1. Introduction
   1. Purpose

This project aims to (1) deliver a DIY Open Source Claw Machine for others to build and (2) serve as a platform for computer vision and control systems research. Claw machines typically “cheat” children out of winning a prize, which reduces their level of enjoyment. With the integration of a camera, research projects at the intersection of computer vision and control systems can be realized. This has many industrial applications.

* 1. Scope   
     This report will detail:
     1. The functional and non-functional requirements of the system
     2. A detailed diagram of the physical, mechanical, and electrical aspects
     3. The system architecture
     4. An end-user’s manual
     5. A parts list
     6. Assembly instructions
     7. The source code

Details about the computer vision use will not be included in this report.

* 1. Definitions, Acronyms, Abbreviation
     1. Callback: A function passed as an argument to an interrupt that is executed when the interrupt is serviced.
     2. Claw Machine: A game machine where one controls the x-y position of a claw and releases it to capture some prize
     3. Event: An occurrence of some external action into the system (ex: button press)
     4. Finite State Machine: A model of a system that expresses mathematically and logically the system states, the transitions from state to state, and the events that trigger the transitions.
     5. Input/Output Pins: General Purpose Input Output (GPIO) pins that allow for interfacing with external devices.
     6. Header/Source File: A header file has the .h extension and lists the imports, definitions, globals, and functions of its associated source file. The source file implements the functions listed in the header file.
     7. Interrupt: An event within a system.
     8. Limit Switch: A type of switch that captures the travel limit for a moving object
     9. Pulse Width Modulation: (PWM) is the type of signal used to control the servo motors and is created by modulating the high and low value of an output signal with a typical period of 20ms (i.e. 50hz).
     10. Stepper Motor: A type of motor that operates by two or more coils altering their polarity to generate a magnetic field which the motor shaft rotates in. These motors typically move 1.8 degrees per step (200 steps per revolution).
     11. Servo Motor: A type of motor that operates via PWM signal and moves in a range of 180 degrees for a typical servo and allows for precise positioning within this range. 360 degree servos (or continuous rotation servos) allow for precise controlling of speed in a similar manner but not position.
     12. Thread: A thread is a programmed set of instructions that can be independently be scheduled and executed by the CPU.
  2. Document Organization

This report is organized as follows:

* + 1. Functional and non-functional requirements are covered in chapter 2
    2. Physical, mechanical, and electrical diagrams are given in chapter 3
    3. The system architecture is given in chapter 3
    4. The user’s manual is given in chapter 4
    5. The parts list and assembly instructions are given in chapter 5
    6. The source code is given in appendix A

1. System Requirement
   1. Functional Requirements
   2. Non- Functional Requirements
2. Design Specification
   1. Technologies Used
   2. System Architecture
   3. Detailed Design (subsystems/modules/components)
3. System Operation (show how the design meets the requirements)
   1. Overview
   2. Use Cases
      1. Specific case 1
      2. Specific case n
4. Appendices
   1. Supporting Documentation
   2. Code explanations
   3. Etc