DEPARTMENT OF
COMPUTER SCIENCE & ENGINEERING

Experiment-1.3

Student Name: Kanishk Soni **UID: 20BCS9398**
Branch: BE-CSE **Section/Group:20BCS-DM_708B**
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Subject Name: Internet of Things Lab **Subject Code: 20CSP-358**

AIM: Demonstration of Autodesk Tinkercad Simulation Platform.

Objective:

1. Learn about IoT based simulations.
2. Testing and model in IoT based simulation platform.

Tinkercad:

Tinkercad is an online collection of software tools from Autodesk. It is an excellent tool that allows you to simulate Arduino-based systems (and a lot more). You can simulate all exercises and even your own designs before trying them on real hardware. It also allows you to do programming using blocks. You can download / copy-paste the generated code later into Arduino IDE to program the real Arduino board, rather than having to write it from scratch.

History:

Tinkercad was founded by former Google engineer Kai Backman and his cofounder Mikko Mononen, with a goal to make 3D modeling, especially the design of physical items, accessible to the general public, and allow users to publish their designs under a Creative Commons license. In 2011, the tinkercad.com website was launched as a web-based 3D modeling tool for WebGLenabled browsers, and in 2012 the company moved its headquarters to San Francisco. By 2012, over 100,000 3D designs had been published by users.

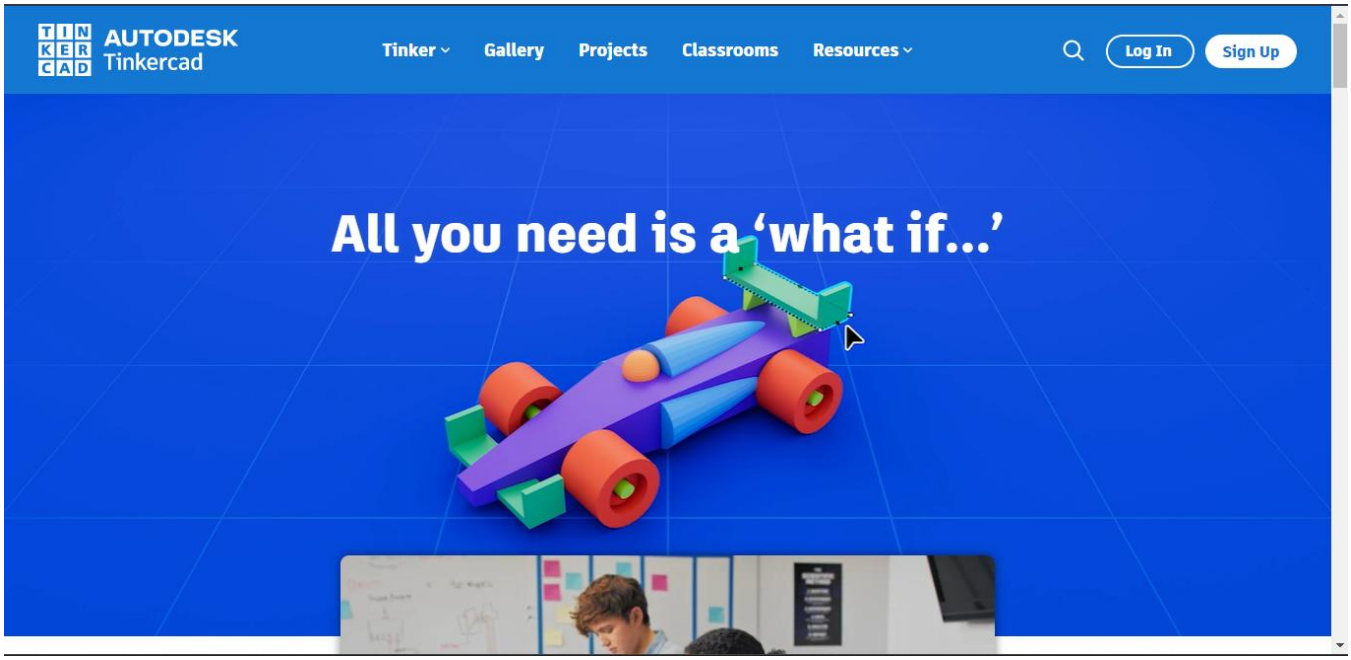
In May 2013, Autodesk announced at a Maker Faire that they would acquire Tinkercad.

In March 2017, Autodesk recommended users of the soon-to-be-retired 123D Sculpt migrate to Tinkercad (or Maya LT). In May, Autodesk discontinued its 123D Circuits (Circuits.io)

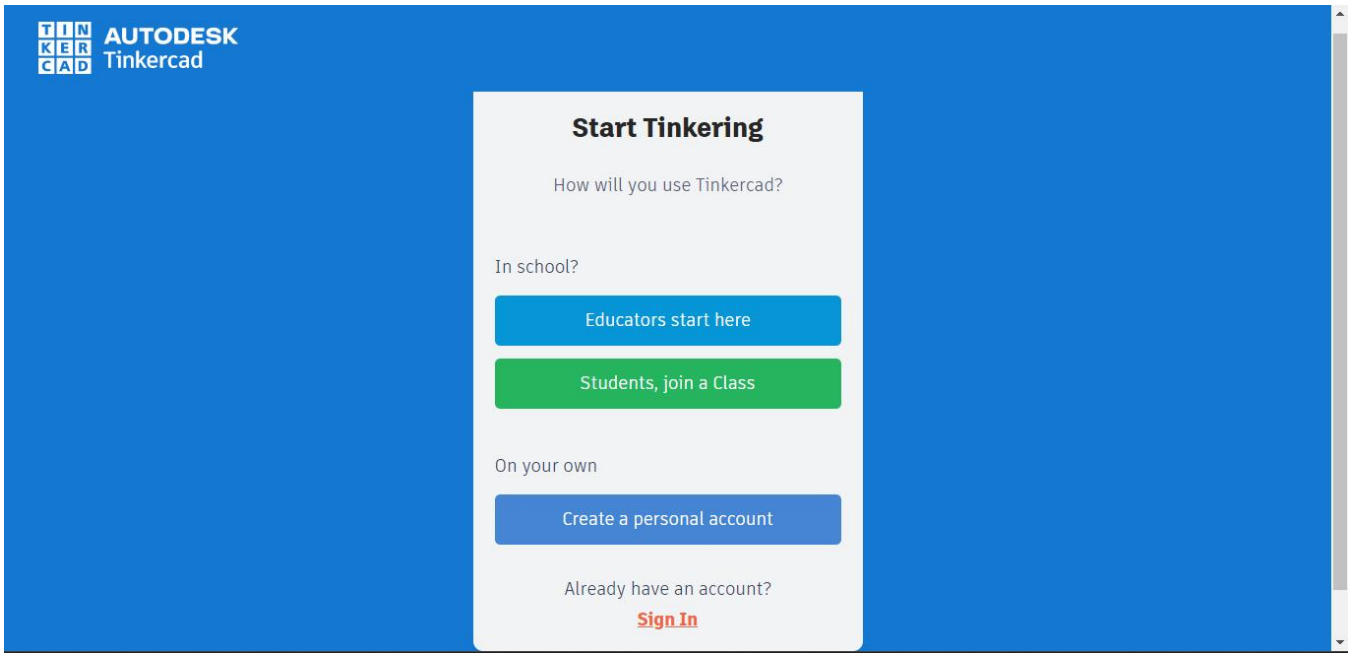
"Electronics Lab". The program's features were merged into Tinkercad.

Tinkercad Account Creation:

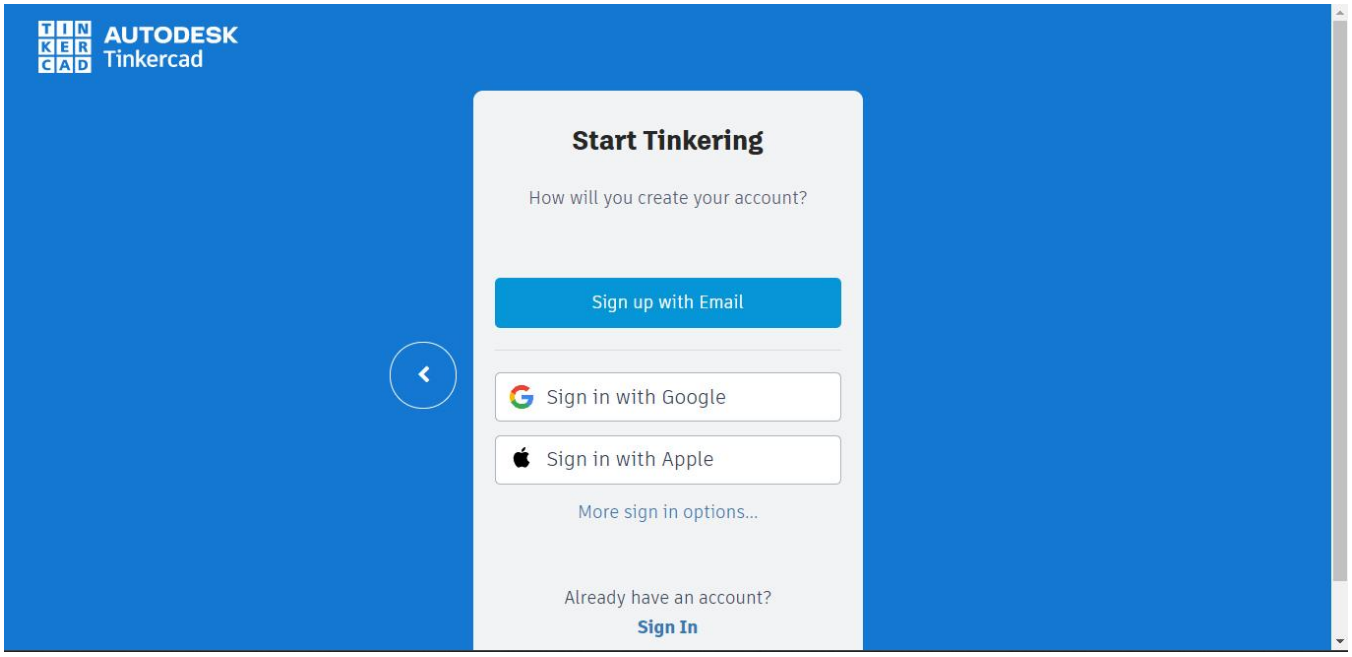
Step 1: Go on https://www.tinkercad.com/ website, and click on sign up option in the top right corner.



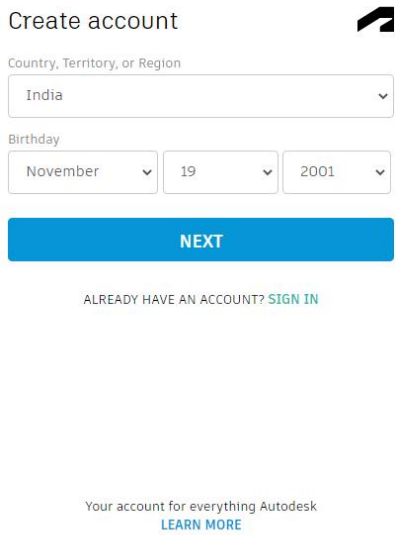
Step 2: You'll be directed to the following page, here click on 'Create a personal account'.



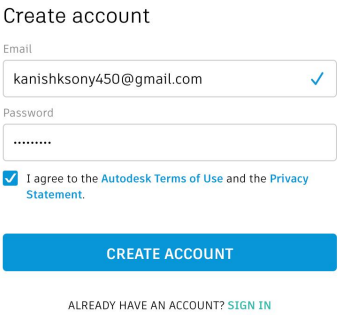
Step 3: It would be followed up with a choice of signing up with an Email or an apple account or a google account. As per your convenience, choose your options.



Step 4: Set up your Country/Region and set your birthday.



Step 5: Enter your Email Id here and set up a strong password.



Step 6: Your account is finally created. Now you can browse through the different components of electronics/designing or sensors etc and create or simulate a design.

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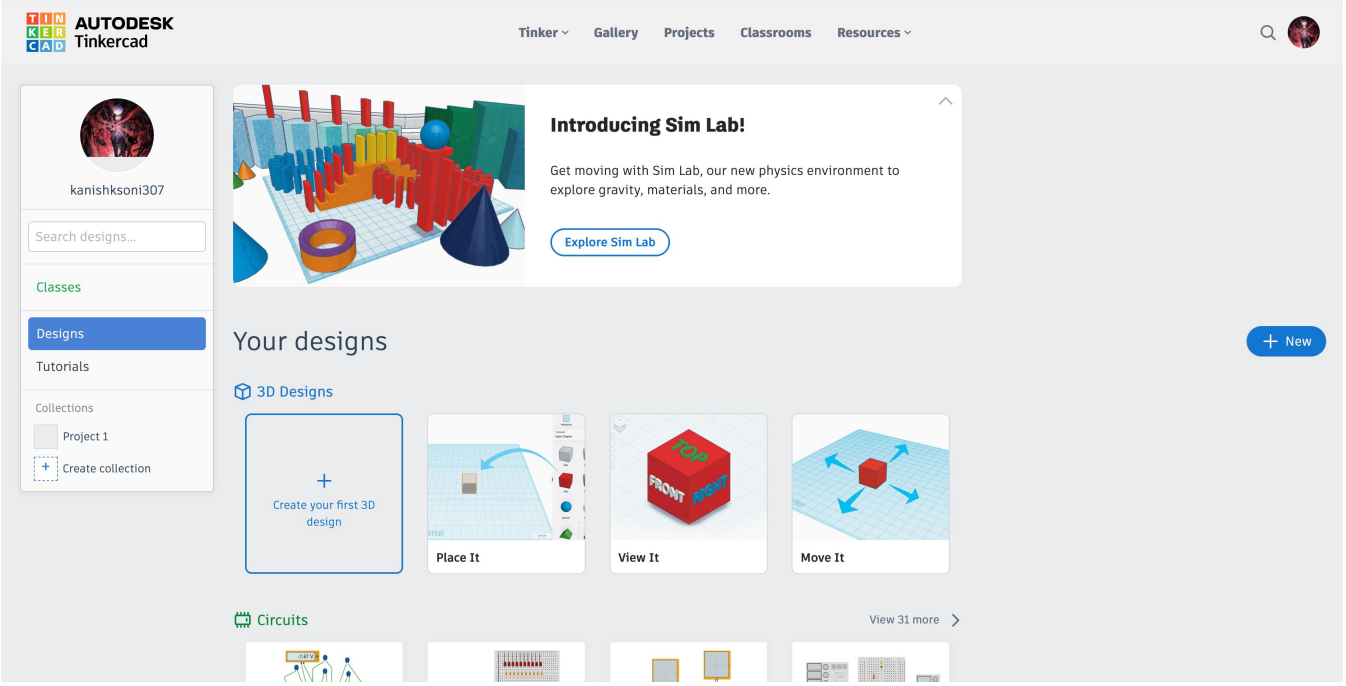
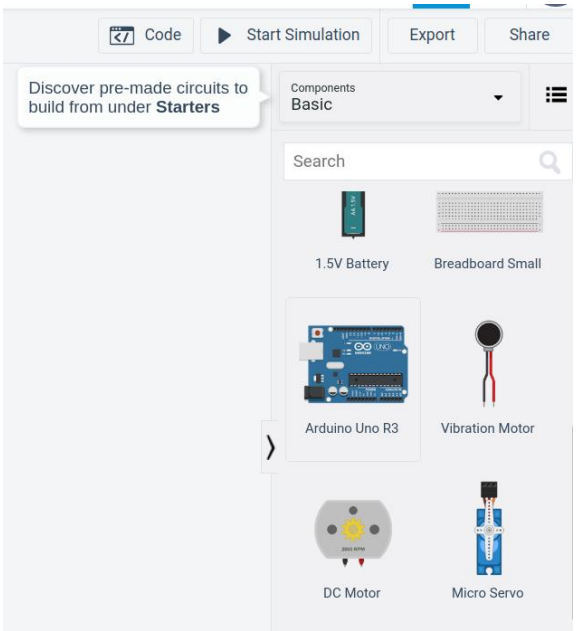
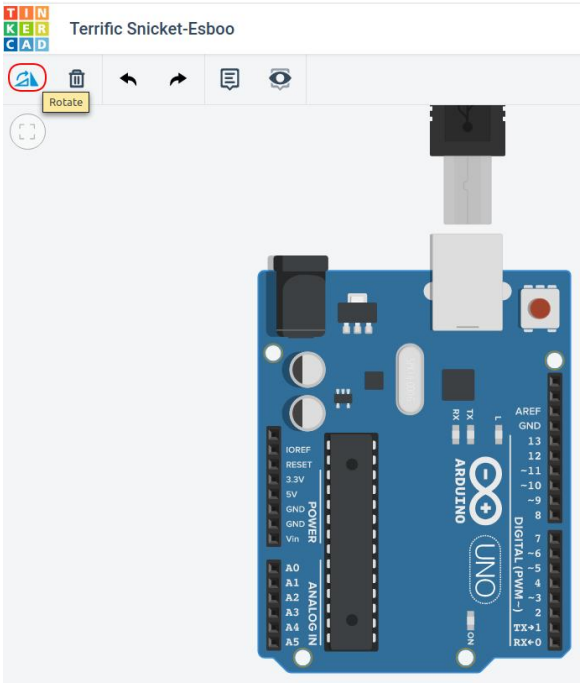


Hardware

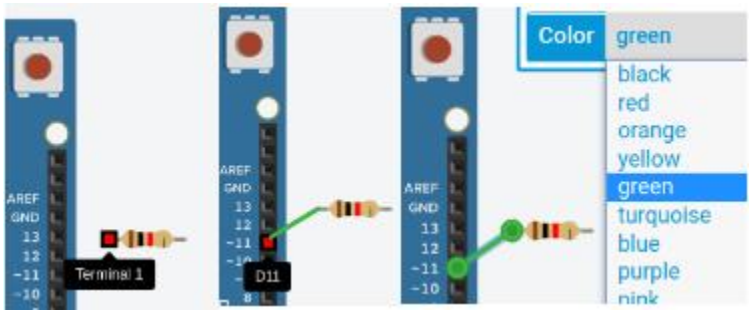
In Components Basic, you can select Arduino Uno R3.



You can rotate it to portrait mode if you wish, which will allow more space for other components to be added.



You can add more components and wire them up as desired. Clicking on the lead of a component allows you to start a connecting wire from there. Clicking on a wire allows you to change its color.



Programming and Simulation:

To program the Arduino,

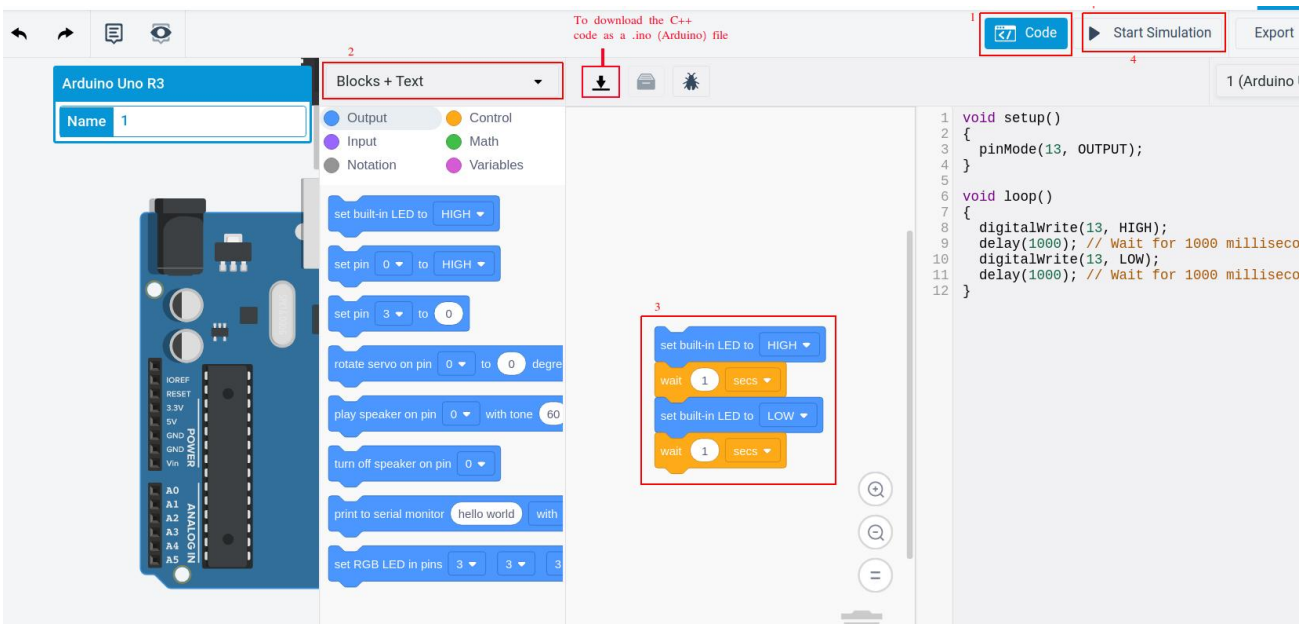
Step 1: Click on Code
Step 2: You can choose Blocks or Blocks+Text or Text*. For beginners, it is recommended to use Blocks + Text.
Step 3: This allows you to see the C++ code generated corresponding to your blocks.
Step 4: You can copy this code later into Arduino IDE to program the real Arduino, rather than having to write it from scratch.

Step 5: You can also download the code as an Arduino-compatible .ino file.

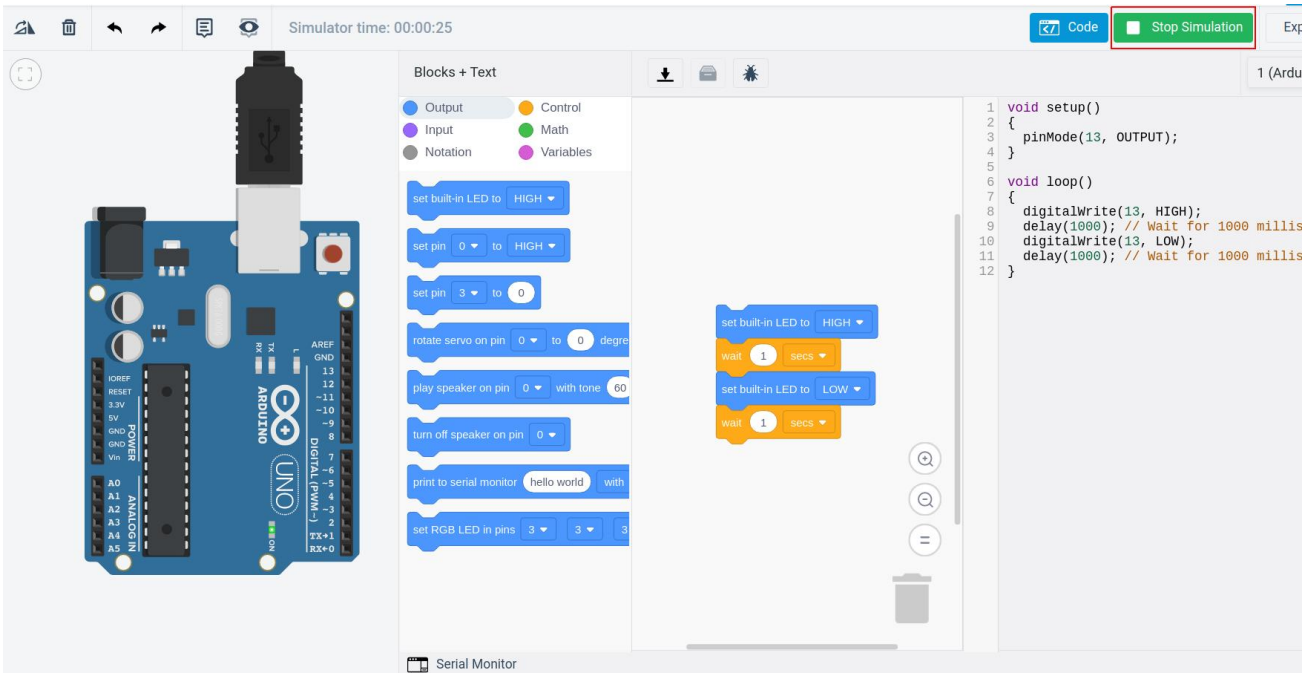
Step 6: You can code by selecting the blocks and connecting them appropriately.

Step 7: You can start the simulation by clicking Start Simulation.

*Note : You can go between Blocks and Blocks+Text anytime. You can go from Blocks / Blocks+Text to Text, but you can't go back from Text to either of the other two (converting blocks to text is easy, converting text to blocks is computationally non-trivial).



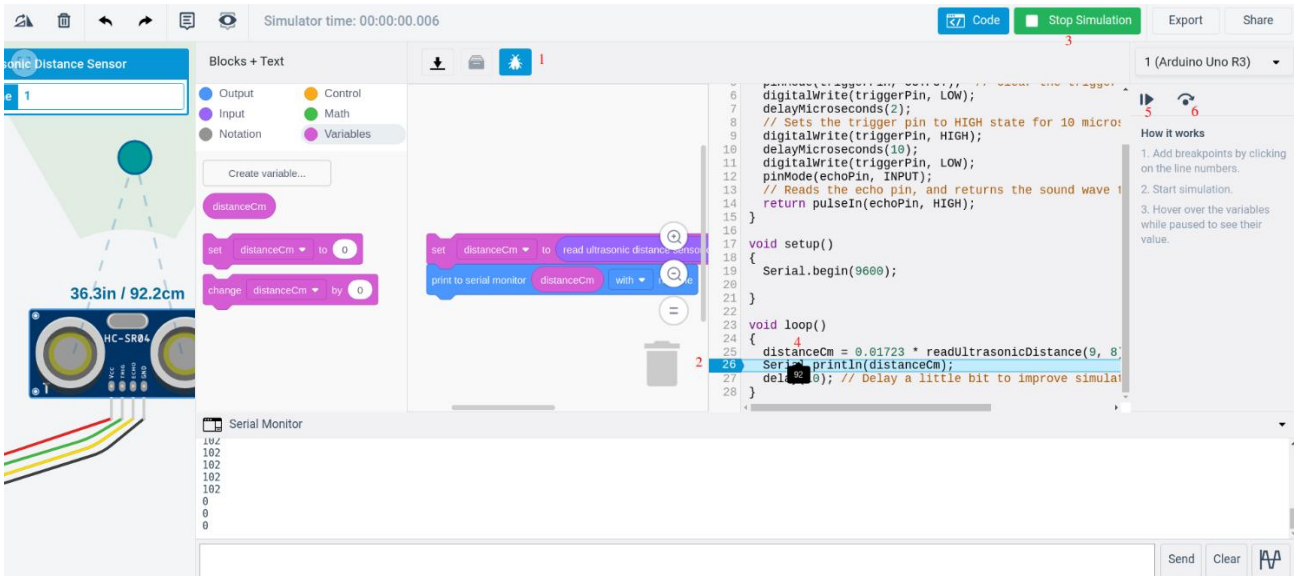
You have to click Stop Simulation to stop the simulation before you can modify your program and/or hardware connections.



Debugging (Advanced)

More often than not, the code written by a programmer does not work as expected the very first time he/she runs it. We need to find out the logical flaws in our code and fix them before we are able to achieve full functionality. Figuring out flaws usually boil down to inspecting variable values at various points in our code, and comparing it with the expected values at those points based on the program logic and data inputs. The usual way Arduino programmers do it is by printing out the variable values to Serial console.

Tinkercard allows for debugging without having to print the values you want to inspect through Serial. The example below shows debugging of the Ultrasonic Distance Sensor example.



Step 1: Press the Debugger button.

Step 2: Select the line(s) where you want the execution is to be paused. Such a line where you wish to pause execution is called a breakpoint.

Step 3: Click Start Simulation.

Step 4: Hover over the variable values you want to inspect, and determine if the values are along the expected lines. If not, there is something wrong, and use your logic to determine what could be wrong.

Step 5: You can press the Resume execution button to run until the next breakpoint.

Step 6: You can also step line by line by clicking the Step Over Next Function button.