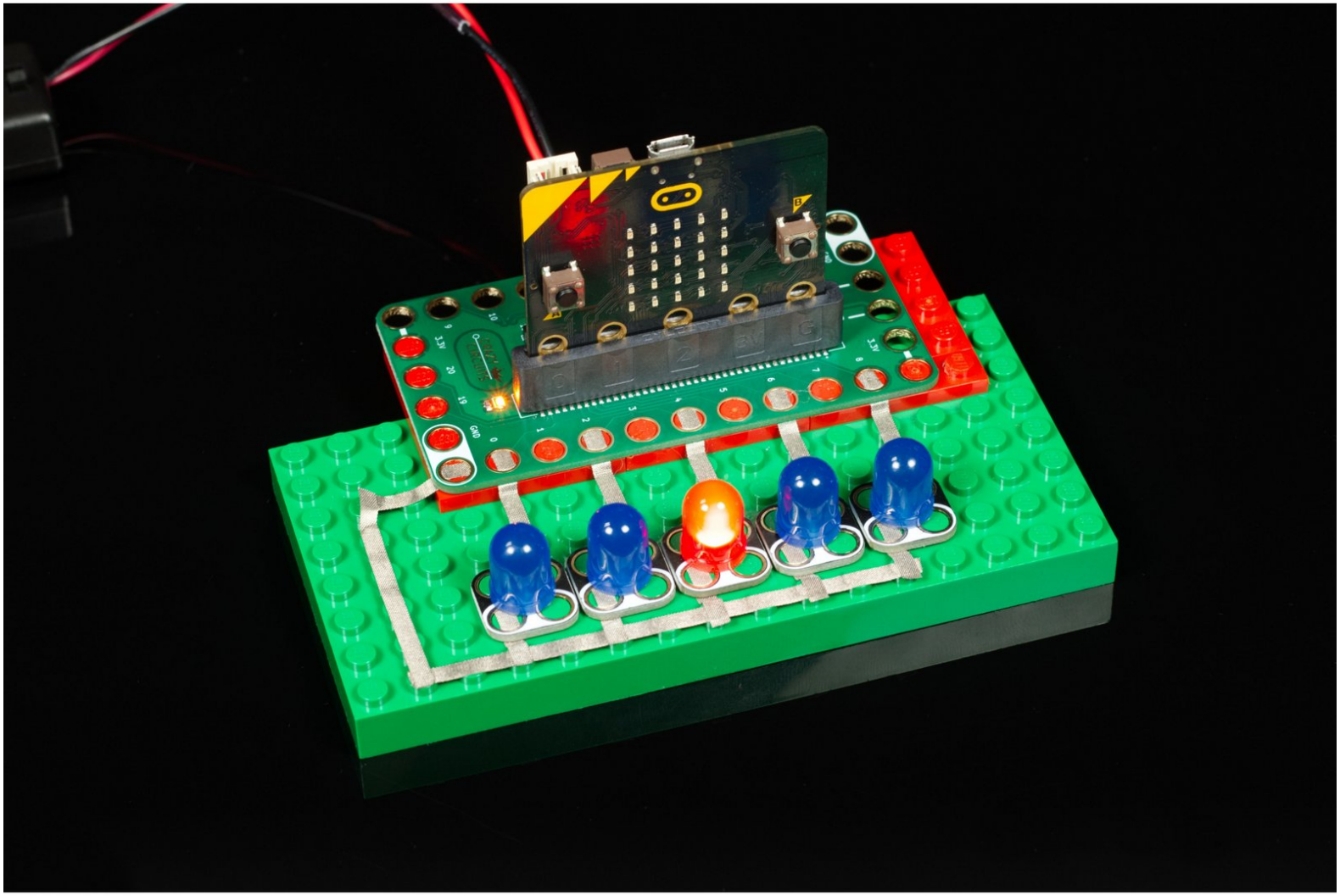
Simple Level

Build a simple level using a micro:bit, a Bit Board, and some LEDs.

Written By: Pete Prodoehl



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INTRODUCTION

The micro:bit has a built in accelerometer which we can use with a Bit Board, a LEGO baseplate, and a few LEDs to create a simple electronic level.

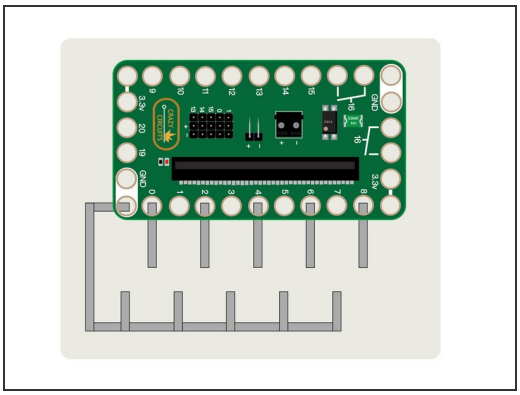
TOOLS:

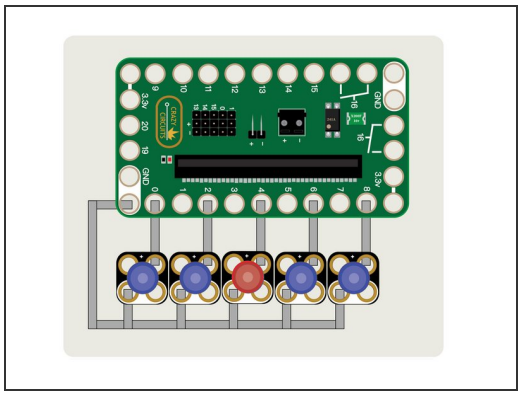
- Scissors (1)
- Computer (1)

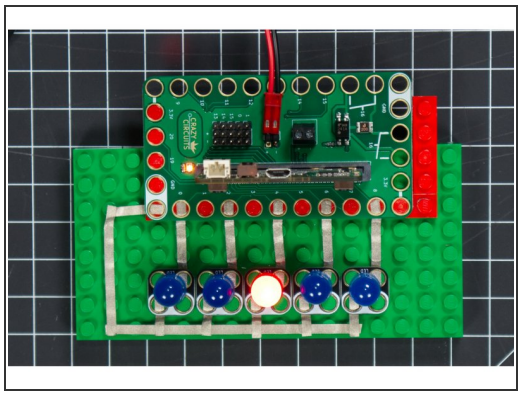
PARTS:

- micro:bit (1)
- Crazy Circuits Bit Board (1)
- Crazy Circuits LED Chip (5)
- Maker Tape (1)
  1/8"

Step 1 — Build your Circuit





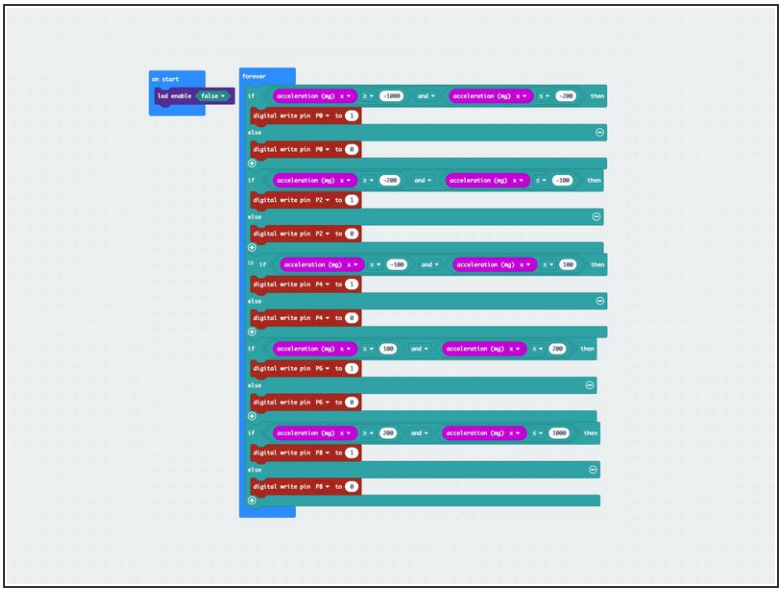


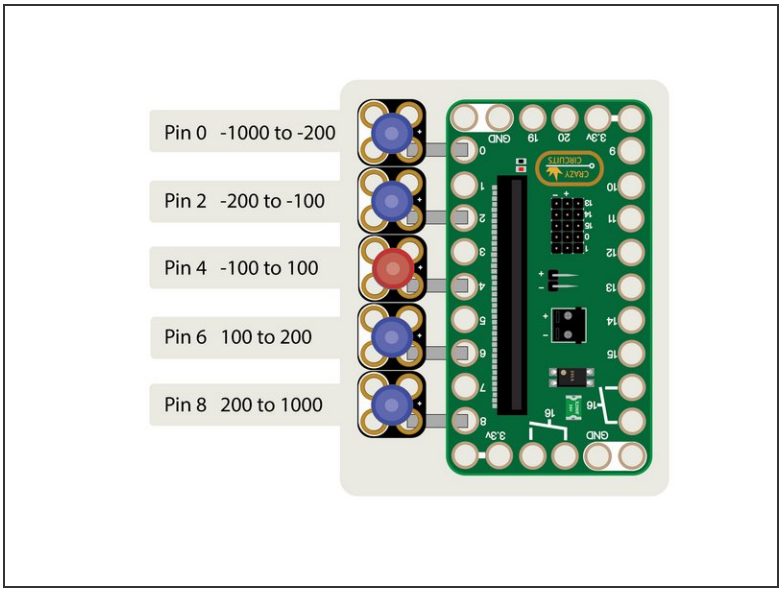
- Build your circuit on a LEGO baseplate using the Crazy Circuits Bit Board, Maker Tape and 5 LEDs.

You can use as few as 3 LEDs or use more than 5 if you like.

We used a few 1 x 4 LEGO plates so our Bit Board would fit level on the baseplate and not hang off the back.

Step 2 — Load the Code





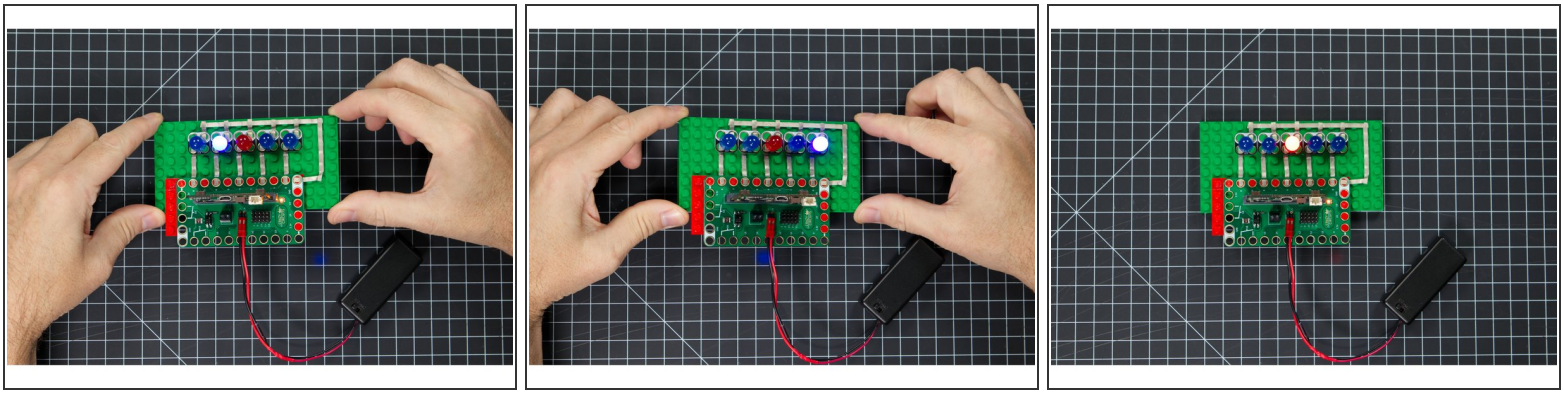
- Insert the micro:bit into the Bit Board and connect a USB cable that is plugged into your computer.

- We'll be using makecode.microbit.org to program our board. It uses a simple drag and drop block interface. We'll also provide all the example code you need.

- We're going to load the following code for our **Simple Level** program: https://makecode.microbit.org/_asufxbbTz...

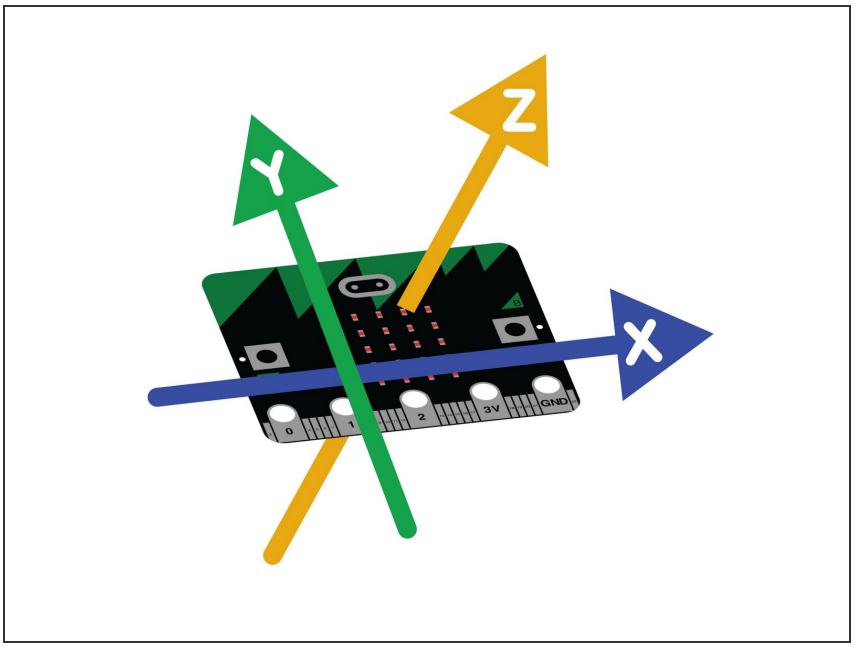
- Once the code is loaded and running you should be able to tilt the board left or right while it is powered by the USB cable and it should work.

Step 3 — Test it Out!



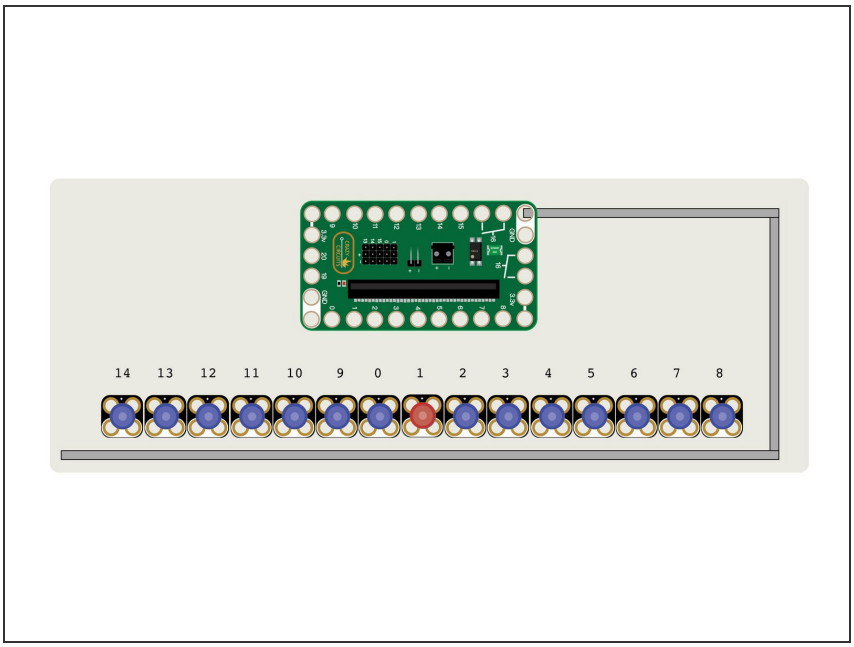
- You can power your level by using a 2 AAA battery pack plugged into the Bit Board or by plugging a USB cable into the micro:bit
- Try picking up the level and tilting left, and then right, and then trying to keep it level. If you get it level the center LED should light up.

Step 4 — The Accelerometer



- The micro:bit measures movement along three axes: X - tilting from left to right. Y - tilting forwards and backwards. Z - moving up and down.
- An accelerometer measures "proper acceleration" which is **physical acceleration** (the rate of change of velocity) of a body in its own instantaneous rest frame. This is different from **coordinate acceleration**, which is acceleration within a fixed coordinate system.
- While our simple level can show us the tilt or angle of a surface, sliding it back and forth rapidly can also measure the physical acceleration (velocity) of the device.

Step 5 — Take it Further



- While our Simple Level uses 5 LEDs you could easily add more. How about 15 LEDs? Can you figure out how to arrange your Maker Tape so you don't overlap any of it when designing a larger circuit?
- The diagram shows where each LED should be routed to on the Bit Board with a suggestion of how Ground might connect to each LED.
- If you build a larger level you'll want to adjust the code to deal with it. Can you break the range from -1000 to 1000 equal amounts based on how many LEDs you have?