

# Studio Workshop: E-Cannons and Other Robot Weapons

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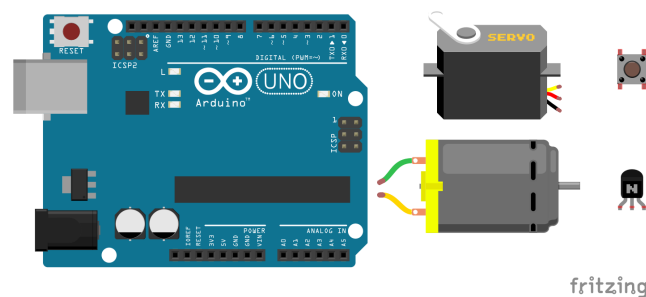


Figure 1: Subset of Course Kit Components

## Abstract

In this workshop participants will learn the basics of microcontrollers, sensors and servo-motors to build their own canon. The canon operates similar to a tennis ball machine that shoots 3/4 inch nylon balls for the SIGGRAPH Feuding Cities game. Learn how to build, program and control the canon to shoot and hit targets. Using these techniques participants can experiment with their own design of the ball hopper to feed the canon more ammunition or develop different weapons. The level of this course is introductory and would be of interest to novice and expert programmers, people interested in robotics, game players to developers and anyone who may be curious about electronics. Some programming knowledge is useful as well as a basic understanding of electronics.

All electronics and accompanying material will be provided and may be used by the participants of the course. If a participant would like to keep their project they may purchase a kit at a special conference price. These materials must however, be returned if they not purchased.

**Keywords:** Arduino, servos, robotics, Feuding Cities

**Concepts:** •General and reference → General conference proceedings;

## 1 Introduction

This year SIGGRAPH will feature a Feuding Cities game which will be played in both the physical and the virtual worlds. The physical world will feature 3/4" nylon balls as the primary ammunition which will be used to score points for the players city. This workshop will walk through all aspects of creating a weapon for

the physical world which can be used to score points for the players team.

Participants will begin their workshop experience by learning the basics of microcontrollers, in particular using Arduinos, see Figure 1. The workshop will introduce a variety of components that will work with the Arduino in order to build out the weapon. For example, the workshop will introduce participants to breadboards, buttons, motors, servos, transistors, and so on. Participants will learn what each of these components is used for and how to make use of them in their project.

Participants will then use workstations in the classroom to learn the basics of programming with an Arduino using the 'sketch' Integrated Development Environment (IDE). Participants will learn how to connect the Arduino to sketch, enable outputs and inputs in code, and use them for the purposes of controlling servos, responding to button presses and so on. While participants are not expected to have any background in programming on the Arduino basic programming constructs such as conditional logic, looping, and so on are expected to be already mastered by the participant.

## 2 Course Weapon

Participants in the course will all work on developing a single common weapon. In particular we will launch the 3/4" balls by using a design similar to a tennis ball launcher. The weapon will feature two motors to propel the ball and a hopper to feed it multiple times. Figure 2 shows the concept for the course weapon. The 3/4" nylon balls are depicted in blue, the housing in red, motors in orange, and the servo in green. The Arduino, breadboard, and other components are not depicted.

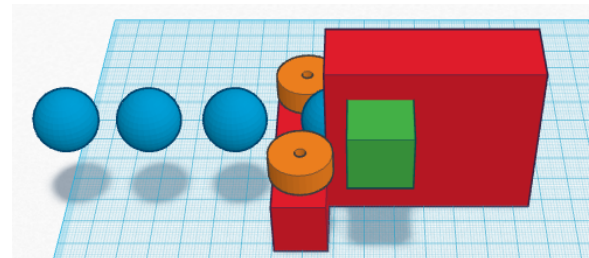


Figure 2: Course Weapon Concept

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By utilizing this basic design participants can further improve their weapons by building larger hoppers, alternative methods of propelling the ammunition, or even choosing a different design all together. In any case, participants will be able to extend the information learned to their own designs.

### **3 Course Outline Lecture/Lab**

The expected course outline will consist of several parts:

- Lecture (45 minutes)
- Introduction - Arduino and Setup (5 minutes)
- Canon Prototypes (5 minutes)
- Aim, Shoot, Making It Work (15 minutes)
- Distance Interaction and Interactivity (10 minutes)
- Reloading and the Hopper (10 minutes)

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### **Acknowledgements**

We would like to thank the many students who participated in an interest based semester long event exploring this idea.