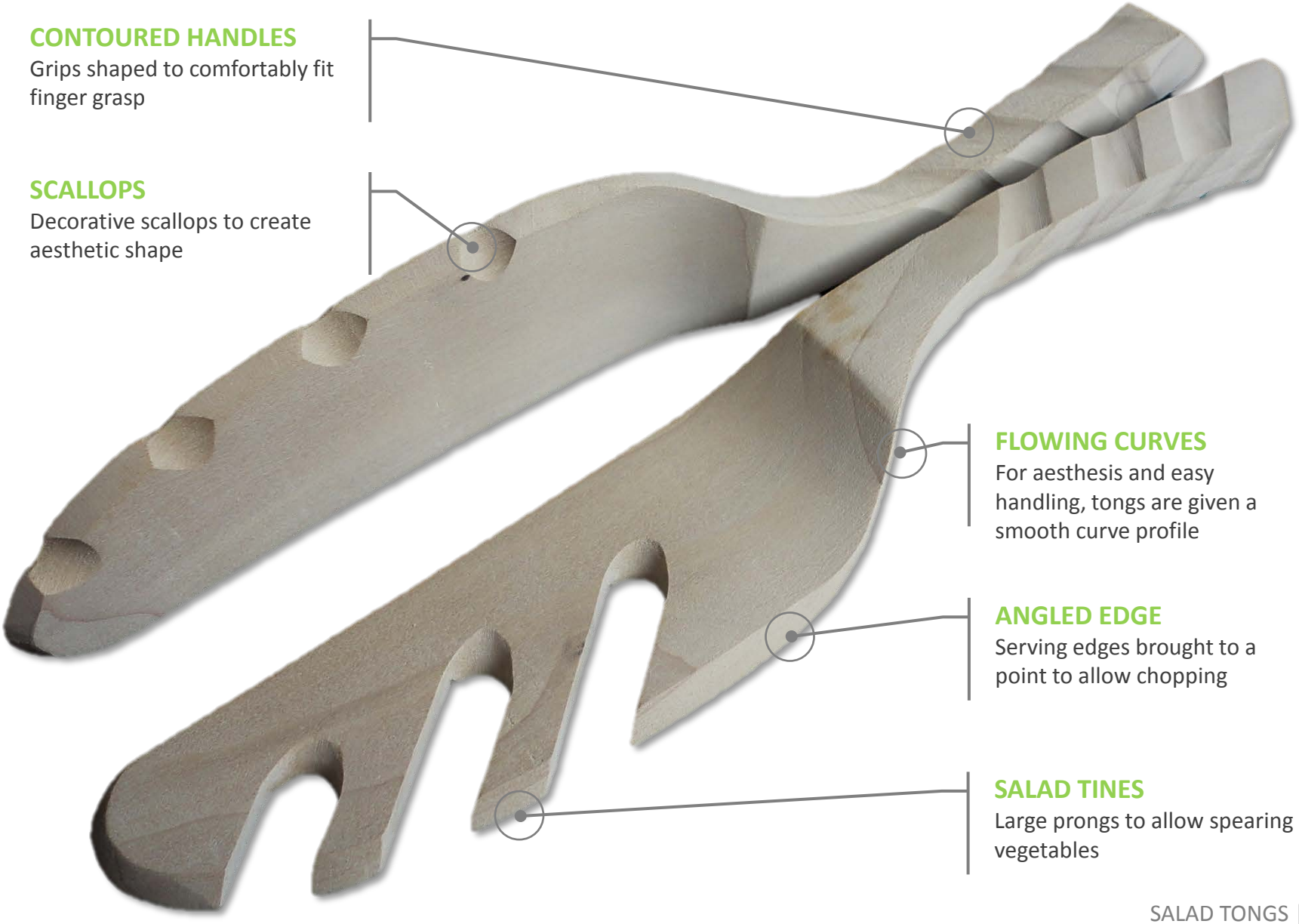
Building a first prototype in soft foam allowed experimentation with different shapes and grips.



Using orthogonal outlines on each side of the block, I quickly achieved the desired tong shapes with few cuts.

Cutting the pattern from the block left very rough tongs which needed power and hand sanding to finish.

FINISHED TONGS



CONTOURED HANDLES
Grips shaped to comfortably fit finger grasp

SCALLOPS
Decorative scallops to create aesthetic shape

FLOWING CURVES
For aesthesis and easy handling, tongs are given a smooth curve profile

ANGLED EDGE
Serving edges brought to a point to allow chopping

SALAD TINES
Large prongs to allow spearing vegetables

DELOITTE

CUSTOMER RELATIONSHIP MANAGEMENT

Deliver highly customized user-centric enterprise software to Fortune 500 clients

Deloitte Consulting, LLP
Chicago – 2006 to 2009

PROCESS

USER RESEARCH

Worked directly with client users to capture existing and future business processes

Mapped business process flows for all business units and users to ensure comprehensive system capability

DESIGN + DEVELOPMENT

Co-created (with client stakeholders and Deloitte's local and off-shore technical teams) an enterprise-wide customer relationship management software

Extensively documented technical and functional system requirements

Worked closely with **diverse sets of stakeholders** at each client to achieve design and process alignment

Designed and executed **testing** to evaluate functionality and ease of use

LAUNCH + SUPPORT

Coordinated directly with client business leaders and Deloitte's technical development team to track and address system issues

Moved seventeen global Medtronic business units onto a single complaints-handling system.

Designed and tested a global marketing campaign management system for Motorola.

Supported a new analytical trade promotions system to help Del Monte gauge profitability.

EATON TRUCK

CHALLENGE

Create a flexible digital model to produce complex surface finishes on a critical load-bearing transmission component

Eaton Truck Innovation Center
Michigan – Summer 2004

PROCESS

DESIGN AND TESTING

Identified that the component's microscopic surface structure would be the **critical factor in durable performance**

Created a **flexible three-dimensional digital model** of the component's surface

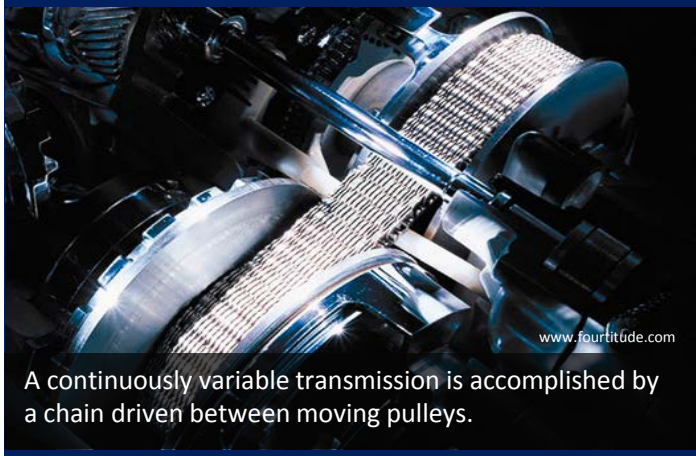
Translated model data into X, Y and Z coordinates for electrical discharge machining

RESULTS

The digital model I constructed allowed Eaton to evaluate the **durability** of the transmission chain pin design

The model also allowed Eaton to **determine the optimal surface texture** for the environmental and mechanical stresses encountered in heavy-load towing

Eaton was introducing continuously variable transmission technology to heavy-duty trucks for the first time.



A continuously variable transmission is accomplished by a chain driven between moving pulleys.

Testing the component meant simulating the stress on the transmission from one million miles of driving.

TRANSMISSION CHAIN

HIGH TENSION CHAIN
Driven by friction between two pulleys with shifting diameters

PIN HEADS
Complex pin head surfaces allow high-pressure contact without excessive wear

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