Hammer Time Mini Golf Hazard with Crickit

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https://learn.adafruit.com/mini-golf-hammer-time-circuit-playground-crickit

Last updated on 2023-08-29 03:46:01 PM EDT
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## Overview

### Please Hammer, Don't Hurt Em

You can build a hole for your dream miniature golf course that has this smashing obstacle -- the Hammer Time hazard! Using cardboard boxes, Crickit, Circuit Playground Express, a gearbox motor, and some craft supplies, you'll create a relentless hammer obstacle that takes just the right timing to avoid that hazard and sink your ball in the hole!

### Parts

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<th>Description</th>
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<td>Crickit: Creative Robotics and Interactive Construction Kit is an add-on to Circuit Playground Express that lets you #MakeRobotFriend using CircuitPython and MakeCode</td>
<td><a href="https://www.adafruit.com/product/3093">https://www.adafruit.com/product/3093</a></td>
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<td>Circuit Playground Express</td>
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<td>Round, Awesome Microcontroller Board</td>
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Materials & Tools

For this project you'll need:

- Large corrugated cardboard box
- Small corrugated cardboard box
- Popsicle stick
- Toothpick or bamboo skewer
- Paddle wheel attachment for TT motor or other wheel
- 2ea. Zip ties
- Wire twist tie
- Magic Spring, a.k.a. "Slinky"
- Golf ball and putter (or you can improvise -- make your own cardboard putter!)
- Paper cup
- Hobby knife
- Pencil
- Hot glue gun and glue, or white glue and patience
- Packing tape

Program the Crickit and CPX with MakeCode

Crickit Install for MakeCode

You can code your Crickit and Circuit Playground Express using MakeCode! Head on over to the Crickit with MakeCode guide to get set up!

Crickit Setup

Plug the motor leads into the Crickit's Motor 1 port. Connect the red wire to the outer terminal and the black one to the inner terminal.

Also, plug in the battery pack to the Crickit's DC power jack.
You can optionally connect the speaker to the Crickit's Speaker terminal if you'll be using the advanced version of the code later that includes a bonus song.

Hammer Time

The program for basic operation is incredibly simple -- it only uses four blocks!

From the Input category, get two on button A click blocks, and use the drop down menu to switch one to on button B click.
From the Crickit category, drag the crickit run motor 1 at 50% block into the on button A click block.

This will cause the motor to run at half speed. Change the value to 100%. You can tune this later to make the hazard harder or easier.

We want a neat way to stop the motor, too. From the Crickit category, drag a crickit stop motor 1 block into the on button B click block.

That's all it takes to get things moving!

Upload Code to the CPX

Change the program's name from 'untitled' to 'Hammer Time' and then download it to your local hard drive. With the Circuit Playground Express (CPX) plugged in via USB, press the CPX's reset button once so the NeoPixels turn green. This places it into bootloader mode.

Drag the 'circuitplayground-Hammer Time.uf2' file you downloaded onto the CPLAYBOOT drive.

The CPX will reboot and is ready for golfing!

Fancy Version

Here's a more elaborate version that adds many more features and interactivity elements, including a bonus easter egg song playback when you press button A!
Have a look at this one to see how it works. These are the key concepts:

- NeoPixel ring is initialized as a strip so we can use advanced features, such as rotating the color values
- The two buttons each have a "state" so that pressing button B toggles a variable to start and stop the motor, and pressing button A toggles a variable to start and stop a song
- A function is used to encapsulate the song composition
- Moving the switch changes a motor_speed variable between 50% and 100%, which is used elsewhere in the code instead of an explicit number to determine the motor speed

Here's a link to the finished program ( ) so you can edit it if you like, or simply download it and use it as is! Optionally, plug in the small metal speaker to the Speaker output terminals on the Crickit for a bigger sound!
To create the hammer action, we'll need to build a lightweight, yet sturdy hammer -- a perfect time to use corrugated cardboard! The hammer will have a pivot running through its handle so that the motor-driven striker can whack the back of the handle, raising up the hammer. Gravity will cause it to drop back down.

Since the TT motor doesn't have a huge amount of torque, we need to help it along so that it doesn't stall out. That's what the slinky rainbow spring is for! We'll use it to assist with raising the hammer, plus it's highly adjustable, and looks awesome!!
Hammer Head

Cut a rectangle of corrugated cardboard roughly 8” x 4” with the flutes of the corrugation running parallel to the short (4”) side -- working with the grain this way will make it easier to roll the cardboard into a cylinder.

Roll the cardboard into a cylinder.

Place a strip of packing tape on one of the ends as shown, then tape the ends together.

Trace then ends and cut out two circles from paper or chipboard (cereal boxes are a good source).

Glue the ends onto the hammer head.
Handle

Cut a strip of cardboard about 11” x 3/4”, making sure the grain runs parallel to the long edge.
If you can, use 5-ply, double thickness cardboard, or cut two strips and laminate them together with glue for added strength.
Cut a small notch in the hammer head to insert the handle.
Place some glue on the head end of the handle, then insert it all the way in, pressing it in place while the glue dries.
If needed, add a dab of glue at the insertion point as well.
Hammer Stand

Bend a strip of cardboard as shown into a bracket to support the hammer's handle pivot, again using either 5-ply or double up two strips for extra thickness
Glue the strip down to a piece of chipboard
Poke a hole through the handle and the stand for the pivot
Use a length of bamboo skewer or a toothpick for the pivot
Striker Assembly

The striker assembly is made with a gearbox motor and a paddlewheel with a popsicle stick attached to it. This will strike the hammer handle once per revolution when it is spinning.

First, we'll build the striker wheel, and then attach the motor to a small box to act as a stand.

Striker Wheel
Secure the popsicle stick to the paddle wheel with two zip ties as shown, with one end protruding from the wheel and the other end flush with the wheel
Be sure the stick clears above the axle mounting hole on the paddle wheel
Pull the zip ties tight
Trim the excess zip tie ends
Motor Mount
Place the strike wheel on one shaft of the TT motor, no need to screw it in just yet
Find and mark a the position of the opposite shaft when the assembly is positioned so that the end of the popsicle stick will reach approximately the middle of the box horizontally, and clear the bottom without hitting the ground vertically
Poke a hole through this point large enough to fit the shaft
With the motor shaft in the hole you just made, use a paper clip or safety pin to mark two points on the box where the motor's screw mounts will be positioned as shown
Poke the holes out a bit larger so they will fit the twist tie
Mount the motor inside the box with the shaft protruding as shown, using the twist tie to secure it
Place the paddle wheel on the motor shaft, then secure it in place with a small screw
Make sure the motor wires are outside the box, then close its flaps. Depending on the style of box, you may be able to leave two flaps open to help secure the striker assembly to the putting green later.

Move the hammer stand in place and you can see how the full striker assembly will work. However, the hammer is a bit heavy for the motor, so we'll add a spring assist!
Add the Spring
Use a piece of packing tape to secure the first coil to the top of the hammer as shown. Press the tape down firmly, then test pulling up on the hammer with the spring.
Make the Putting Green

A large shipping box is perfect for building a putting green. I used a box from a flat-pack piece of Swedish furniture, so the dimensions required no modification, just the addition of the obstacles and cup. The two halves of the box are laid end to end for a longer green. You may need to cut, fold, and join parts to construct a similar green, depending on your materials.
Add Cup

Position the cup about 12" from one end of your cardboard box.
Trace the bottom of the cup as a general guide, then redraw a slightly larger circle and cut it out with a hobby knife.
Place the cup in the hole and mark a line on the cup all the way around as a cutting guide.
Use scissors to cut the cup from the lip to the marked circle into six strips -- these will act as mounting flanges.
Tape the cup underneath the box, right under the hole.
Attaching the Hammer Time Hazard

Place the hammer stand behind the hole as shown, so the hammer head strikes just a bit in front of the cup.

Place the striker assembly so that it will hit the hammer properly -- you can turn it on to test the best position.

Then, tape both the hammer stand and striker assembly down with packing tape.
Pull the spring up and over the striker assembly box so that it has just the right amount of tension to help the hammer up, but not so much that it never comes back down!
Back Rail

You can now take a strip of cardboard and make a protective back rail. This will keep the ball from falling off of the green, and from destroying the mechanism!

Just make sure you cut the strip of cardboard narrow enough so that it clears under the hammer's handle right at the pivot point.

You can use tape or glue to hold secure the rail. If you like, add more cardboard strips for additional side rails.
Play Through!

Time to play! Press the ball into the cardboard a bit to create a divot to hold the ball in place while preparing mentally, physically, and emotionally for your putt. Clear your mind. Become the ball. Visualize success. STOP. Hammer Time.