Gustavo Placencia Carranza / Yang Hu

Professor Peter Jansen

ISTA-303: Introduction to Creative Coding

5 December 2018

ISTA 303: Assignment 4

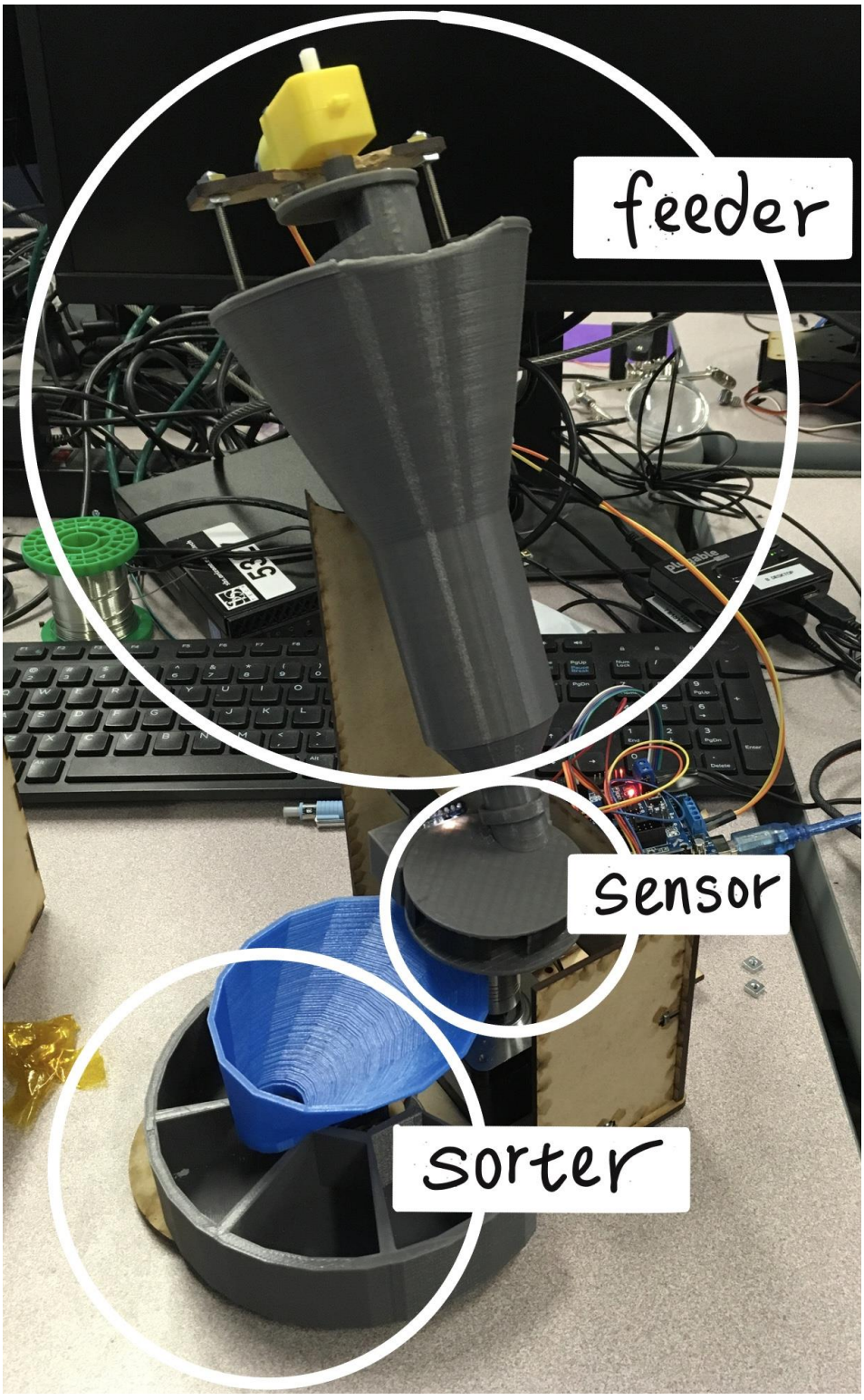
Skittle Sorter

Documentation

Gustavo Placencia Carranza / Yang Hu

ISTA-303 Assignment 4: Skittle Sorter

Part 1: Assembled Skittle Sorter



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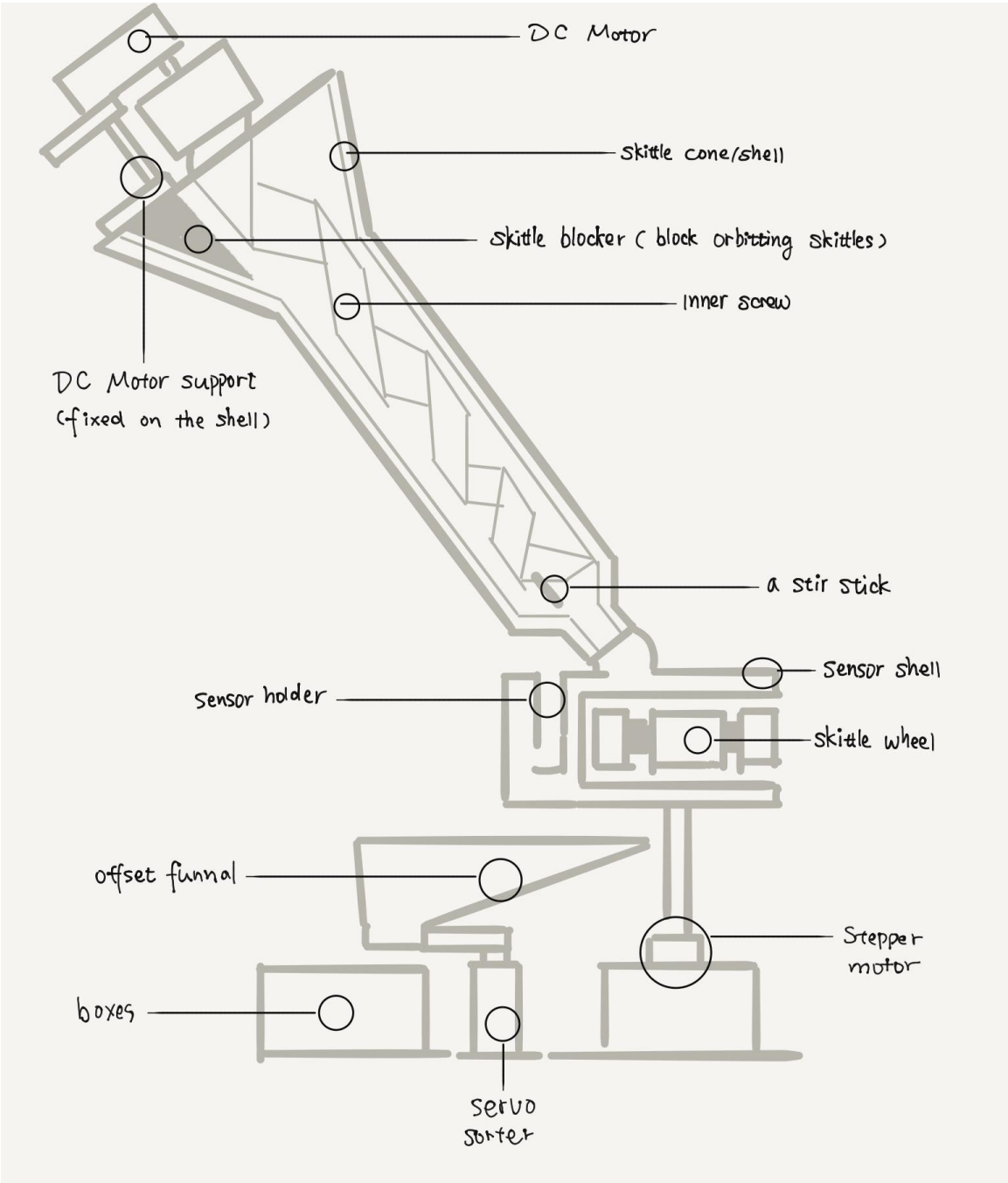
ISTA-303 Assignment 4: Skittle Sorter

Part 2: Design Concept



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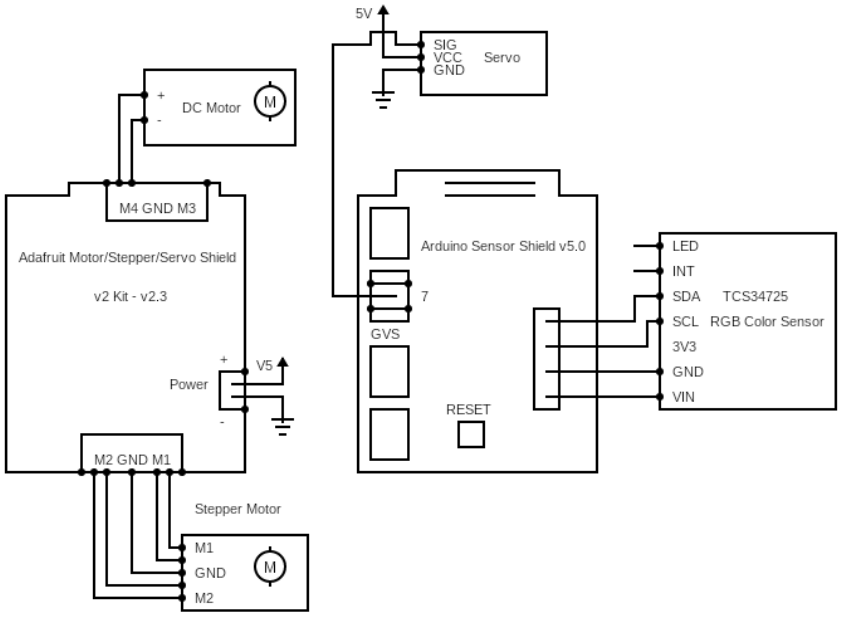
ISTA-303 Assignment 4: Skittle Sorter

Part 2: Circuit Schmatic



Part 4: Subsystem Designs

In this section, each design will be demonstrated in three parts:

1. Inspirations or concepts
2. openScad / illustrator screenshot
3. (Optional) the possible drawback of the design

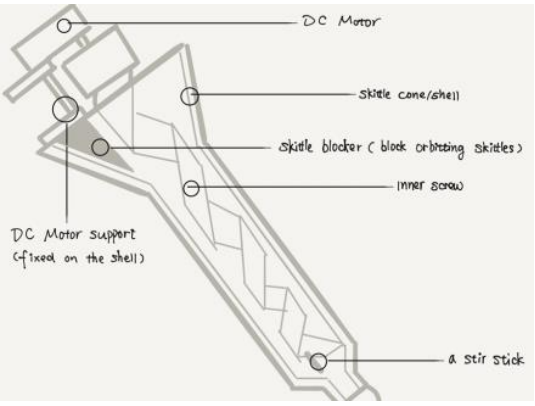
Feeder

The feeder consists of these parts:

a. Cone shape skittle container

b. Inner screw skittle feeder

c. Small parts (stir, block, support)



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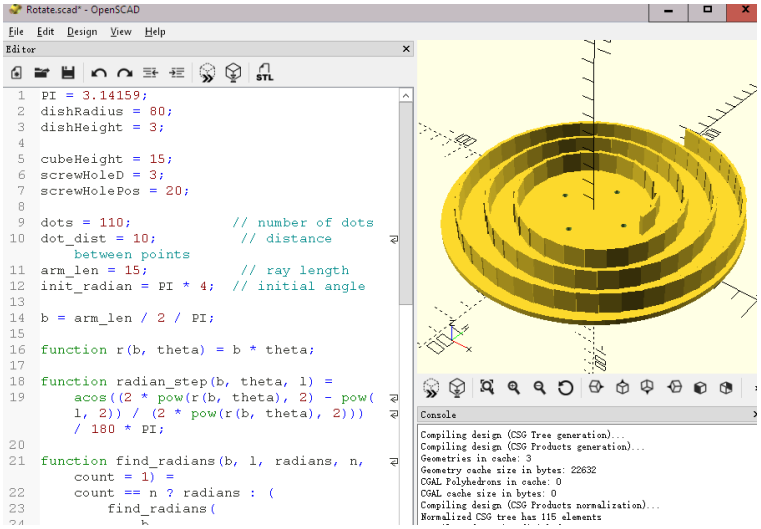
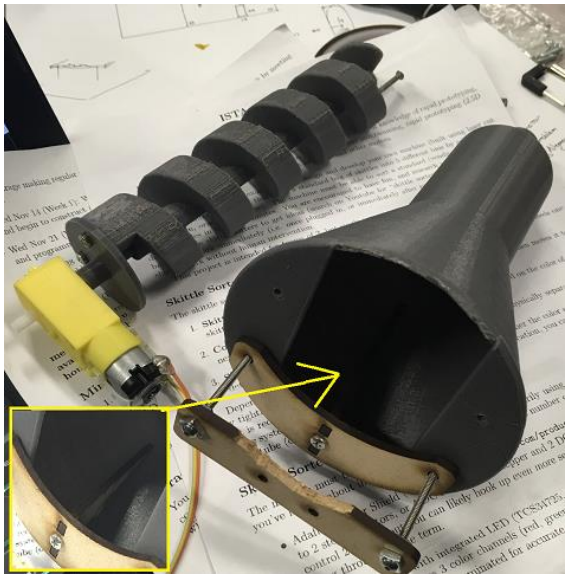
ISTA-303 Assignment 4: Skittle Sorter

The current design is actually the second one we made. The first one looks like this:

The coil dish doesn't work, because if we make it flat, skittles won't move, and if we make it lean, skittles will stop at the lower bend (won't climb up).



Therefore, we came up with a vertical version of this.



The concept of inner screw is inspired by a kind of rock driller. Our design works just like drilling a small amount of skittle out of the pile, though in an upside-down way.

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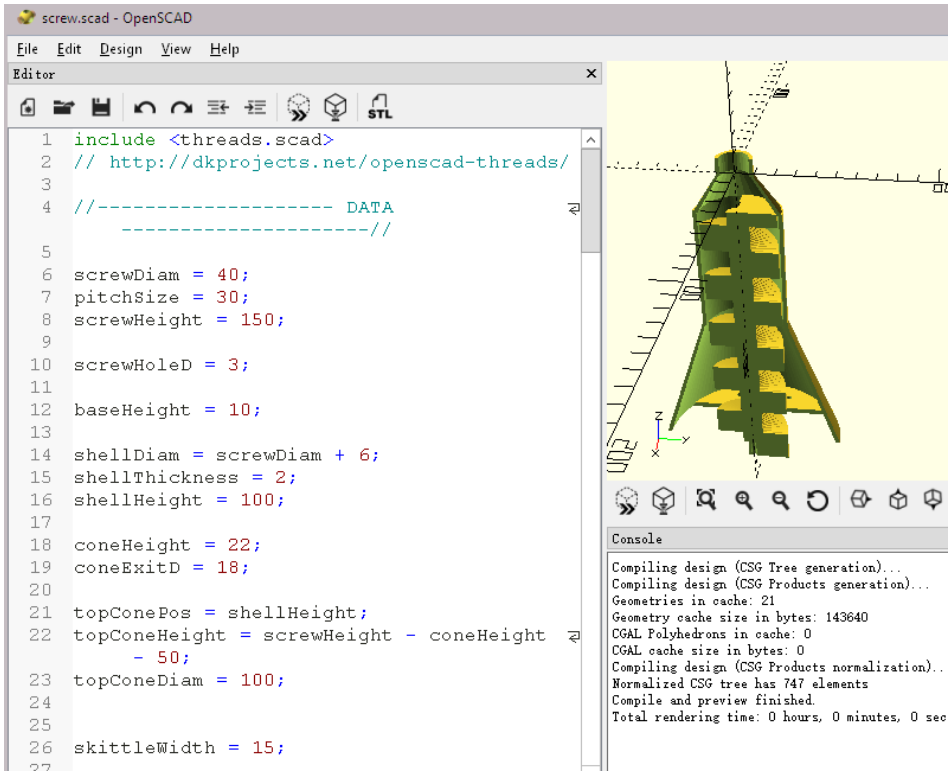
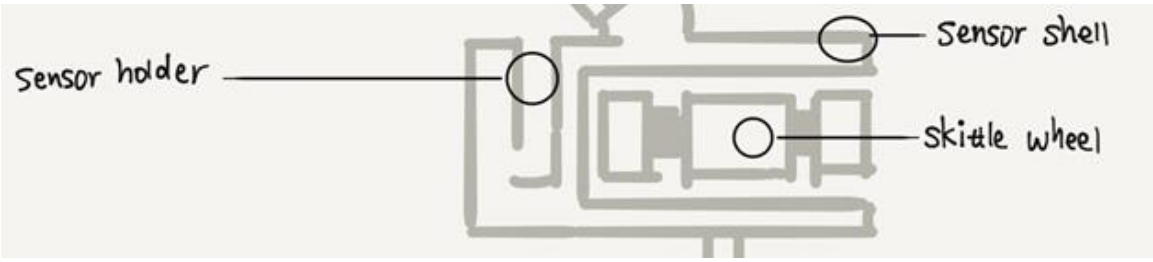
ISTA-303 Assignment 4: Skittle Sorter

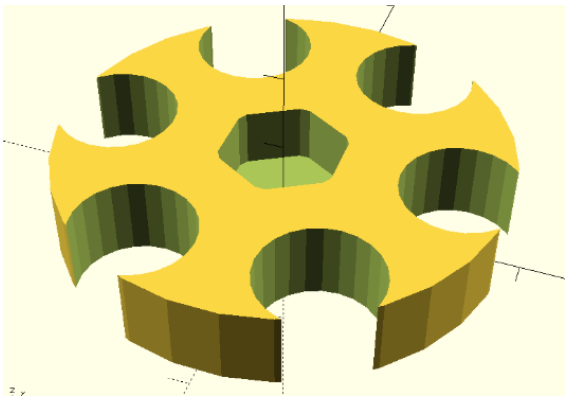


There is also a long screw at the bottom as a stirrer. It stirs skittles to prevent stuck, like a Catfish Effect.

Sensor



The sensor consists of these parts:



a. The color sensor

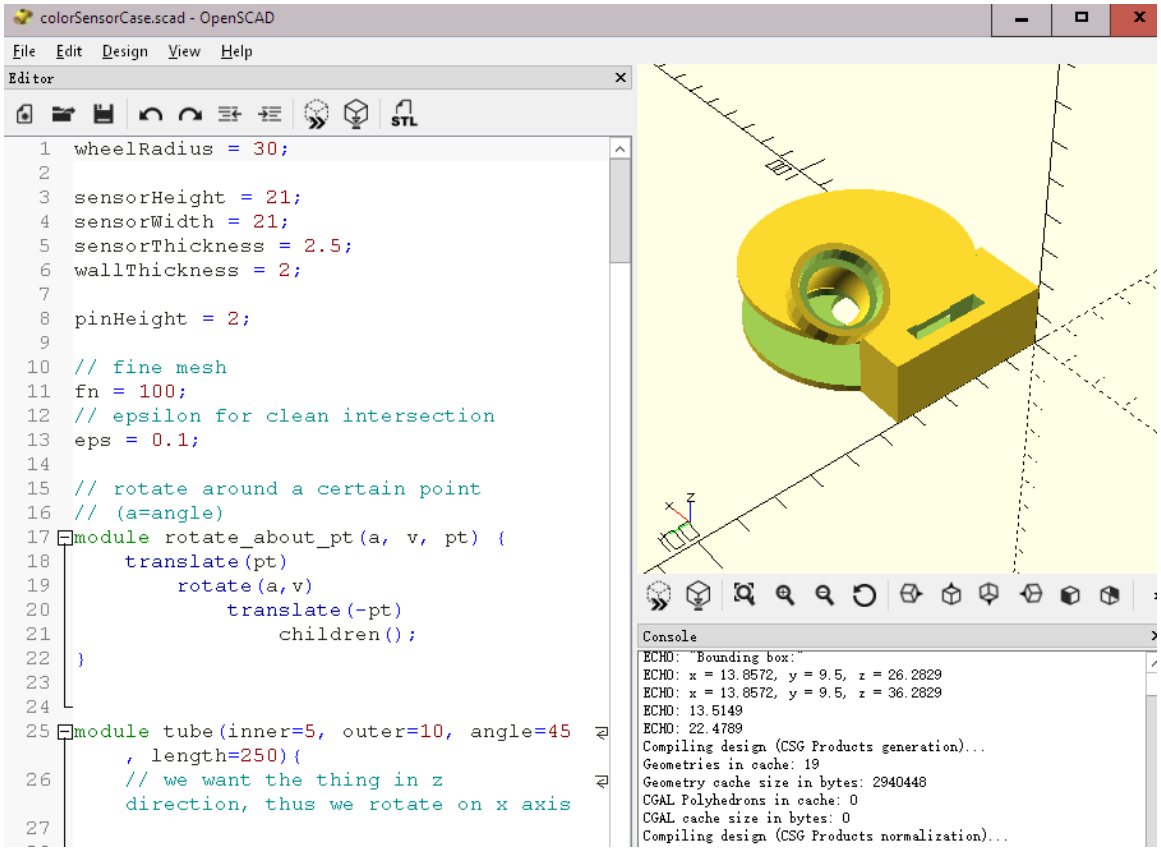
b. The sensor holder

c. The skittle wheel

The color sensor part catch skittle from the

feeder, while drop them into the sorter. The design for the color sensing chamber was made to maintain a dark, closed environment for each skittle to be sorted in its

appropriate color bin in a fast, efficient manner. The rotary component has 6 small chambers that contain a maximum of 3 skittles at any one time. This makes it so that one stepper motor can accomplish three tasks: loading one skittle at a time, placing it in front of the color sensor, and passing it on to the sorting part of the device to be placed in its appropriate bin. This also makes it easier to code since both pieces of the mechanism (color sensing and sorting) can be thought of as one large piece rather than two independent ones at the time of coding.



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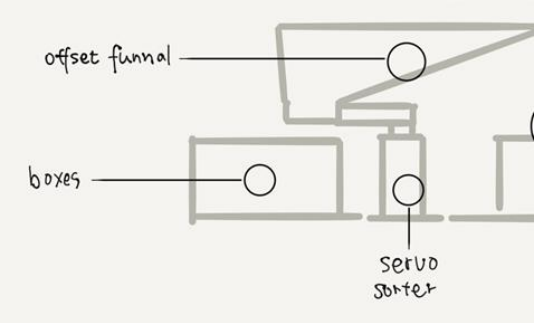
ISTA-303 Assignment 4: Skittle Sorter

Sorter

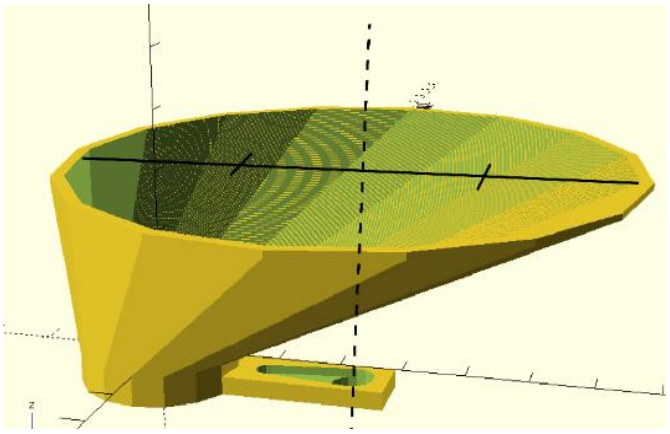
The sorter consists of these parts:

a. Offset funnel

b. Skittle boxes



This particular design for a sorting mechanism was made with the intention of reducing the probability of a skittle getting stuck, providing a general area for the skittles to fall, and minimizing the moment of inertia of whatever object the servo had to move. Because of the way the structure is built, it also moves in-place, meaning that it's required operating space is equal to that of its size. This helped with our objective of making a sorting device that occupied the smallest space possible.



Gustavo Placencia Carranza / Yang Hu

ISTA-303 Assignment 4: Skittle Sorter

Part 4: Results

Because of some fatal performance flaw, the sorting accuracy is very low (less than 15%, most are sorted by accident). Therefore, instead of showing a test result, we'll explore the problems we encountered.

Part 5: Exposed bugs and possible improvements

The first problem happens when skittles are poured too quickly into the top cone. The screw gets stuck. We can probably ask more torque from the motor, but it increases the risk of crushing skittles. Although the problem is avoidable by pouring skittles carefully, it is still a performance issue that should have been solved.

The second problem, which is the most fatal one, is the step losing of the stepper motor. The skittle wheel expects the motor to move exactly 60 degrees. However, because of the step losing (by frictions), the movement is either less than or more than 60 degrees (depend on the steps we feed in), and we cannot find a "magic number" to fix that (change one number in our length 6 steps array to 33 will be slower, and to 34 will be faster). The alternative way to do this is using a servo. However, the servo shakes the structure a lot, and caused other inaccuracy. Therefore, to solve it in this way, we may have to re design our sorter, at least the supporters and shells.

The last problem we found is the sorter funnel. Skittles drops well when the funnel is stationary. However, if the funnel is in motion, skittles sometimes slides around exit hole

(like orbiting). Because the funnel still assumes the dropping speed while stationary, skittles will be sorted into the wrong box (usually the next skittle's color). This inconsistency forces us to do slower, because the wait time needs to reference the slowest skittle, unless we can check skittle status by some scanning or detecting technique.

Part 6: Workload of team members

	Part	Gustavo	Yang
Feeder	screw		√
	shell	√	√
	Part	Gustavo	Yang
Sensor	holder		√
	wheel	√	
	Part	Gustavo	Yang
Sorter	funnel	√	
	boxes		√
	Part	Gustavo	Yang
Other	Circuit schematic	√	
	Write-up graphs		√
	Write-up writing	√	√

Part 7: References

<threads.scad> library. *Dkprojects*, http://dkprojects.net/openscad-threads/