

CMPM 179-02/ARTG 179-02

Alternative Controllers: Designing Beyond the Joystick

Eddie Melcer's Contact:

Email: *emelcer@ucsc.edu*

Office Hours: *Wednesdays, 1 - 3 pm*

Office Location: *Social Emotional Technology Lab, E2 262*

TA Kate Compton's Contact:

Email: *kecompto@ucsc.edu*

Office Hours: *Tuesday/Thursday 1:30 – 3 pm*

Office Location: *Social Emotional Technology Lab, E2 262*

Course Pre-requisites:

Student's should have completed an introductory programming course or at least be comfortable with learning to write small amounts of code in Java.

Required Materials:

The Smraza UNO Project starter kit or comparable set of sensors and hardware is **required** (<https://www.amazon.com/Smraza-Project-Starter-Tutorials-Mega2560/dp/B01JL0AZRC> or <https://www.amazon.com/gp/product/B01L0ZL8N6> and <https://www.amazon.com/SunFounder-Digital-Accelerometer-ADXL345-Raspberry/dp/B0151FIBZO>).

Students **must** come with a working Arduino development board (preferably the Arduino Uno, Duemilanove or Diecimila), a breadboard, jumper wire set, photoresistors, one potentiometer, tilt switches, piezo buzzer, USB cable to connect Arduino to a laptop/computer, and laptop/computer to create Arduino and Processing programs.

Course Description:

Alternative Controllers: Designing Beyond the Joystick provides an introduction to Physical Computing and interaction design for students interested in building alternative physical interfaces for games, toys, and other interactive experiences. We will study and discuss examples of existing interfaces, brainstorm various scenarios the technology can be used in,

and apply that knowledge towards the design/creation of our own alternative interfaces. Students will learn how to build prototypes that utilize a variety of switches and sensors in tandem with Arduino and Processing code to create novel interactions.

Course Objectives:

- Exploring context and possible applications of physical interfaces for games, toys and other interactive experiences.
- Developing a tool set to design meaningful physical interactions.
- Learning Physical Computing concepts (i.e., application of various sensors and switches).
- Connecting hardware to software with Arduino, Processing, and serial communication.
- Building prototypes that utilize custom game controllers.
- Becoming familiar with open source tools, DIY methodologies, and how to continue learning outside of class.

Course Structure:

This course combines hands on circuit building and coding projects with class discussions, lectures, and presentations.

Course Requirements:

Students are expected to attend class on time, complete homework assignments and Midterm/Final projects, participate in class discussions, present assignments and projects clearly and concisely, and cooperate in group projects.

Grading:

- Class participation 10% of grade (discussions and attendance)
- Homework 15% of grade
- Documenting homework, midterm, and final prototypes 15% of grade
- Midterm project 30% of grade
- Final project 30% of grade

What Documentation Should Look Like:

- **Video of working prototype (2 min MAX)**, pictures, sketches.
- *1st Paragraph:*
 - Name of the prototype.
 - Give credit to all teammates that worked on project.
 - Describe narrative/elevator pitch for prototype in 1 – 3 sentences.

- *2nd Paragraph:*
 - *Describe rules, goals, and mechanics of prototype.*
 - *Explain how alternative controller is used to receive input and produce output that makes the prototype work as intended.*
 - *Why did you choose the interface that you used for the game?*
- *3rd Paragraph:*
 - *If this was a team project, describe your individual contributions*

Detailed Timetable:

Week	Class	Content	Homework
#1	4/4	Introduction & Overview <ul style="list-style-type: none"> • Introductions • Class overview • What are alternative controllers? • Alternative game interfaces: <ul style="list-style-type: none"> ○ Examples and discussion • Analyzing existing interfaces • Understanding and designing for affordances of the controller, environment, and body • Commercial alternative controllers and hardware for making them • Embracing the DIY mindset • Arduino and Processing, your tools for the quarter 	<ul style="list-style-type: none"> • Order Smraza Super UNO Starter kit if you haven't already! <ul style="list-style-type: none"> ○ https://www.amazon.com/Smraza-Project-Starter-Tutorials-Mega2560/dp/B01JL0AZRC • Download/set up Arduino and Processing <ul style="list-style-type: none"> ○ Arduino: https://www.arduino.cc/en/Main/Software ○ Processing: https://processing.org/download/?processing • Watch GDC 2017 talk about custom hardware prototyping: http://www.gdcvault.com/play/1024204/-Line-Wobbler-Beasts-of
	4/6	Designing Beyond the Joystick <ul style="list-style-type: none"> • Recap • Broadening the space of play (literally) • Situating in physical and virtual environments <ul style="list-style-type: none"> ○ Supporting narrative • Virtual vs. Physical <ul style="list-style-type: none"> ○ Player(s), environment(s), and spectator(s) ○ Theming the experience (costumes) ○ Thinking about spectators • Techniques for physical interaction design <ul style="list-style-type: none"> ○ Sketching, storyboarding, etc. 	Brainstorming Assignment 1 Look up an existing game show interface or alternative controller game from the class pinterest (https://www.pinterest.com/galaxykate/alt-controllers/) and analyze how different aspects of the design impact player and spectator experiences. E.g., think about narratives, affordances, physical interactions, gameplay, and emotions that the interfaces evoke. Create 3 – 5 slides highlighting some of these aspects <ul style="list-style-type: none"> • First slide should explain how the game show works or have a link to a video that shows the core gameplay

		<ul style="list-style-type: none"> ○ Low and high fidelity prototyping ○ Paper (and random object) prototyping ○ Bodystorming (more on that later) • The importance of playtesting <p>Guest talk by Elena Márquez Segura:</p> <ul style="list-style-type: none"> • Augmented physical experiences, the case of LARPs • Bodystorming 	<ul style="list-style-type: none"> • Remaining 2 – 4 slides should highlight some of the points above. <ul style="list-style-type: none"> ○ Use images, gifs, or videos to help illustrate your point <p><i>DUE 4/10</i></p>
#2	4/11	<p>Basic Circuits, Digital Input, & Digital Output</p> <ul style="list-style-type: none"> • Recap • Presentations for Brainstorming Assignment 1 • What is a circuit? • AC/DC • Ohms Law • Conductors vs. Insulators • What is a circuit diagram? • Debugging a circuit (various approaches) • Understanding a breadboard • Building circuits with Arduino • Understanding digital input and output • Using LEDs for output 	<p>Prototype Project 1 (Buttons & LEDs)</p> <p>Sketch the design and build a game interface that uses multiple switches and LEDs (for example, a trivia game buzzer or a Simon game).</p> <p><i>Document in blog post</i></p> <p><i>DUE 4/20</i> <i>(In class presentations)</i></p>
	4/13	<p>Basic Circuits, Digital Input, & Digital Output (Continued)</p> <ul style="list-style-type: none"> • Recap • Using switches for input • Finish building Family Feud interface • In-class project: <ul style="list-style-type: none"> ○ Building a Family Feud interface • Separate into groups for Prototype Project 1 	
#3	4/18	<p>Thinking in Analog: Diversifying Input & Output</p> <ul style="list-style-type: none"> • Recap • Switch vs. Sensor • Understanding analog input and output 	

		<ul style="list-style-type: none"> Using variable resistors (Potentiometers) Using Flex and Pressure sensors for input In-class project: <ul style="list-style-type: none"> Building custom flex sensor 	
	4/20	Thinking in Analog: Diversifying Input & Output (Continued) <ul style="list-style-type: none"> Presentations for Prototype Project 1 Recap Using Buzzers for output Controlling tones with the Arduino In-class project: <ul style="list-style-type: none"> Building an intruder alert system 	
#4	4/25	Getting Serial: Communication with Arduino and Processing <ul style="list-style-type: none"> Recap Using a sensor as a switch Bouncing in a switch (debouncing to avoid the wobble effect) Using photoresistors and Piezo elements as input Serial data, communication between Arduino and Processing In-class project: <ul style="list-style-type: none"> The Matrix glasses interface Separate into groups for Prototype Project 2 	Brainstorming Assignment 2 Brainstorm 2 potential games or interactive experiences that use Arduino and Processing for your midterm project. These can be entirely original or (substantial) expansions on existing prototypes you made. You can use any hardware for the Arduino, even if we haven't covered it in class. Make sure to bodystorm the interactions to ensure that they are physically reasonable for the player. <i>Document in blog post</i> DUE 5/1 <i>(In class presentations)</i>
	4/27	Getting Serial: Communication with Arduino and Processing (Continued) <ul style="list-style-type: none"> Recap Using sound in processing In-class project: <ul style="list-style-type: none"> Infinite Whack-A-Mole game Work on Brainstorming Assignment 2 	*Santa Cruz Mini Maker Faire 4/29
#5	5/2	All About the Beat: Detecting Sounds in Arduino <ul style="list-style-type: none"> Recap Presentations for Brainstorming Assignment 2 	

		<ul style="list-style-type: none"> Faking sensing - degrees of separation between perceived input method and actual sensor detection Understanding analog sound and transducers Using electret microphones 	
	5/4	Midterm Prep <ul style="list-style-type: none"> Recap Presentations for Brainstorming Assignment 2 Discuss Midterm Project and groups 	Work on Midterm Project <i>Document in blog post</i> DUE 5/16 <i>(In class presentations)</i>
#6	5/9	Guest Speaker: Zak Rubin – Hands on Controller Dissection	
	5/11	Guest Speaker: Kate Compton	
#7	5/16	Midterm Project Presentation <ul style="list-style-type: none"> In-class presentations and demonstrations Discuss Final Project and groups 	
	5/18	Sensing Motion and Distance <ul style="list-style-type: none"> Recap What could go wrong? Challenges in public display deployments Using accelerometers and ultrasonic distance sensors Using tilt switches as an alternative to accelerometers In-class project: <ul style="list-style-type: none"> Building a custom motion controller 	
#8	5/23	In-Class Brainstorming Activity	
	5/25	Sensing Devices and Computer Vision: Engaging with Objects and the Body <ul style="list-style-type: none"> Recap Presentations for Final Project Assignment 1 What is augmented reality? <ul style="list-style-type: none"> Examples and discussion Understanding infrared and computer vision Commercially available technology for broader distribution (camera and Kinect) 	Final Project Assignment 1 Revise your midterm project (or create a new prototype if you don't want to continue the midterm one). The prototype should have much more polish and variety to the gameplay/physical interactions than the midterm project. This means you should have a fully functional game/interaction that only needs additional visual polish and tweaking based on playtesting feedback. We will playtest your prototype during class on 6/1 in E2, RM 262.

		<ul style="list-style-type: none"> • Detecting the body with Microsoft Kinect • Face detection and tracking with OpenCV and Processing • Fiducial markers and tracking objects with reactIVision, TUIO, and processing • In-class project: <ul style="list-style-type: none"> ○ Building a mask application 	<p>Document in blog post</p> <p>DUE 6/1 (In class presentations)</p>
#9	5/30	<p>Making Robust Alternative Controllers: Soldering and Conductive Thread</p> <ul style="list-style-type: none"> • Recap • Basics of soldering • The LilyPad, wearables, and conductive thread • Work on final project <p>Moving to Learn: Alternative Controllers in Educational Games</p> <ul style="list-style-type: none"> • Recap • How can the body help us learn? <ul style="list-style-type: none"> ○ Embodied cognition, interaction, and enactment • Examples and discussion • Work on final project 	
	6/1	<p>Playtesting Final Prototypes Class will be held in E2, 262</p> <p>/*Not Covering Due to Time Constraints*/</p> <p>Getting Really Physical (for Health): Exergames and Rehabilitation Games</p> <ul style="list-style-type: none"> • Recap • Presentations for Final Project Assignment 2 • What are exergames? • Rehabilitation games and addressing disabilities in design • Examples and discussion • Work on final project 	<p>Final Project Assignment 2</p> <p>Document your game in two ways for submission to upcoming festivals:</p> <ol style="list-style-type: none"> 1. Create a video trailer for your game (1 - 2 Minutes) <ul style="list-style-type: none"> ○ This should show the game name ○ Explain the game elevator pitch/narrative ○ Briefly explain the rules ○ Show gameplay highlighting the rules and fun aspects of your game ○ Display the team members involved 2. Create a gameplay teaser for your game (1 - 5 Minutes) <ul style="list-style-type: none"> ○ Use footage of full or large portions of gameplay from playtests ○ Pick clips that showcases the best parts of your game

			<p><i>Document in blog post</i></p> <p><i>DUE 6/10</i></p>
#10	6/6	Final Project Work Week: Adding Polish <ul style="list-style-type: none"> • Work in Final Project groups • Playtest Final Project games 	
	6/8	Final Project Work Week: Adding Polish <ul style="list-style-type: none"> • Work in Final Project groups • Playtest Final Project games 	
FINAL	6/12	Final Project Presentations and Demonstrations	<i>Great job and take it easy!</i>