It's About Time

by bernard

This build plan and images depict Interlake High School's It's About Time device, which achieved consistent results at all the tournaments we attended.

BUILD PLAN

For this pendulum timing device, we used a 0.125-inch Actobotics precision shaft which extended out from a vertical wood support to hold up a length of string attached to the pendulum's bob. Two 0.125-inch collar locks were used to secure the position of the string along the precision shaft (See *Figure 3*). For the bob, a 0.25-inch collar lock was used since it was available and had a hole that allowed the string to be easily tied to it (See *Figure 4*).

Using the Device

To use this device, the 0.25-inch collar lock is initially held up by a magnet, placed at the intersection of two balsa sticks (See *Figure 2*). The magnet is then pulled down to release the pendulum's bob. This allows for consistent releases of the pendulum at a consistent height.

The period of this device can be determined by either recording some oscillations with a camera and determining the period with video player or timing oscillations with a stopwatch (and rather than timing a single oscillation, it's good practice to time multiple, maybe 10, oscillations and divide the time by the number of oscillations to get the period so human error is minimized).

Then, for trials, after the bob is released, the number of oscillations is counted (preferably out loud to keep count and bother the proctor who has to endure a full hour of it). If the trial ends when the bob is in the middle of an oscillation, count a partial oscillation (e.g. a quarter oscillation). By multiplying the number of oscillations counted by the period, we were able to get close enough estimations of time.

Improvements

With a single string attached to the pendulum's bob, we noticed it tended to occasionally swing perpendicular to its intended direction of motion (forwards and backwards when it was intended to swing left and right). Tying two equal lengths of string from the bob to the precision shaft (at two different points along the shaft) would have prevented this unintended swaying back and forth and might have allowed for more consistent runs. We did not have time to do this and were still able to achieve consistent results.

MATERIALS

Home Depot: wood, screws, a neodymium magnet, angle brackets
Servocity/Actobotics: 0.125-inch precision shaft, 0.125-inch and 0.25-inch collar locks

IMAGES

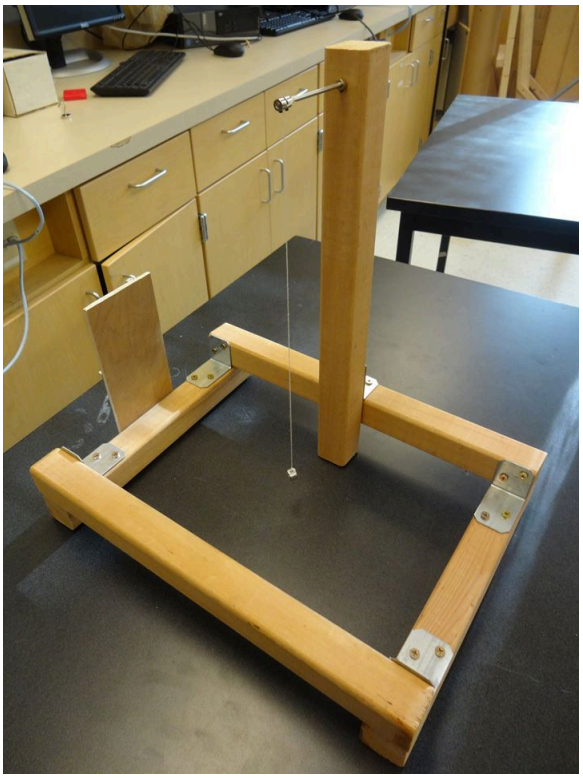

Figure 1. A photo of the entire device.

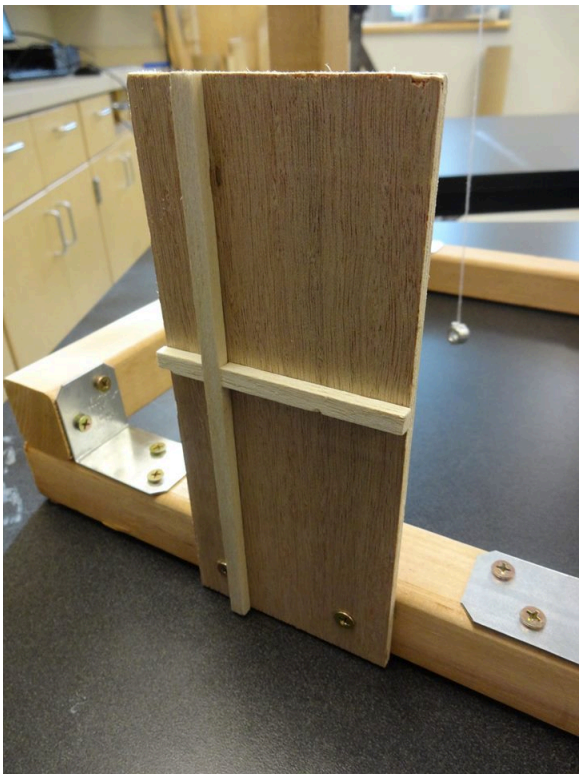

Figure 2. A photo of the release mechanism for this pendulum. The magnet is placed in the lower right quadrant.

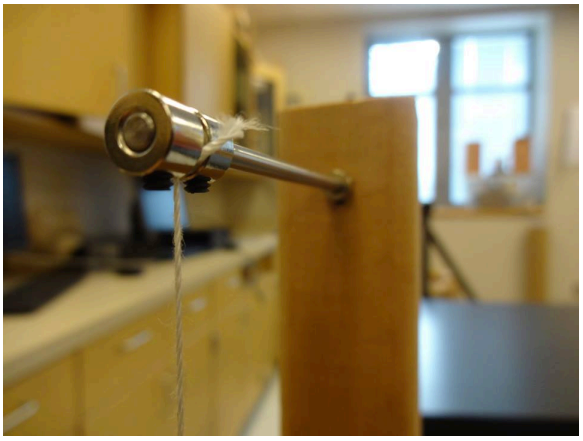

Figure 3. A photo of the connection between the string and the horizontally extending shaft. The two 0.125-inch collar locks secure the position of the string along the length of the shaft.

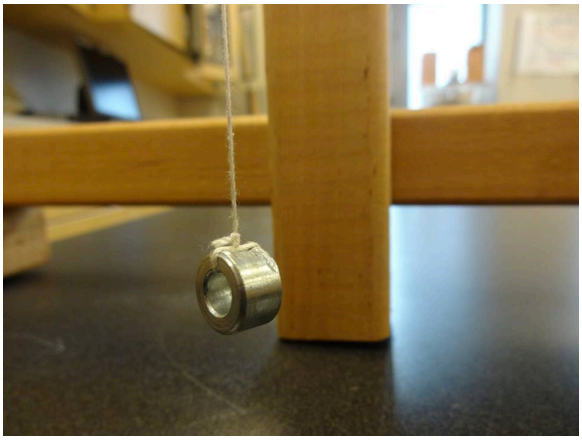

Figure 4. A photo of the bob, a 0.25-inch collar lock.