

9-9-17

Project Research: Ballistic Launcher

Possible Objects to Launch:

- Tennis balls
 - Might be more practical to build a launcher for; could be used more realistically.
 - Might be hard to construct/find materials for. For example, the launcher would need to be bigger to accommodate the size of the ball, and a motor/device strong and small (to economize size better) enough to launch it could be hard to obtain.
- Ping-pong balls
 - Might be less practical to build a launcher for; less realistic to use.
 - Might be easier to construct/find materials for. For example, the launcher could be smaller due to the size of the ball, and a motor/device strong and small (to economize size better) enough to launch it is likely easier to obtain.

Decision: I will use **ping-pong balls** to design my launcher around. While it would most certainly be a greater challenge and learning experience to build a launcher for something like tennis balls, especially considering that I have already done this project for ping-pong balls back in my POE class, I am focused more on going through the design process, the statistical analysis, and presenting my findings in the end. These are the things I want to put most of my efforts into, but I still want to engineer a good launcher, and one that is better/more advanced than the one I made in POE.

Things the Launcher Could/Should Do/Be:

- Be easily reloadable
- Hold multiple balls at a time (i.e. something that serves the purpose of a “cartridge” for bullets in a gun, or a “hopper”)
- Be fully automated (someone would only need to load the launcher, and it would launch on its own)
- Be adjustable to launch at different angles
- Be portable (small enough to carry around easily, wouldn’t need to disassemble it at all to move it)
- Be made from all recycled/found materials, or be made from all VEX materials and parts.

Things to Keep in Mind: When the concept drawings are eventually ranked and one is chosen to be worked off of, these will be some of the characteristics that are used as scoring guidelines.

- In the end, we want to have a functioning launcher, so the design chosen needs to be one such that the launch distances of the ball are as **consistent** as possible. The design should take into account and have solutions for as many sources of error for inconsistent launch distances as possible.

- The launcher should ideally be made with materials that are easily attainable. Using technology/VEX materials/automated parts is a possibility, but it would be difficult for someone else to reproduce if they didn't have access to these materials.
- While it is not the main purpose behind creating this launcher, the chosen design should also be one that is visually appealing, if possible. If the most effective launcher design isn't the most consistent one, then it is alright, but it is something to keep in mind, as a better looking launcher will be received better when it is presented.

Possible Launcher Designs:

- Using a PVC pipe in some way is likely one of the best way to go.
- Could have some sort of hinge that snaps back and slaps the ball - may not need a PVC pipe for this.
- Could have a spring-loaded launcher that has a flat surface attached to a spring and hits the ball when the spring is compressed and released.
- Could have a rubber band that serves as a slingshot - pull the band back with the ball in it and then release it.
- Could have a catapult-like structure, with the ball resting on a curved surface connected to a long arm that is pulled down, launching the ball.
- Could have motors that spin wheels and have the ball pass through these balls, either inside of a PVC pipe or on a ramp.
- Could use air compression in some way to launch the ball simply with air pressure.

Possible Materials and Purpose(s):

- Ping-Pong balls to launch with
- Wood to use as a base to mount the launcher on and construction of the launcher.
- PVC pipe to have the ball launched from.
- Small DC motors (could be VEX or bought personally)
- Batteries to power the motors
- Wires to connect motors and batteries
- Wood glue (or just glue) to attach parts of the launcher together
- Nails to attach parts of the launcher together.
- Small springs to launch the ball
- Rulers/protractors/pencils to make measurements
- VEX kits and materials to construct the launcher
- Rubber bands to use as a slingshot

Where Materials can be Obtained: Most of these materials can either be found in the common household or classroom, and if not can be purchased cheaply at hardware stores like Home Depot.

Example Launchers: These launchers have aspects/features that would be possibilities to include in other designs, or have designs that could be used as templates for other ones with different aspects.

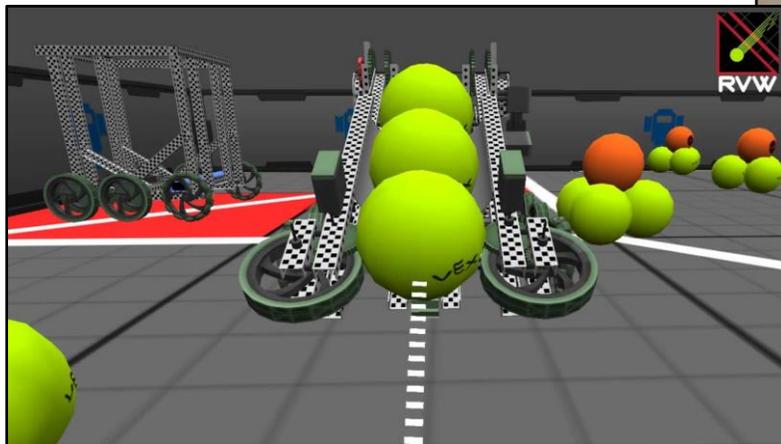
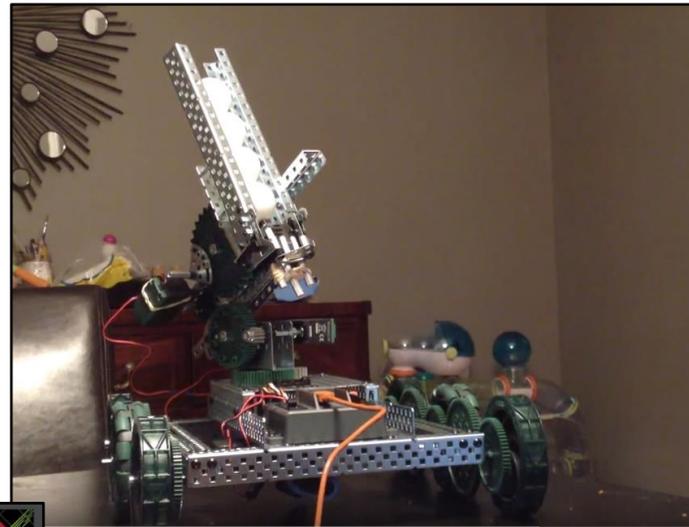


Source: <http://www.backroomworkdesk.com/2013/01/22/ping-pong-ball-launcher-ver-2/>

Description: (Left) This image shows a possibility for a “hopper” to hold balls in before launching them, as well as a “bent” PVC pipe design which could be used in other setups.

Source: <https://www.youtube.com/watch?v=Tp9STcq4ixE>

Description: (Right) This image shows another example of a possible hopper design for the ping-pong balls. It also shows an all VEX design, something that likely won't be done, but is a possibility.



Source: <https://www.youtube.com/watch?v=RQdRm8jhXZo&feature=youtu.be>

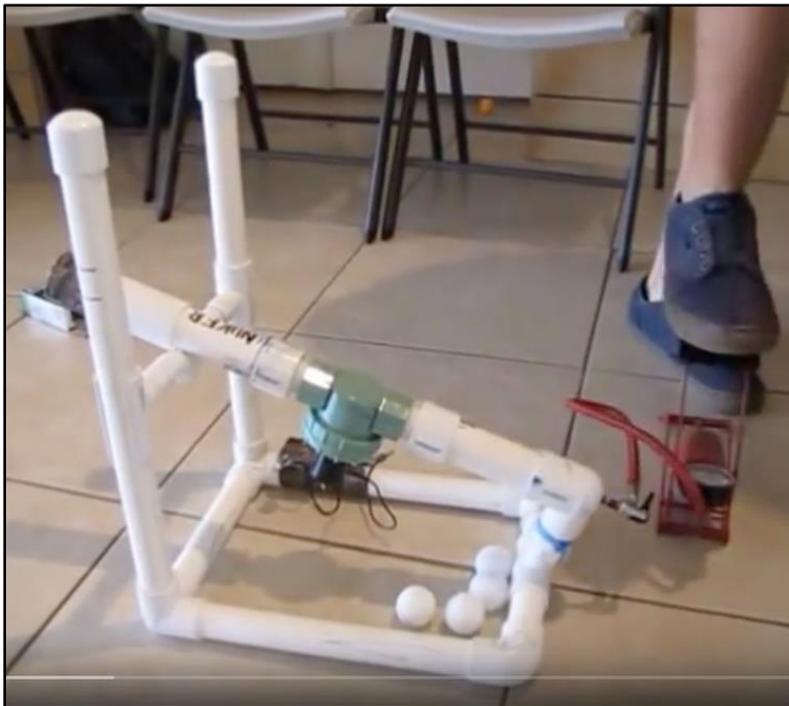
Description: (Left) This image shows a possible dual-wheel design that launches balls, without the use of a PVC pipe. It is an all-VEX design, however, but it could be made without VEX materials.

Source: <https://www.flickr.com/photos/justinhulbert/1086973199>

Description: (Right) This image shows a launcher with a wooden “protractor” setup for adjusting the launch angle. It also shows a PVC pipe/spring design for launching.



Source: The remaining images are from the following source <https://www.youtube.com/watch?v=nTte-Vz0Hac>



Description: (Left) This image shows an air-compressed launcher setup. While this is a possibility, it might be too time-consuming to carry out.



Description: (Right) This image depicts a design that has an object flick ping-pong balls through a short PVC pipe.



Description: (Right) This image shows a launcher with notches cut into two vertical boards that when a rod is placed through serve as an angle-adjusting device. A catapult design is also shown.

Description: (Right) This image shows a launcher with a different version of the wooden “protractor” design, as well as a slingshot/PVC pipe design.



Description: (Left) This image shows a different angle adjustment device that uses notches in two wooden sticks.

(Right) This launcher shows a catapult design for launching ping-pong balls.

Description:

