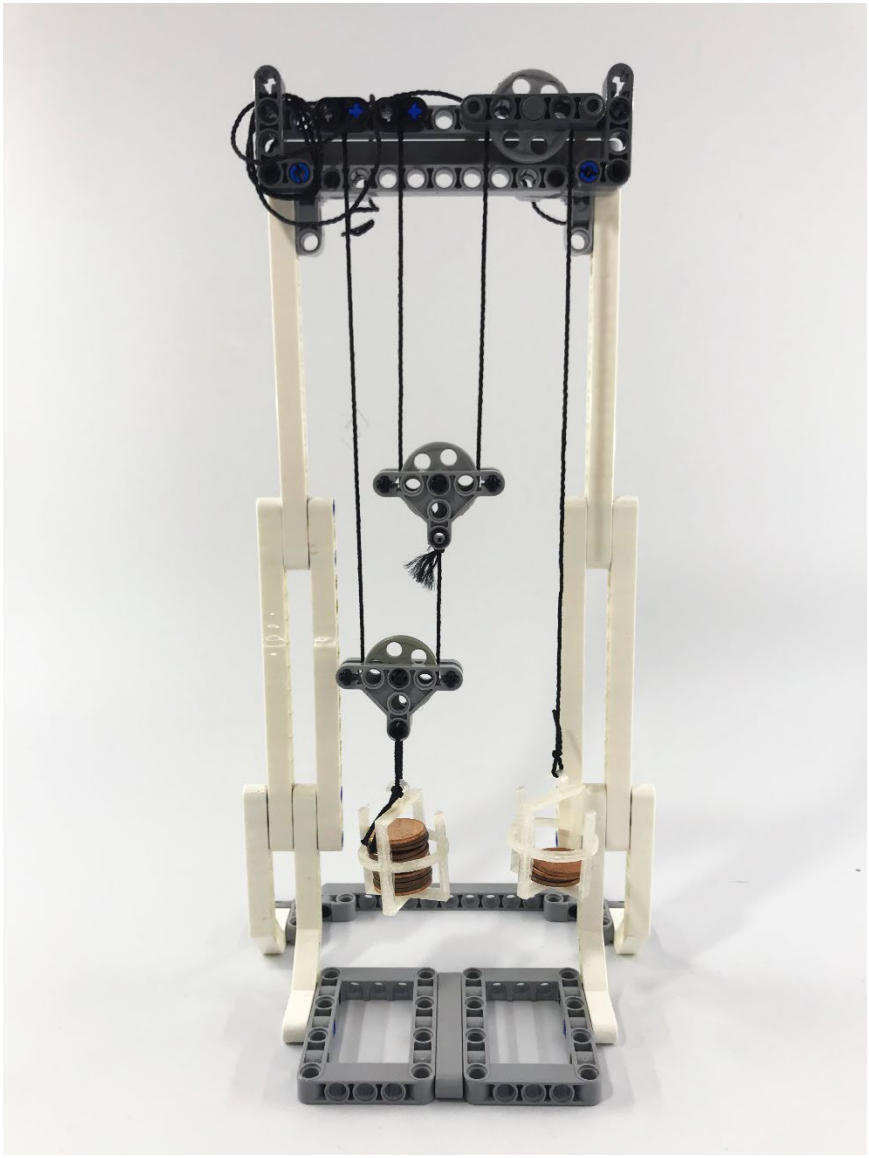
Pulley System using Mindstorm EV3

By Yufeng (Eric) Wu

Tuft University Center for Engineering Education and Outreach



This is a customizable, interactive pulley system that can be used in various classroom settings to help students learn basic physics concepts. The entire set up can be created using parts from a LEGO Mindstorms EV3 kit, some strings and any kinds of weight. Alternatively, as provided by this document, using 3D-printed parts can further enhance the performance of the pulley system.

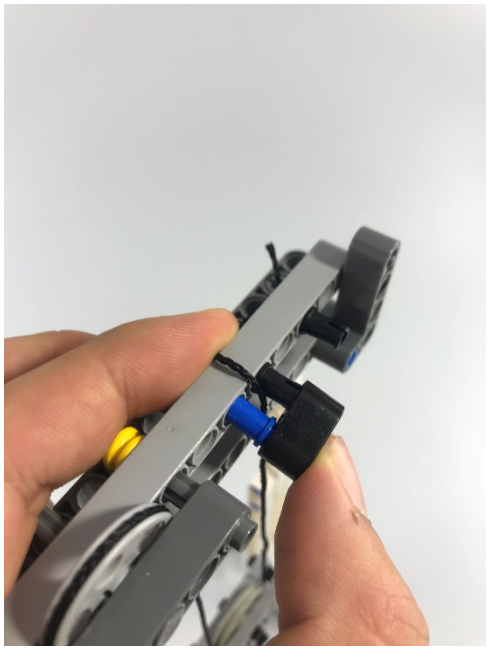
1. Materials Needed:

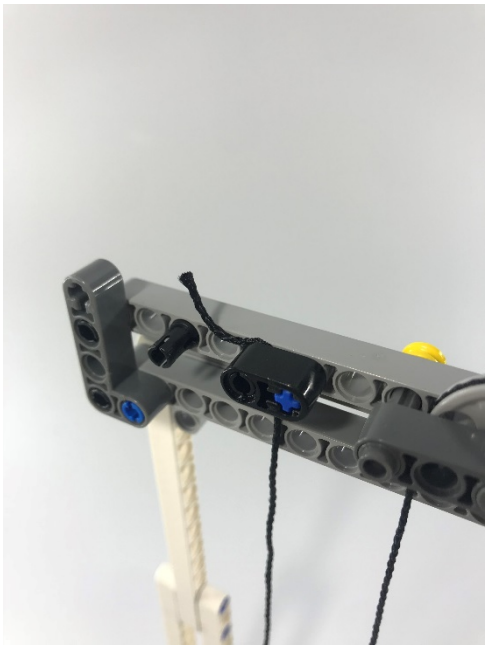
- LEGO Mindstorms EV3 kit
- Light strings
- Weight (e.g. Lab weights for physics class, pennies, etc.)
- A plus: a 3D-printer

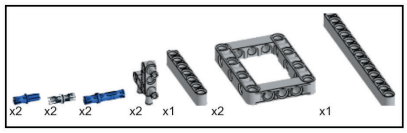
2. Building Instruction:

See next page.

Tips: Strings can be fixed to the horizontal beam using the method shown below:



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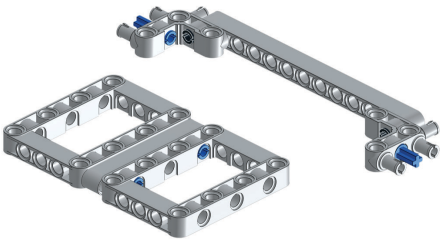

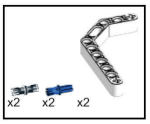
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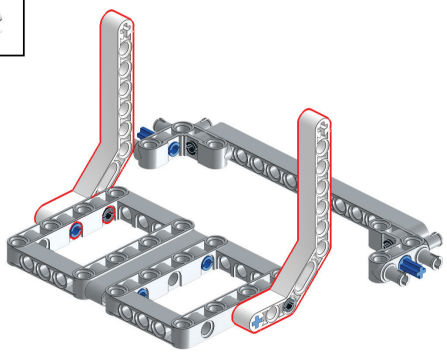

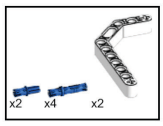
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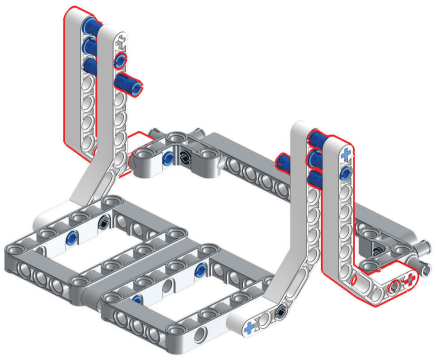

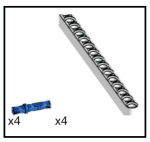
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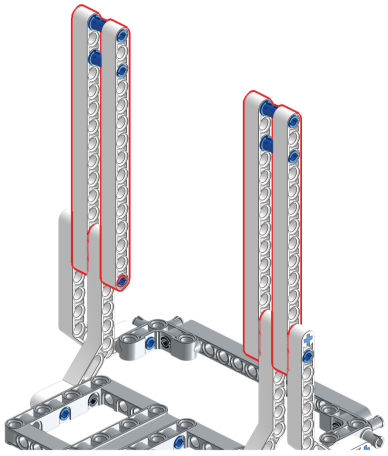

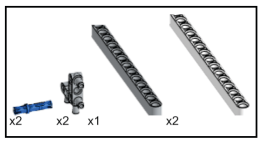
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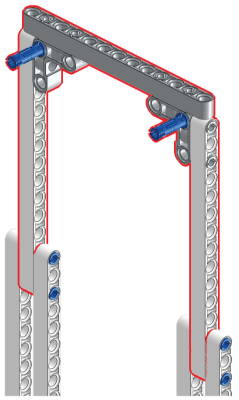

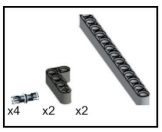
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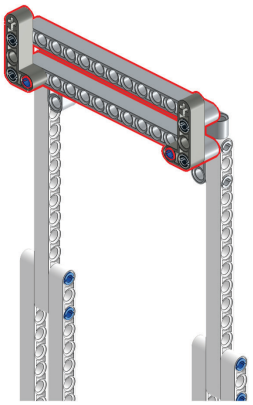

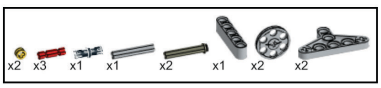
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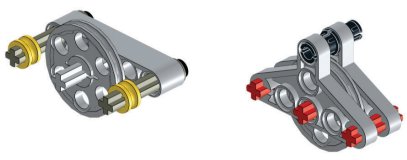
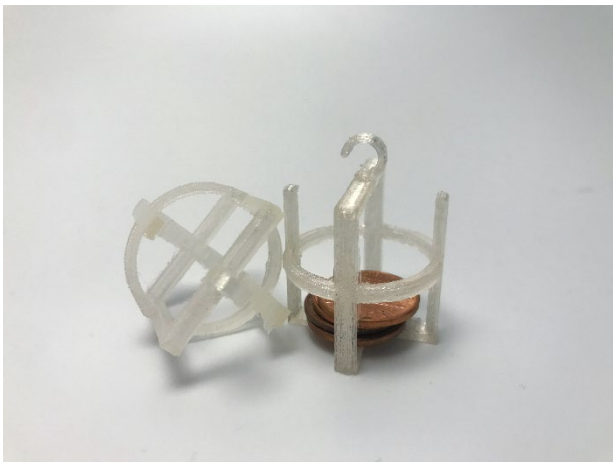


3. Alternatives/Supplements:

Coin Baskets

https://drive.google.com/open?id=1Z_-JYygVIaCSPHJauDEy1k_v8UnbfghS



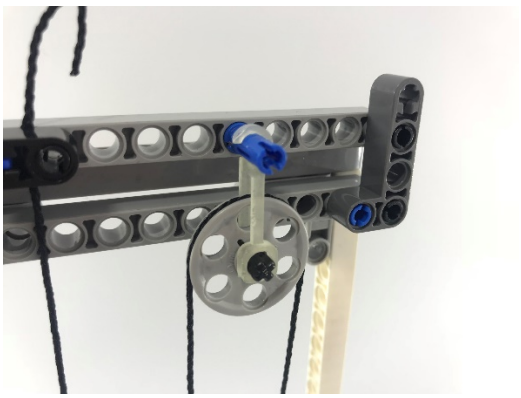
Note: In order for the baskets to fit perfectly, you may need to scale the object 2-3 percent larger, depending on the resolution and materials of your 3D printer. The basket is design to be able to hold both pennies and quarters.

Pulley Attachment

https://drive.google.com/open?id=1ziJeFLVG2erJQYu1Uo8qxCmZVOlc_OPa

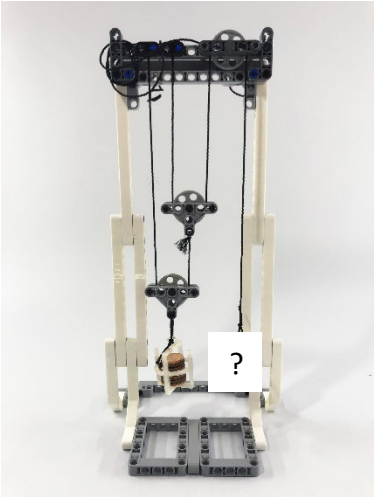
Note: The pulley hanger in the picture was printed using a Form2 printer. Because it is small and requires much more precision, a lower-resolution printer might not be able to make it fully functional.

This is not a required piece for the set up. It is rather a replacement for the LEGO piece and can reduce the unnecessary weight by some degree.

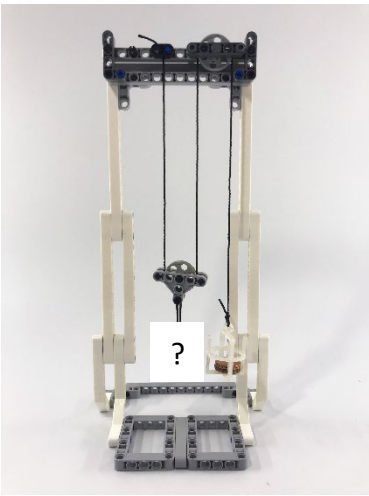


4. Sample Physics problem

1) With the pulley assembly shown below, if 16 coins are placed in the left basket, how many coins should be put inside the right basket in order to make the two weights balanced?



2) With the pulley assembly shown below, if 3 coins are placed in the right basket, how many coins should be put inside the left basket in order to make the two weights balanced?



3) Suppose you only have 5 quarters. Use the pulley system and find an object in the classroom that has a weight of about 10 pennies.