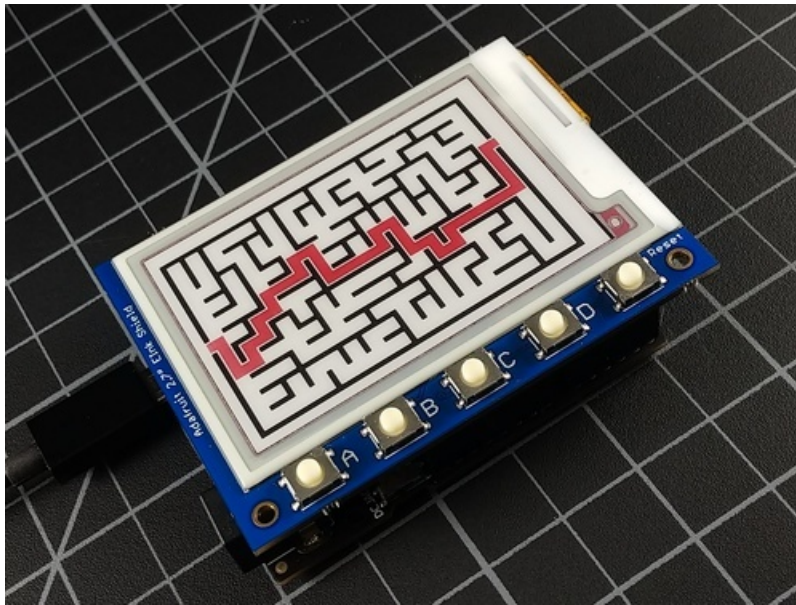


 adafruit learning system

ePaper Maze Maker

Created by Dan Cogliano



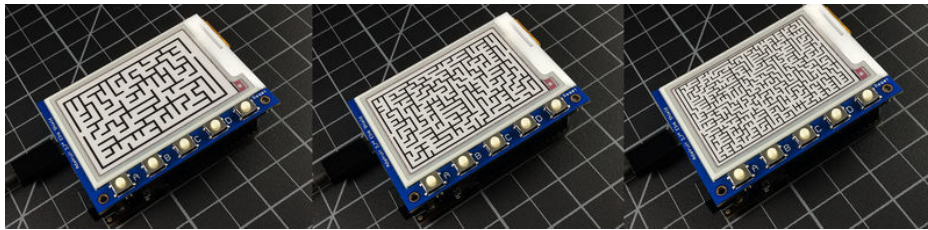
Last updated on 2020-05-19 12:35:47 AM EDT

Overview

This project generates random mazes and their solution using an Adafruit Metro M4 Express and an Adafruit ePaper shield. This is a fun, no-solder project suitable for all ages with three difficulty levels to choose from. You will have some a-maze-ing fun with it!

This project does not use WiFi, so it will work with either the Metro M4 Express or the Metro M4 Express Airlift. This project can be made portable by adding a battery, making it a great activity to take on a long car ride to minimize hearing "Are we there yet?" from the back of the car.

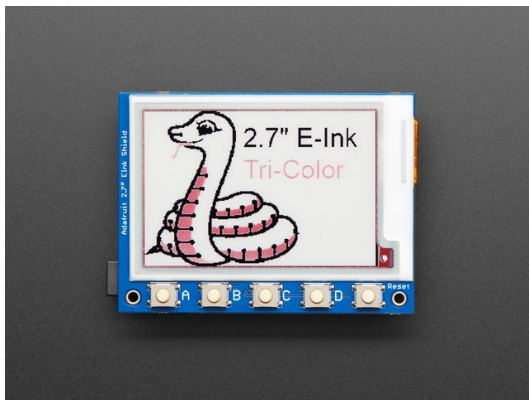
The original maze generator code this project is based on was written over 20 years ago in C for printing random mazes on paper. The use of the ePaper shield in this project brings a modern touch to this classic code.



Parts

Building this project requires no soldering and uses just two parts: the Adafruit Metro M4 Express and the Adafruit 2.7" Tri-Color eInk / ePaper Shield with SRAM. Either the Metro M4 or Metro M4 Airlift Express can be used. To make this project portable, you could use a [9V battery](https://adafru.it/yPe) and [adapter](https://adafru.it/yFp) (shortest battery life) or add a [USB battery pack](https://adafru.it/e2q) and [adapter cable](https://adafru.it/Bfm) (longer life and rechargeable).

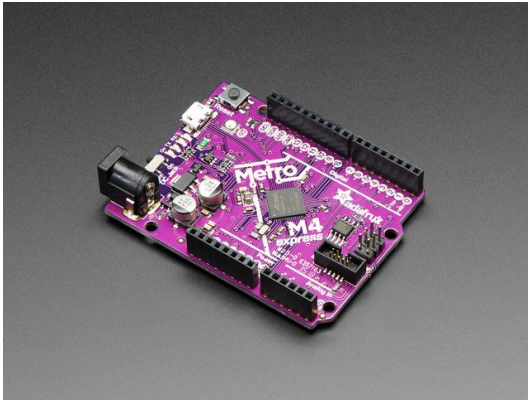
If you are interested in ePaper displays for other projects, check out the entire line of [Adafruit's ePaper displays](https://adafru.it/ExU).



Adafruit 2.7" Tri-Color eInk / ePaper Shield with SRAM

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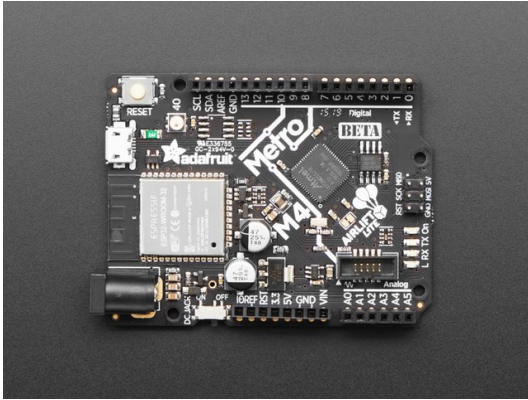
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Adafruit Metro M4 feat. Microchip ATSAM51

\$27.50
IN STOCK

Add To Cart



Adafruit Metro M4 Express AirLift (WiFi) - Lite

\$34.95
IN STOCK

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USB cable - USB A to Micro-B

\$2.95
IN STOCK

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9V battery holder with switch & 5.5mm/2.1mm plug

OUT OF STOCK

Out Of Stock



Alkaline 9V Battery

\$1.50
IN STOCK

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The Maze Algorithm

For those interested in how the program creates a random maze, this section is for you!

There are two algorithms used here, a maze generator and a maze solver. The maze consists of a grid of boxes. Each box is numbered sequentially and initially contains 4 walls surrounding each grid. Using a random number generator, a box is selected from the grid and one of the 4 walls is removed making an opening with an adjacent box. The adjacent box receives the same sequence number as the selected box as well as all the other boxes sharing the same sequence number. This ensures that a maze loop is not created, which will cause a problem with the maze solver algorithm. Also, walls are not removed if the adjacent box has the same sequence number or is on the border. Breaking walls on random boxes continues until all boxes have the same sequence number. This ensures all boxes are connected to each other.

Since the boxes are all connected, any location along the perimeter can act as a start and end location. The algorithm puts the start and end location on opposite sides, but it does not matter which end you start from.

For the maze solver, it traverses through the maze from the start of the maze, making right turns at every intersection, until it reaches the end. This may cause some backtracking when a dead end is encountered, but it eventually finds the end of the maze. After removing the backtracking moves, the solution path is then overlaid on top of the maze.

Arduino Setup

If you don't have it already, you will need the Arduino IDE installed on your computer to upload this sketch to the Metro M4. You will find information on installing Arduino in this learning guide (<https://adafru.it/CfF>). You will also need to configure the Metro M4 to work with the Arduino IDE. There are articles for setting up the [Metro M4 Express](https://adafru.it/Fkt) and [M4 Express Airlift](https://adafru.it/EZh) with Arduino and other environments in the [Adafruit Learning Guides site](https://adafru.it/dlu).

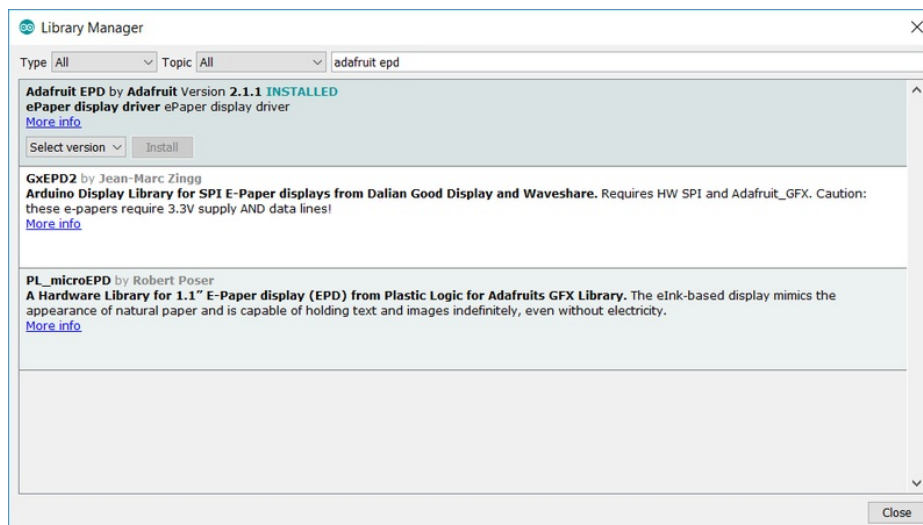
Installing The Libraries

For this sketch, you will need to install these libraries:

- Adafruit EPD (ePaper display) library
- Adafruit GFX library
- Adafruit BusIO library
- Adafruit NeoPixel library

All of these libraries can be installed directly from the IDE. Select the menu item, **Sketch -> Include Library -> Manage Libraries**. From the Library Manager Window, enter the words **adafruit epd** in the search box and you should see the Adafruit EPD library appear. Click the box where the library appears and then click the "Install" button to install the library. Be sure to install the latest version of the library.

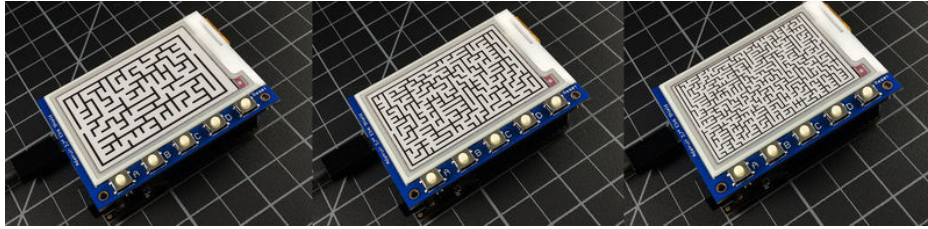
In the same manner, install the **Adafruit GFX** and **NeoPixel** libraries by searching the words **adafruit gfx** and **neopixel**, respectively, to install the latest versions of these libraries.



Once you have the Arduino IDE setup, you are ready to install the ePaper Maze Maker. It is available from GitHub by clicking the links at the top of the code below.

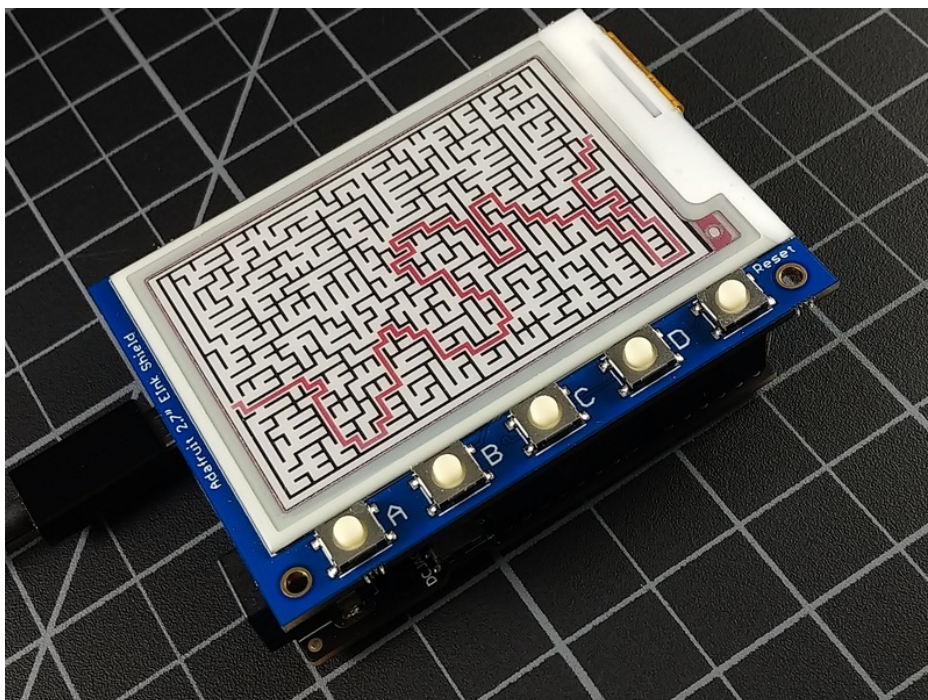
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Use



The ePaper shield contains 4 programmable buttons and a reset button at the bottom of the display. For this sketch, buttons **A**, **B** and **C** select the difficulty level, with **A** being the easiest level, **B** the medium level and **C** the difficult level.

Button **D** toggles the solution on and off in case you get stuck solving it. The solution is overlaid on top of the maze in red ink, thanks to the tri-color feature of the ePaper shield.



The built-in color LED NeoPixel on the Metro M4 Express displays green when the display is being updated for either the maze or the solution. Note that the buttons are disabled while the display is being updated, which could take a few seconds as is true for all ePaper displays.

The maze difficulty is based on the number of squares in the grid. When more squares are used in the grid, the maze becomes more complex and harder to solve. More squares are added to the maze by making them smaller in order to fit them on the fixed size of the ePaper display. Here is the breakdown of the 3 maze sizes:

- Easy Maze: 12 x 18 (14 pixels per box)
- Medium Maze: 17 x 26 (10 pixels per box)
- Hard Maze: 25 x 37 (7 pixels per box)

For example, at 14 pixels per box, this gives enough room on the ePaper shield for a maze size of 12 x 18, allowing for 4 pixels for the maze wall width.

Have fun solving mazes!

