

Assemble, Program, and Play Mini Game System

Presentation URL: <http://goo.gl/jFK3vv>



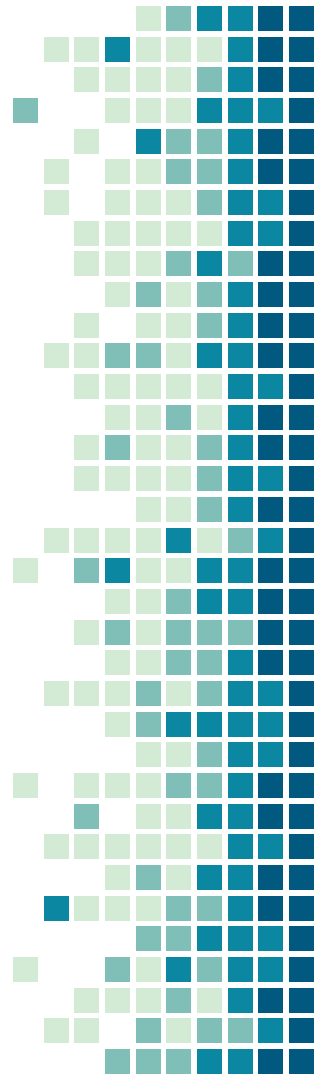


HELLO!

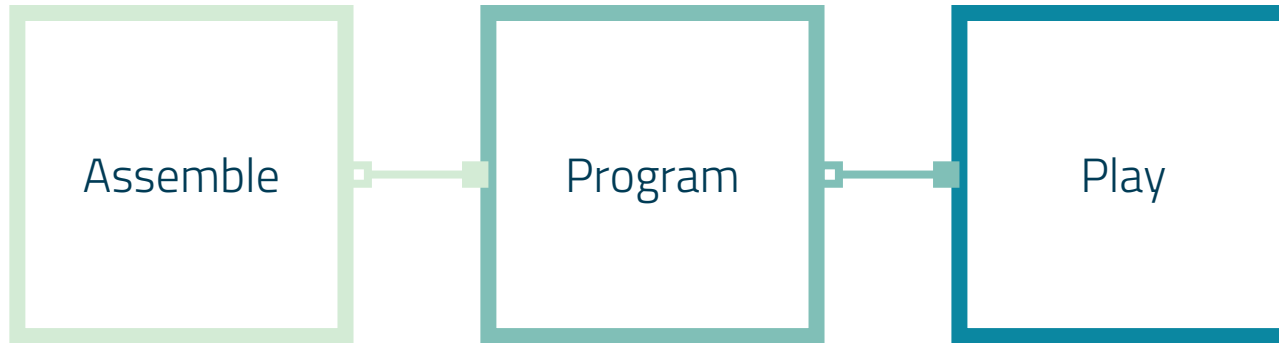
I am Jesse Campbell...

You can find me at

<http://www.jbcse.com>



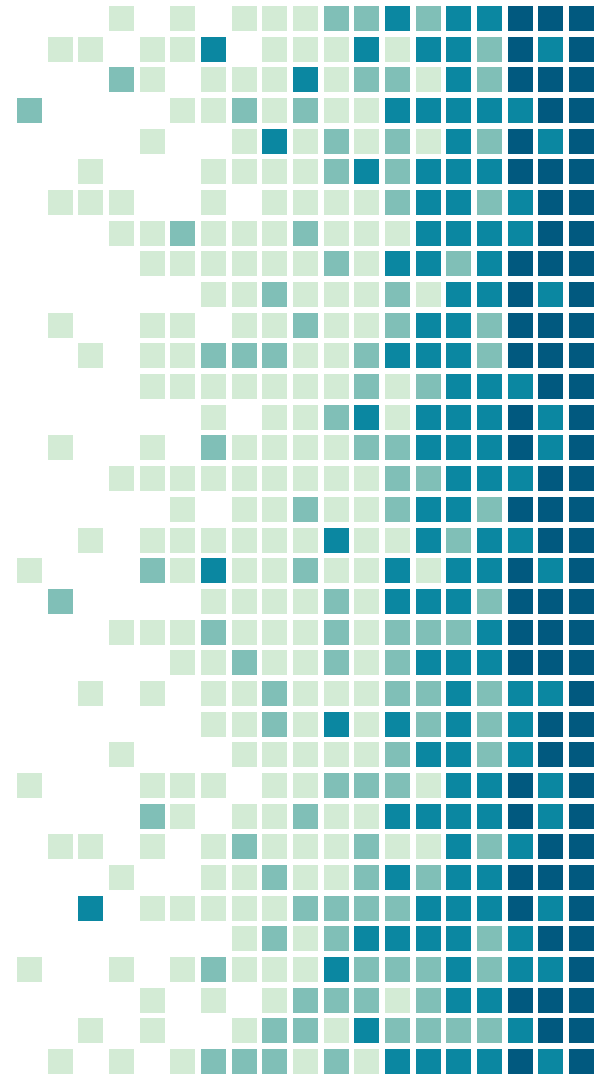
STEPS



1.

Introduction

What is Arduino and Arduboy?





Arduino is...

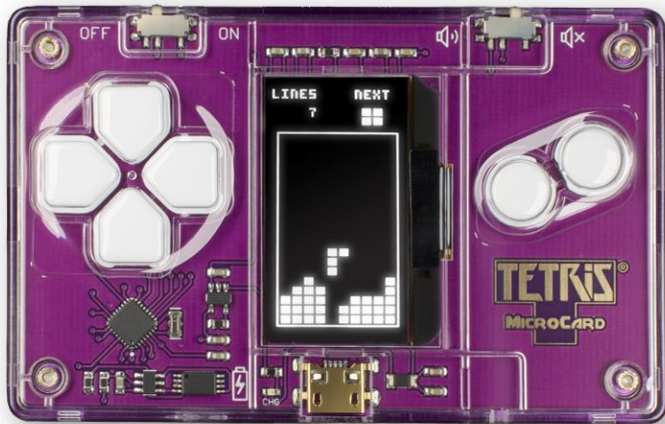
Type of small, embedded computer.

Fast enough to play basic games.



Aruboy

- Arduino-based game platform
- Games are written in C++
- Has about 100 games
- No cartridge slot
- Sold commercially for ~\$50
- Common commodity hardware

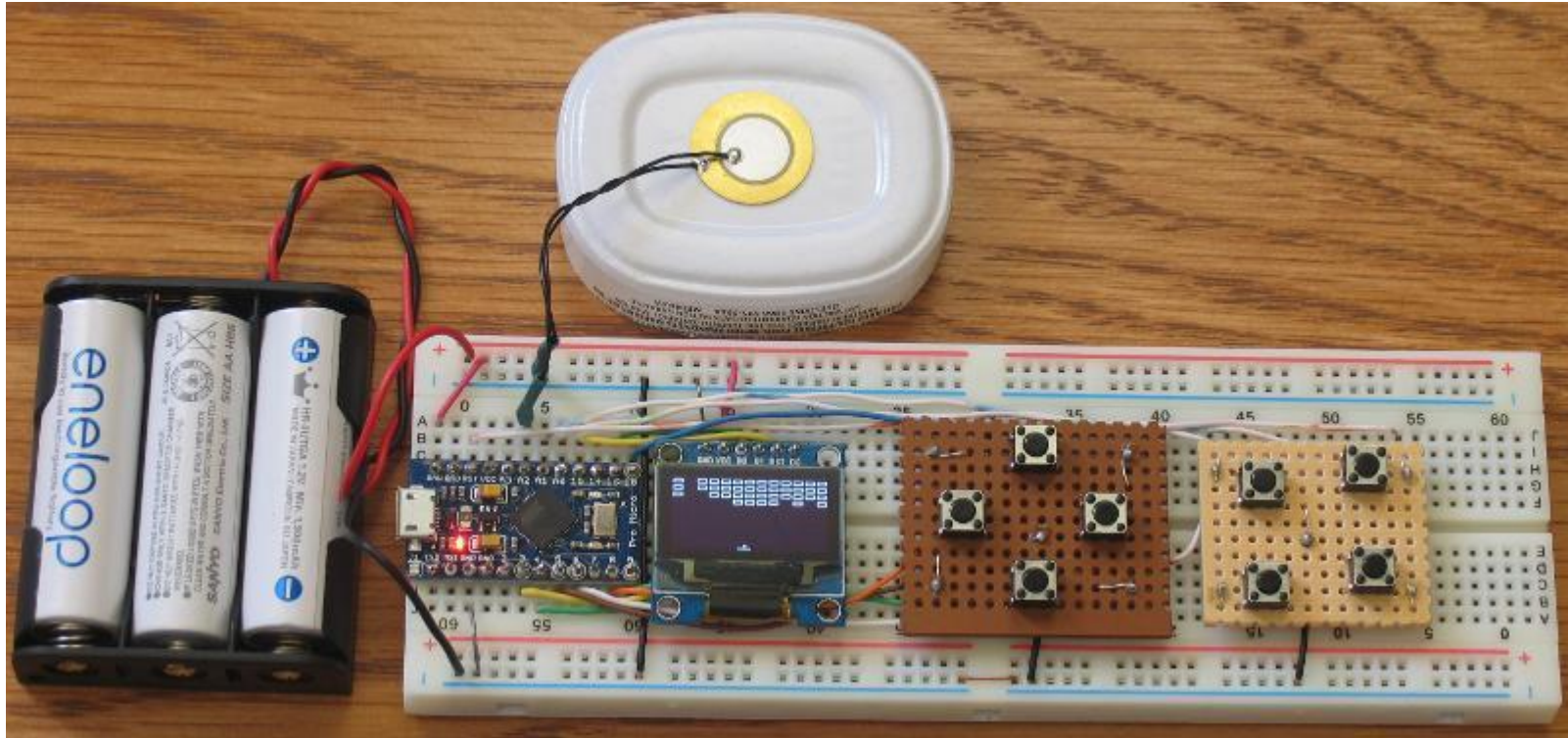


Tetris Microcard

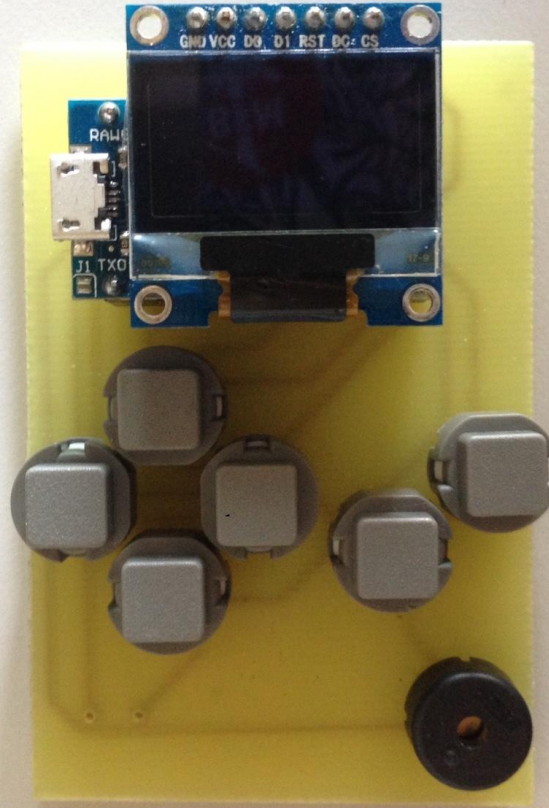
- Variation of Arduboy
- Only plays Tetris
- Closed source
- Licensed by Tetris LTD

Arduboy Compatible Clones

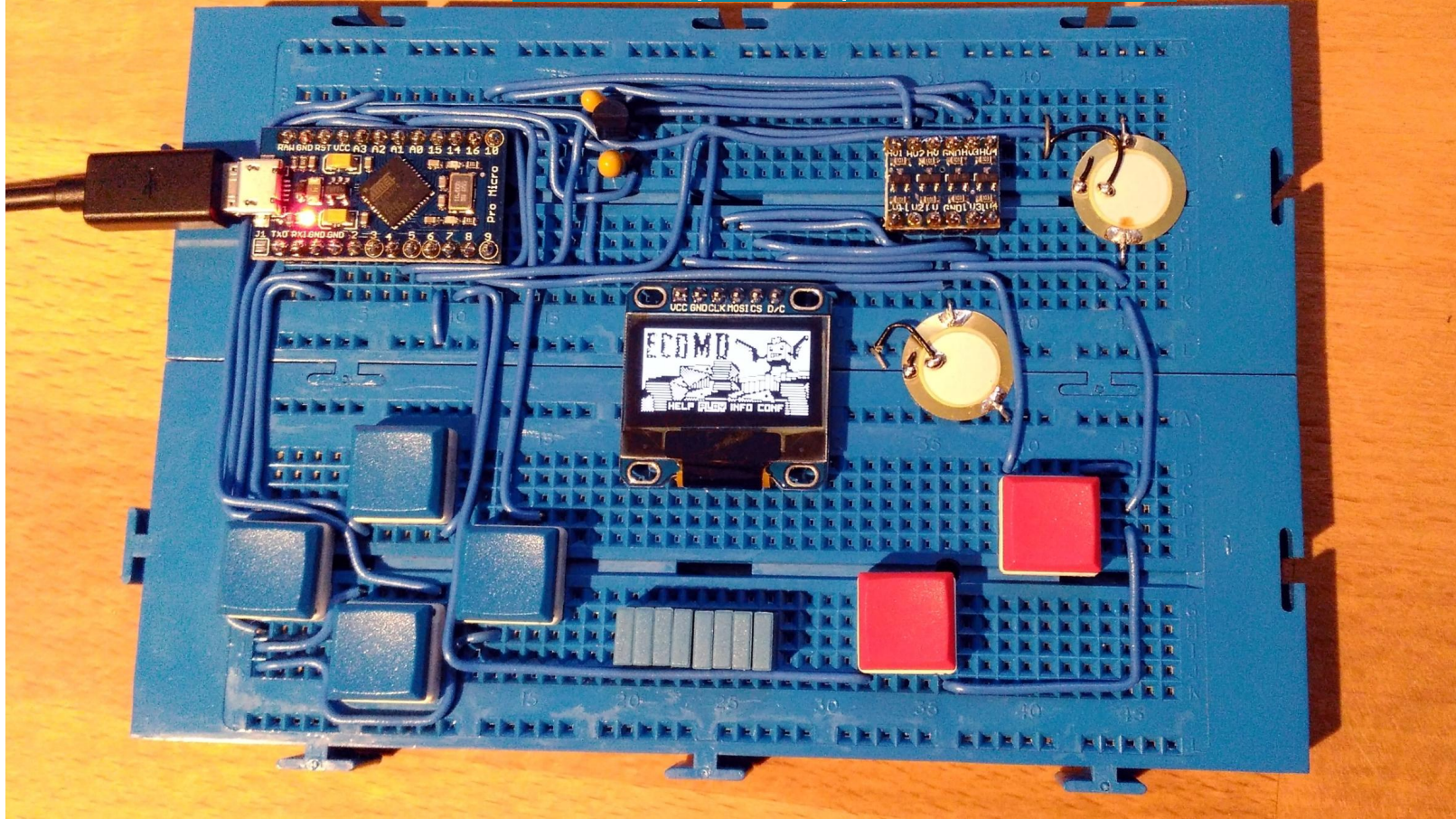
Arduboy Compatible Clones



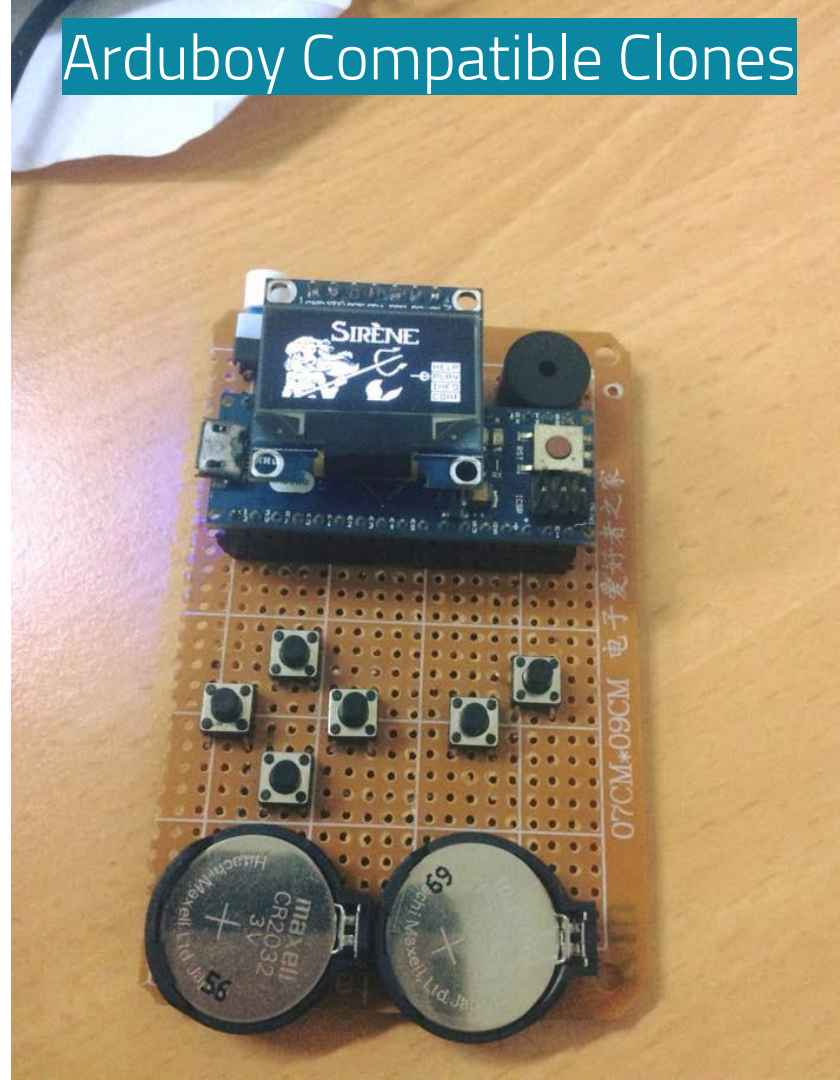
Arduboy Compatible Clones



Arduboy Compatible Clones



Arduboy Compatible Clones



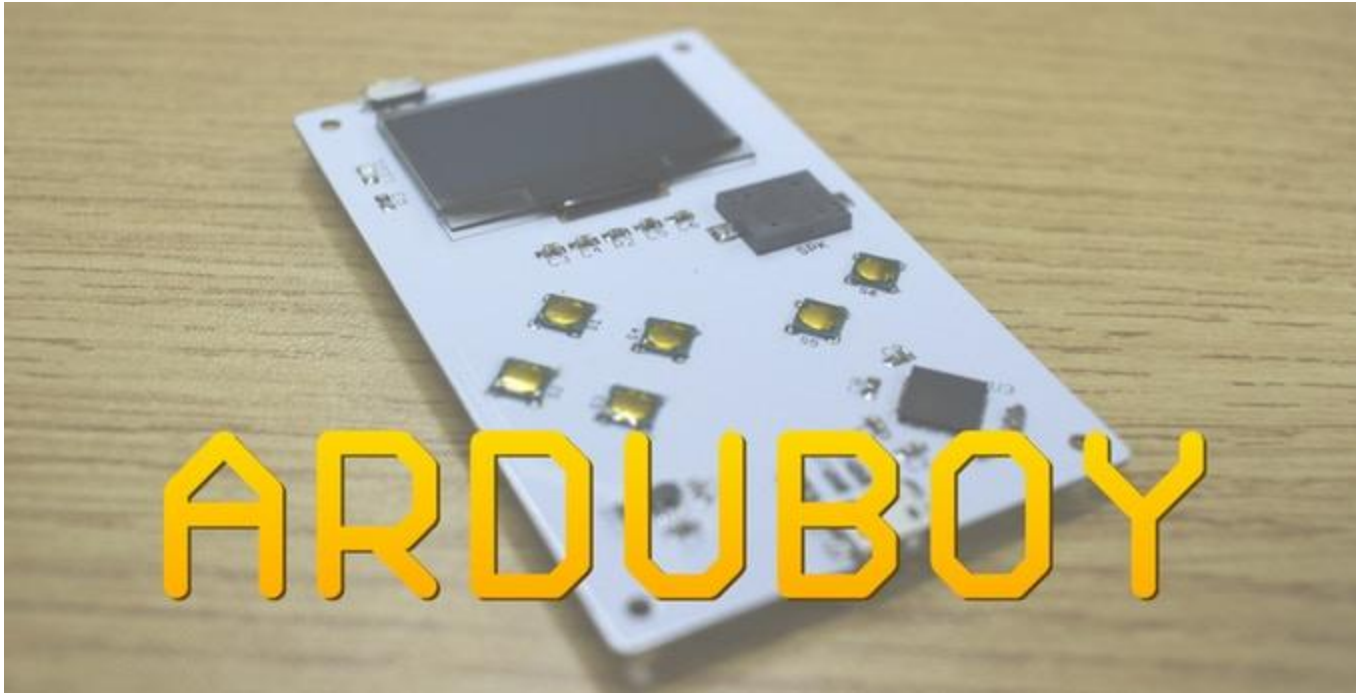
Arduboy Compatible Clones



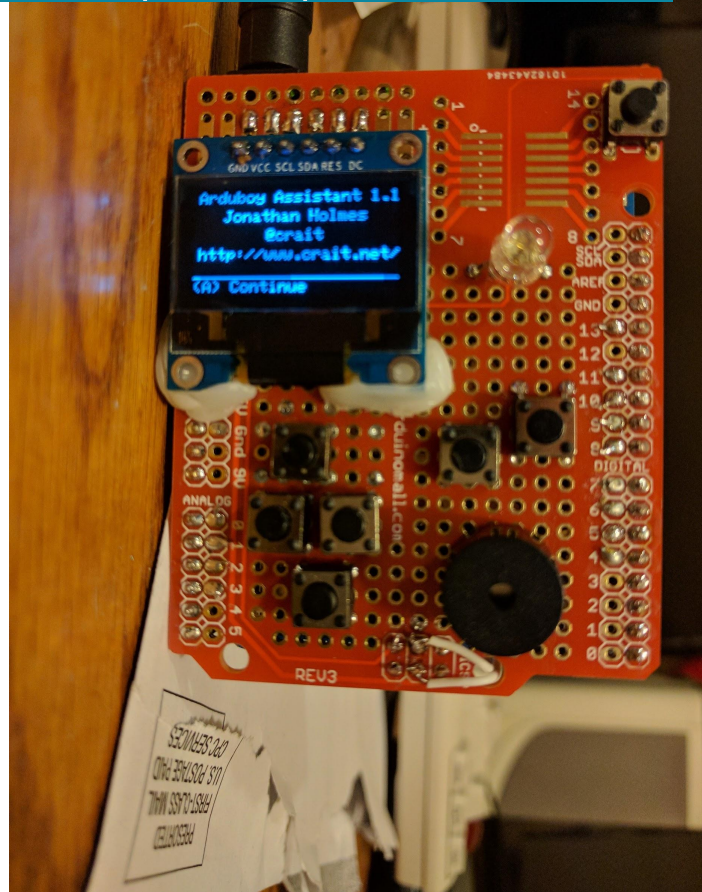
Arduboy Compatible Clones



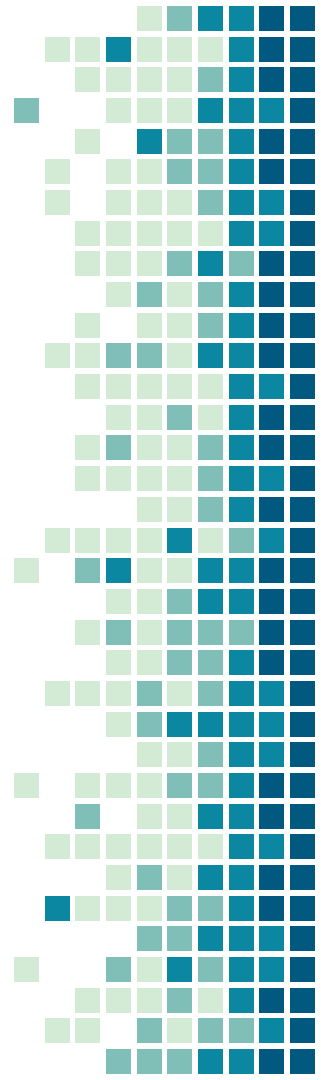
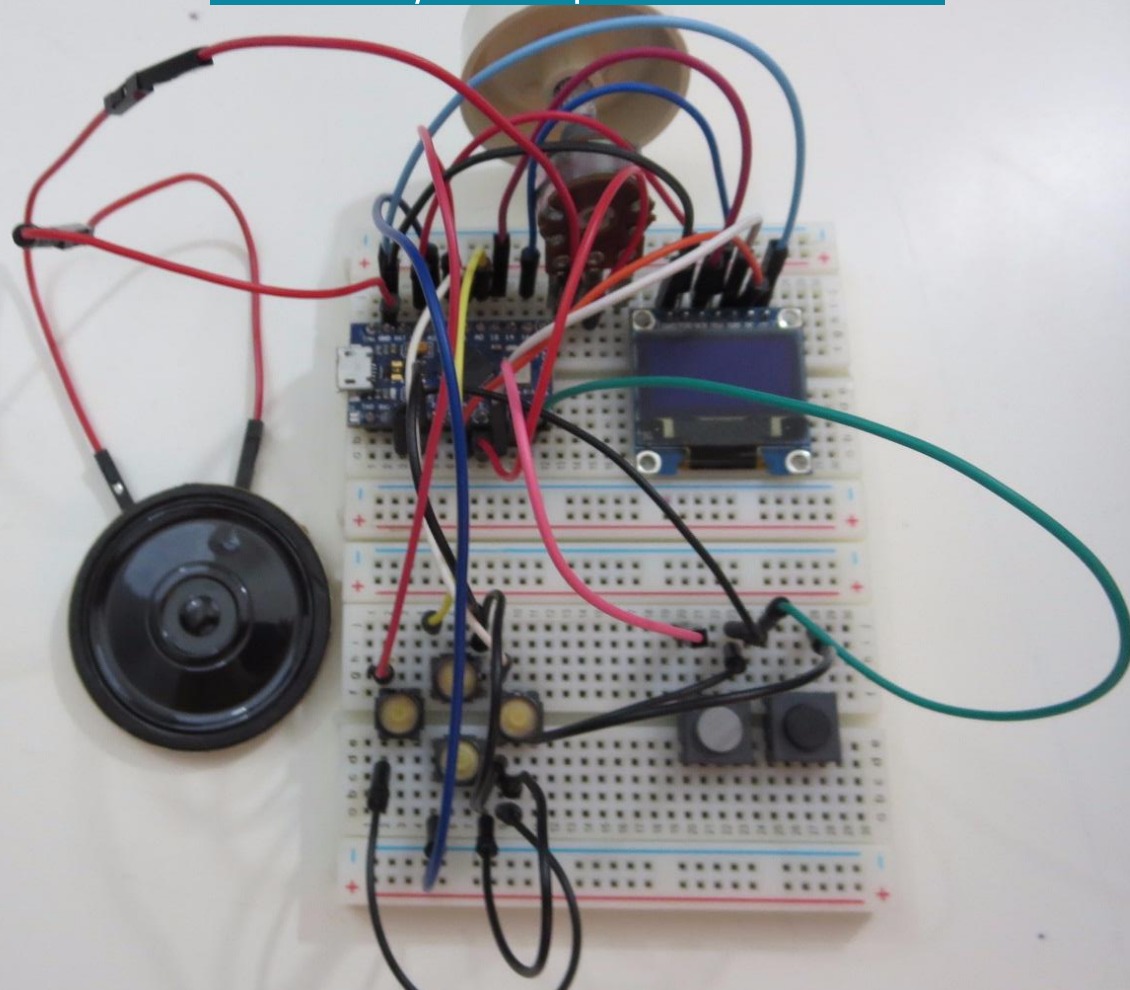
Arduboy Compatible Clones



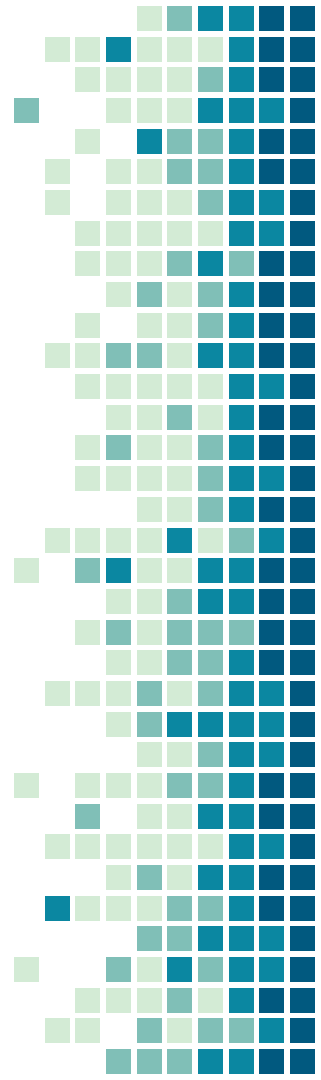
Arduboy Compatible Clones



Arduboy Compatible Clones



Arduboy Compatible Clones



PCB Design

- Wiring Table

Display Pin	Pro Micro Pin
Data	16
Clk	15
DC	4
Rst	6
CS	GND
3v3	(not connected)
Vin	VCC
Gnd	GND

Buttons - Tie one pin of each button to GND and the other pin to:

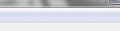
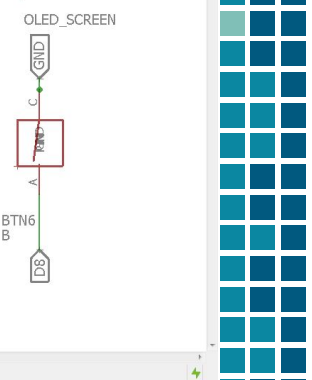
Button	Pro Micro Pin
A	7
B	8
UP	A0
RIGHT	A1
LEFT	A2
DOWN	A3

Plezo Speaker:

Speaker Wire	Pro Micro Pin
1	5
2	GND

RGB LED - Tie the anode to VCC. The cathode of each LED should go to an appropriate dropping resistor and the other side of the resistor should go to:

Resistor for Color:	Pro Micro Pin
Blue	9
Red	10
Green	3 (with custom library)

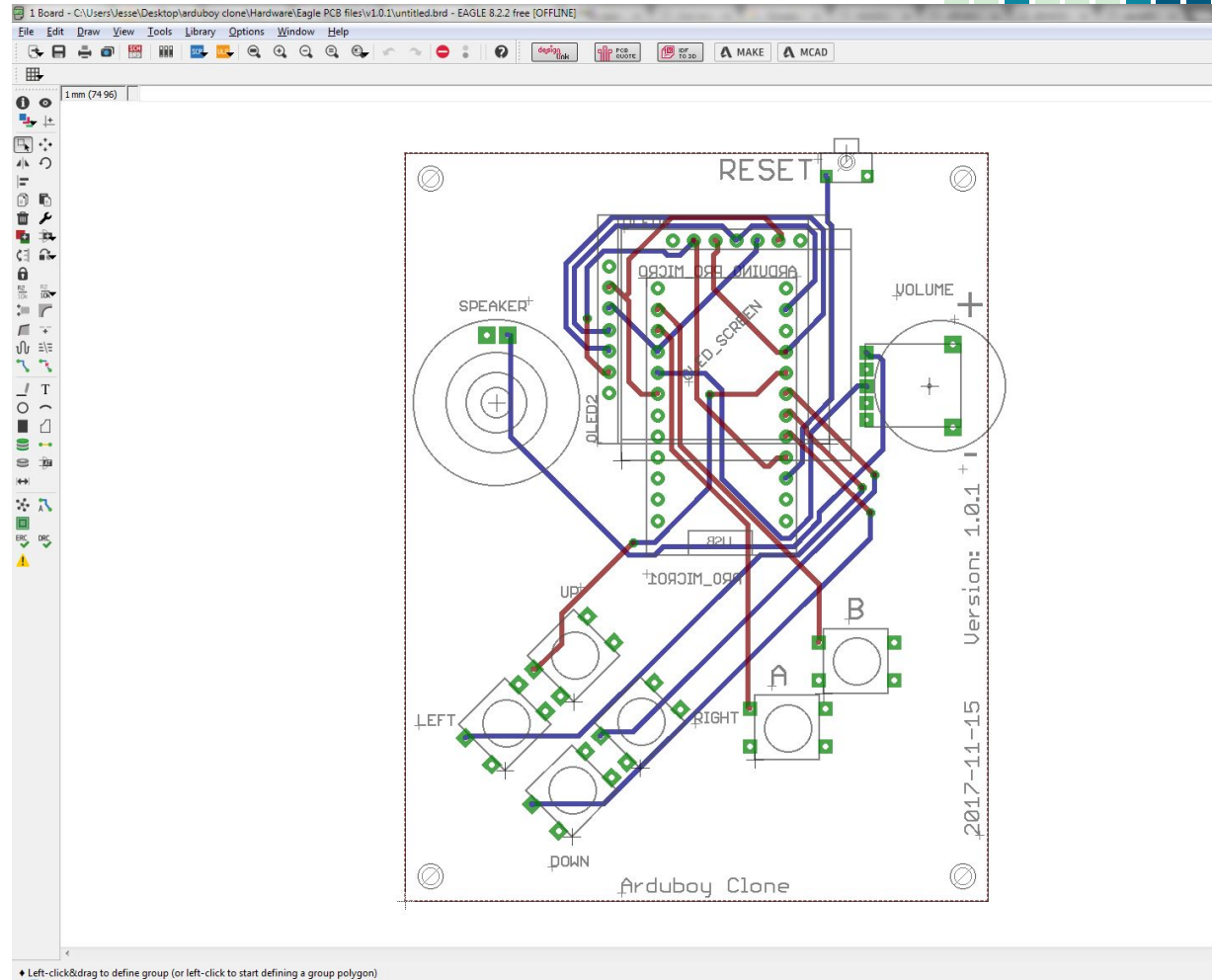
[illegible]

PCB Design

Created in Autodesk Eagle

Eagle is free for small
2-sided boards.

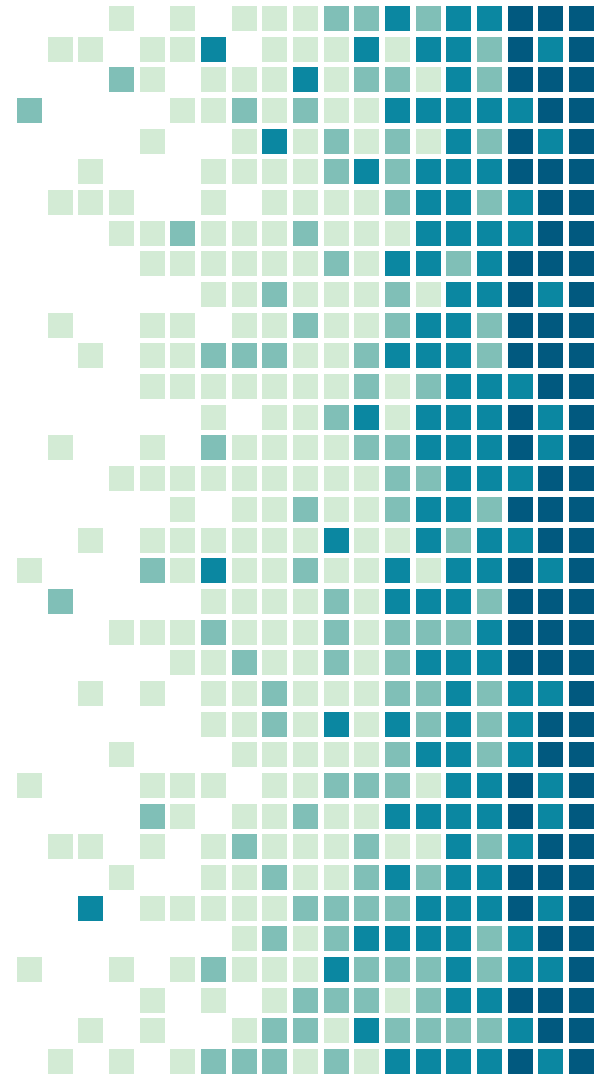
Boards ordered from
[Seed Fusion](#)



2.

Assembly

Assemble according to instructions



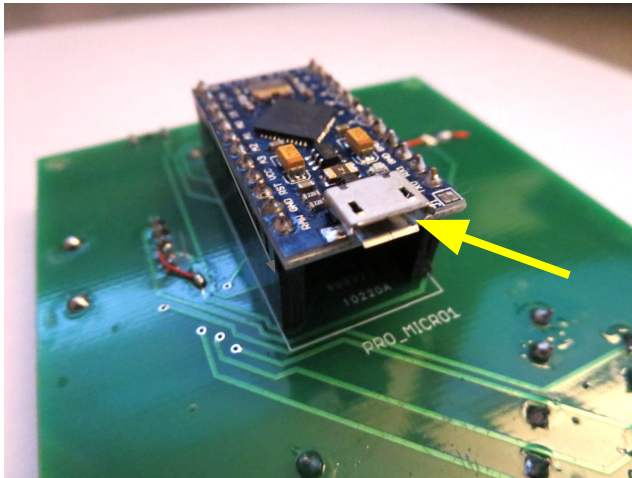
Assembly Materials

- [Arduino Micro clone](#) (without reset button)
- [OLED display 0.96"](#) SSD1306 128x64 resolution
 - [Blue](#) or [White](#) available
- [Buttons](#), [speaker](#), [knob](#), [headers](#), [reset btn](#), etc.
- Printed Circuit Board (PCB) - Gerber files avail.

These items are available on eBay and Aliexpress.
Part cost to produce 10 is about **\$10/each**.

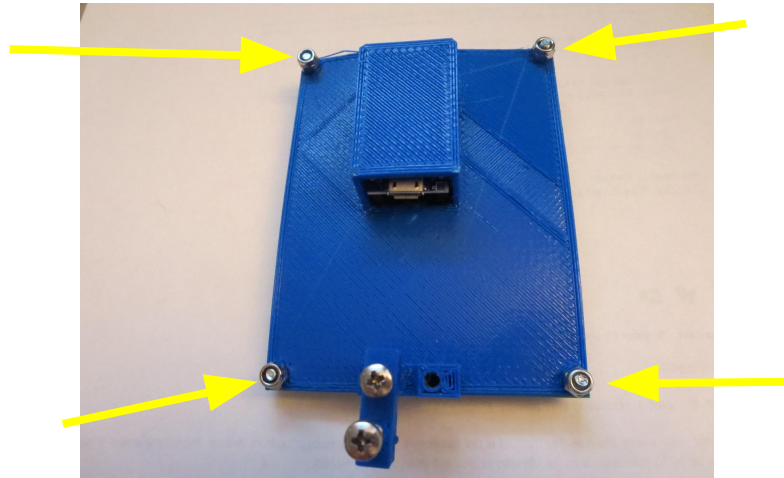
Assembly

1. Attach Arduino Pro Micro to back of printed circuit board (PCB) with USB facing PRO_MICRO1



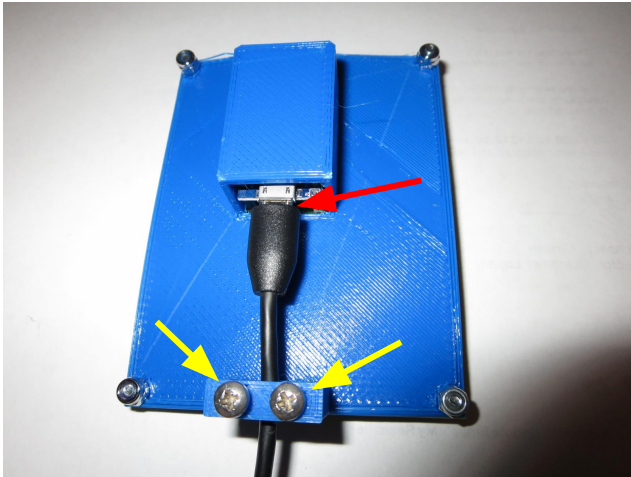
Assembly

2. Attach plate to back using screws and lock nuts. Make sure the screw reaches the plastic inside nut.



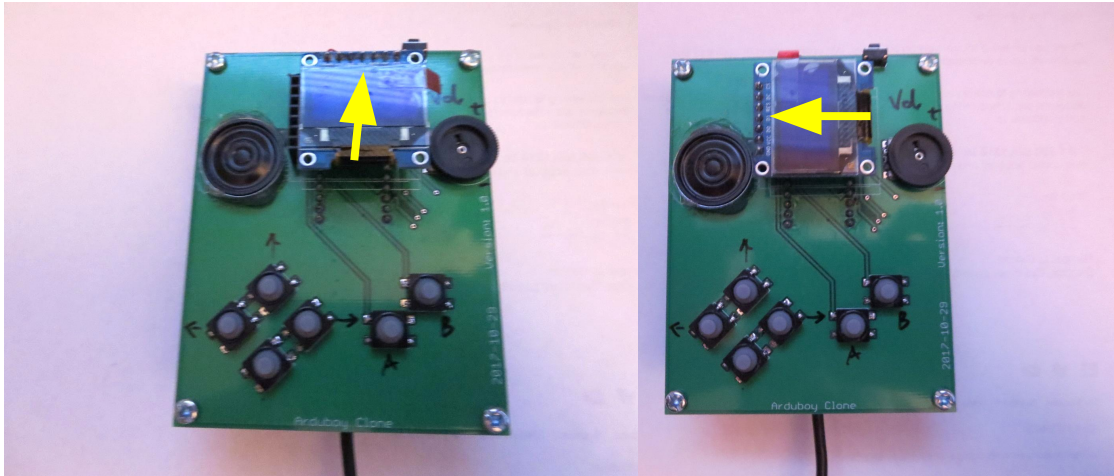
Assembly

3. Plug in USB cable. Close strain relief onto cable.
Be careful with the fragile micro USB port.



Assembly

4. Plug in the screen horizontally. It can be mounted vertically. Plug in only these two ways



Programming

Programming

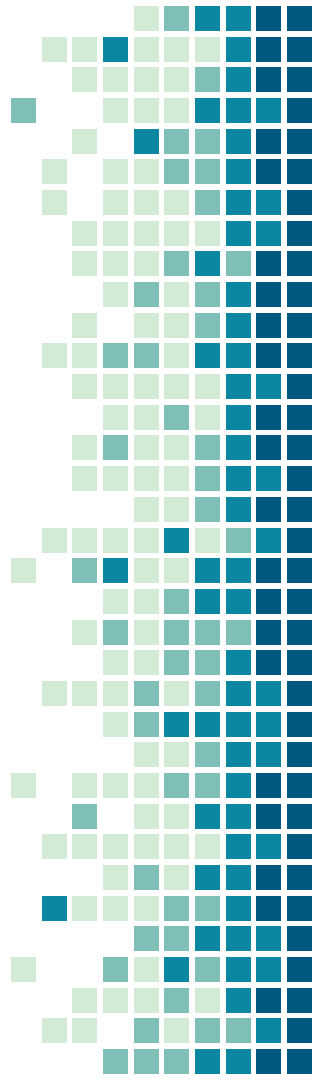
1. Install [Arduino Integrated Development Environment](#) (IDE)
 - a. Enable Verbose messages
2. Install Arduboy libraries, [1](#) and [2](#)
3. Run example sketch, "Hello World"
 - a. Compile
 - b. Upload (Press Reset when you see PORTS...)
4. Change "Hello World" to your name then upload



Programming

Install Arduino Integrated Development Environment (IDE)

<https://www.arduino.cc/en/Main/Software>

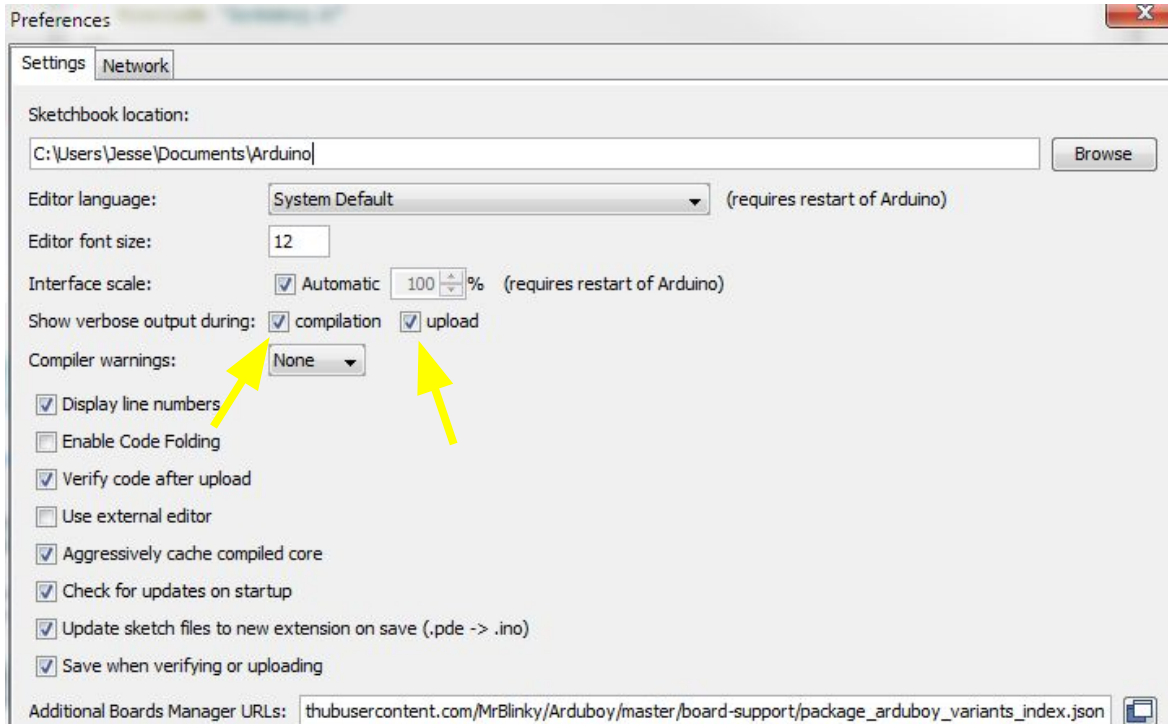


Programming

Enable Verbose messages

- File -> Preferences -> "Show verbose output during: "
 - Check "compilation" and "upload"

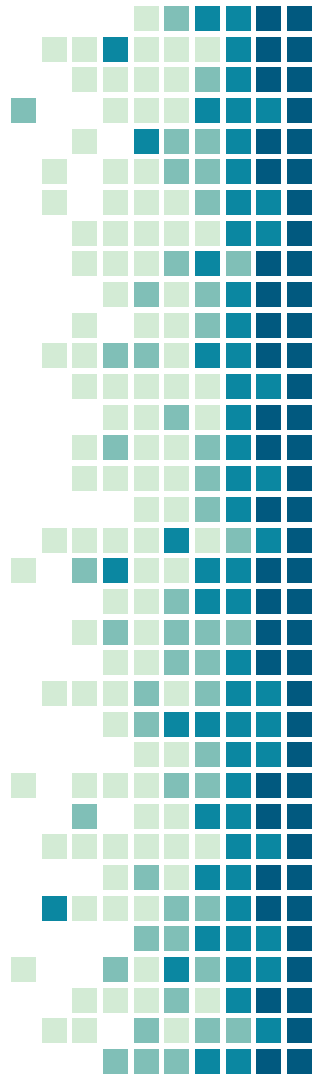
Programming



Programming

Install Arduboy libraries,

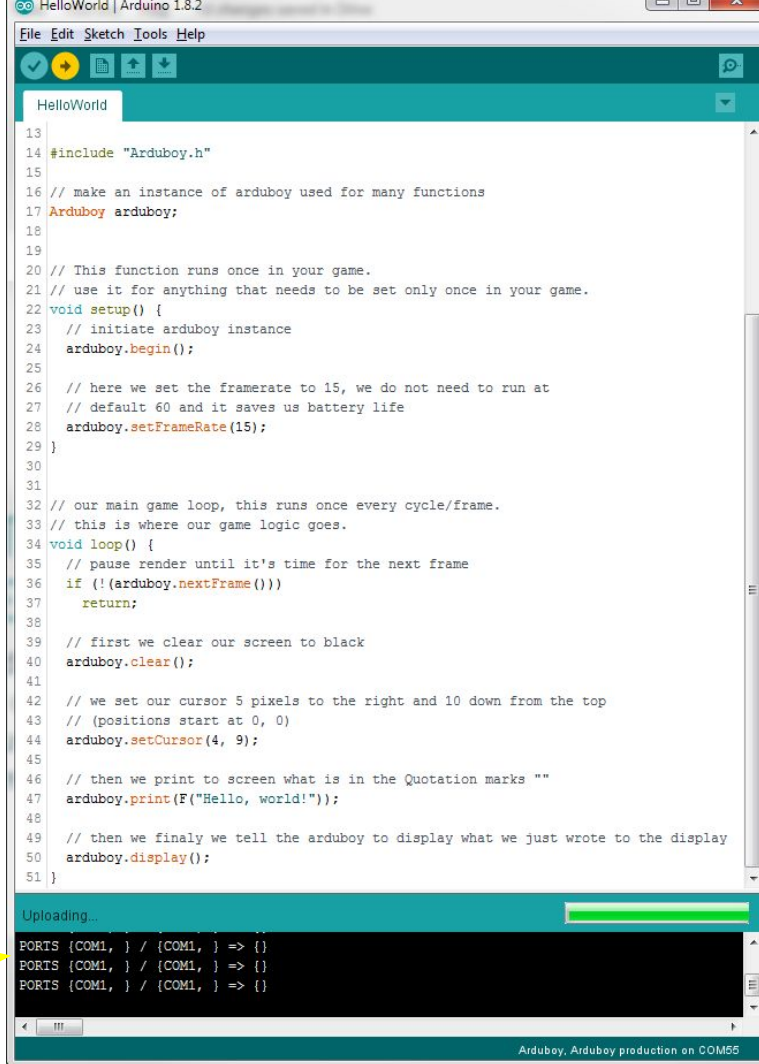
1. <https://github.com/Arduboy/Arduboy#installing-the-arduboy-library>
2. <https://github.com/MrBlinky/Arduboy/tree/master/board-support>



Try out this example

- File -> Examples -> Arduboy2 -> HelloWorld

Press Reset or
Change COM Port



```
File Edit Sketch Tools Help
HelloWorld
13
14 #include "Arduboy.h"
15
16 // make an instance of arduboy used for many functions
17 Arduboy arduboy;
18
19
20 // This function runs once in your game.
21 // use it for anything that needs to be set only once in your game.
22 void setup() {
23   // initiate arduboy instance
24   arduboy.begin();
25
26   // here we set the framerate to 15, we do not need to run at
27   // default 60 and it saves us battery life
28   arduboy.setFrameRate(15);
29 }
30
31
32 // our main game loop, this runs once every cycle/frame.
33 // this is where our game logic goes.
34 void loop() {
35   // pause render until it's time for the next frame
36   if (!arduboy.nextFrame())
37     return;
38
39   // first we clear our screen to black
40   arduboy.clear();
41
42   // we set our cursor 5 pixels to the right and 10 down from the top
43   // (positions start at 0, 0)
44   arduboy.setCursor(4, 9);
45
46   // then we print to screen what is in the Quotation marks ""
47   arduboy.print(F("Hello, world!"));
48
49   // then we finally we tell the arduboy to display what we just wrote to the display
50   arduboy.display();
51 }
```

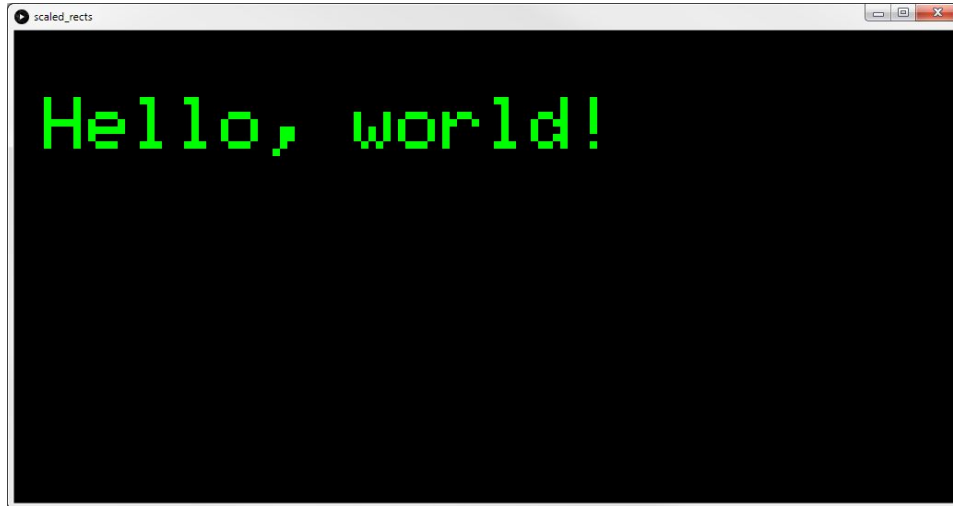
Uploading...

PORTS {COM1, } / {COM1, } => {}
PORTS {COM1, } / {COM1, } => {}
PORTS {COM1, } / {COM1, } => {}

Arduboy, Arduboy production on COM65

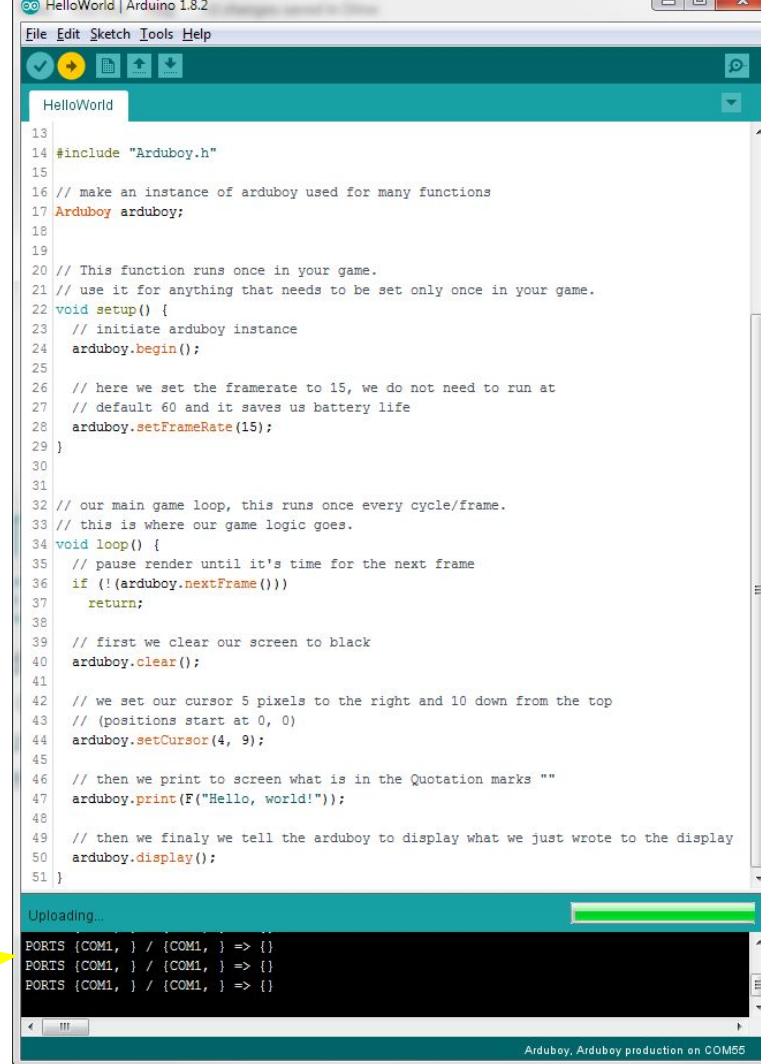
Example Programs

- Hello, world!



Edit this example

- Change Line 47 to say "Hello, [your name]!"



```
File Edit Sketch Tools Help
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```

Uploading...

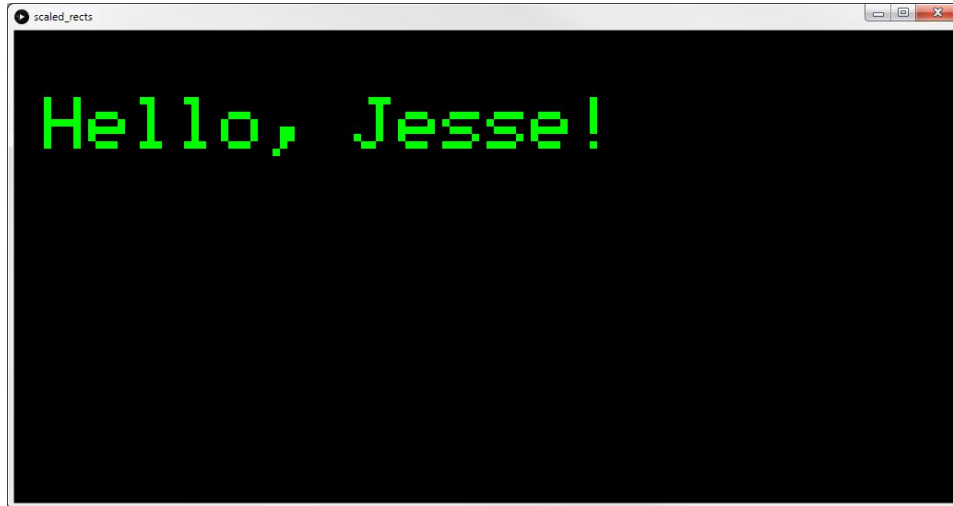
PORTS {COM1, } / {COM1, } => {}
PORTS {COM1, } / {COM1, } => {}
PORTS {COM1, } / {COM1, } => {}

Arduboy, Arduboy production on COM65

Press Reset or
Change COM Port

Example Programs

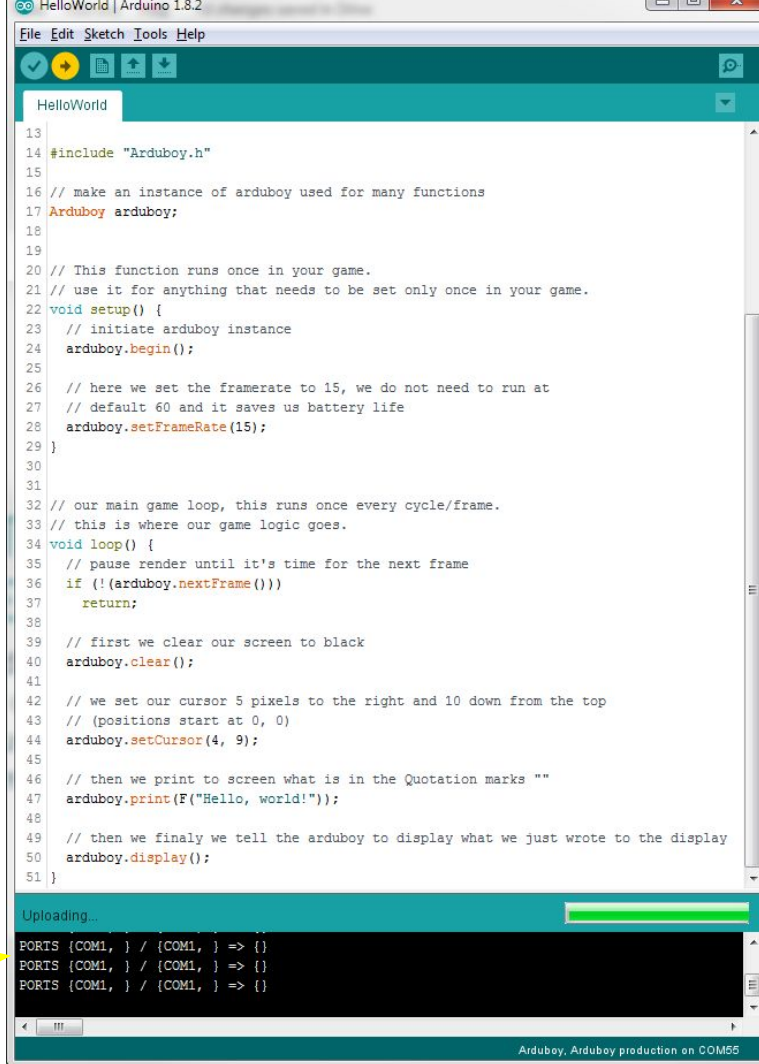
- Hello, [your name]!



Try out this example

- File -> Examples -> Arduboy2 -> PlayTune
- Turn up volume using volume wheel

Press Reset or
Change COM Port



```
File Edit Sketch Tools Help
HelloWorld
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```

Uploading...

PORTS {COM1, } / {COM1, } => {}
PORTS {COM1, } / {COM1, } => {}
PORTS {COM1, } / {COM1, } => {}

Arduboy, Arduboy production on COM65

Example Programs

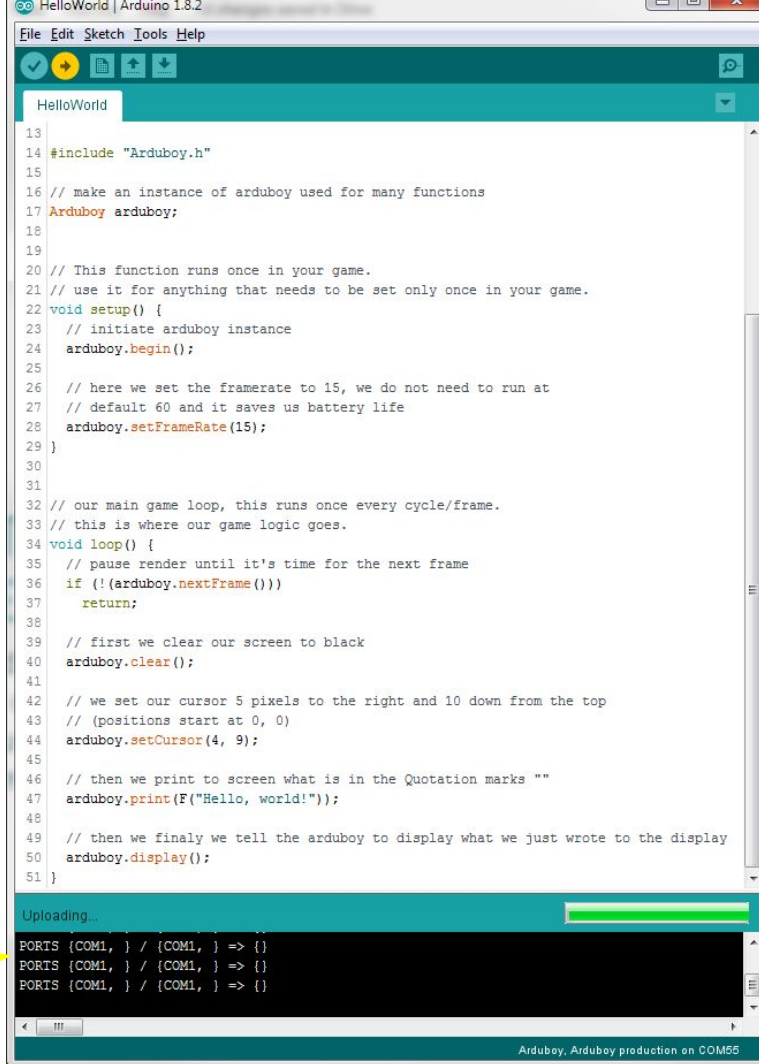
- Music Demo. Mute (A), Unmute (B)



Try out this example

- File -> Examples -> Arduboy2 -> Buttons

Press Reset or
Change COM Port



```
File Edit Sketch Tools Help
HelloWorld
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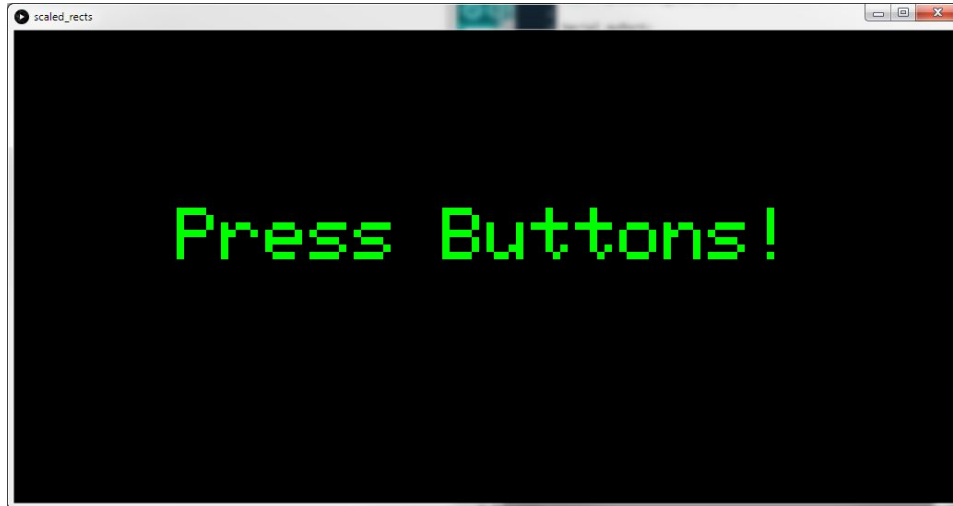
Uploading...

PORTS {COM1, } / {COM1, } => {}
PORTS {COM1, } / {COM1, } => {}
PORTS {COM1, } / {COM1, } => {}

Arduboy, Arduboy production on COM55

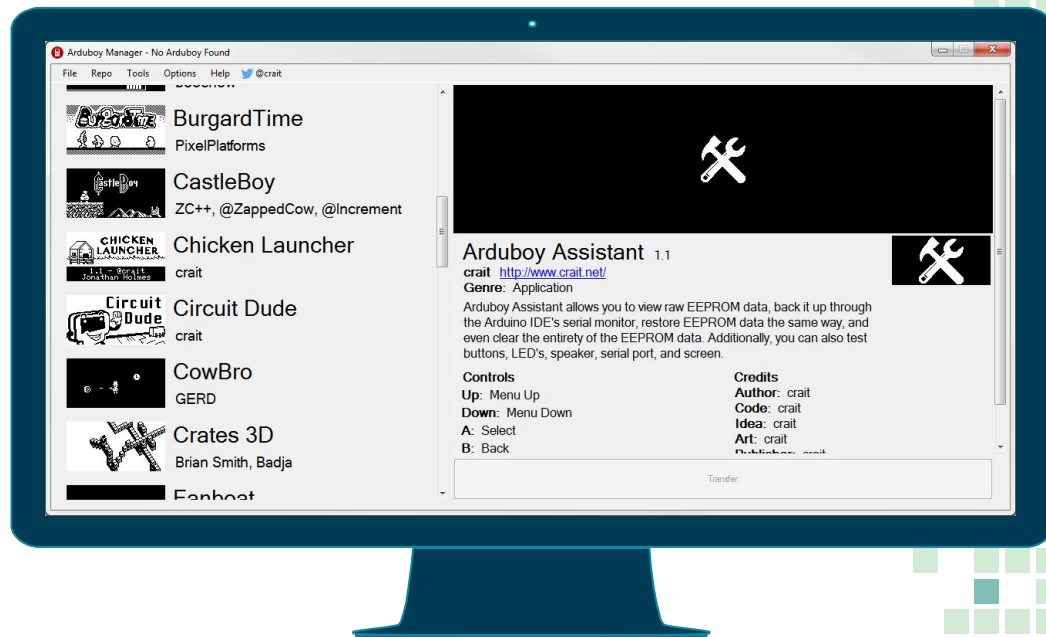
Example Programs

- Press Buttons Demo

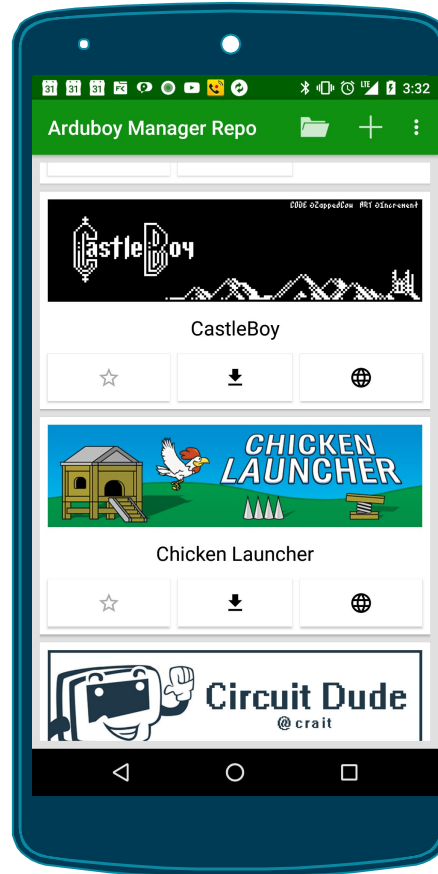


Arduboy Manager for PC

- Load games from library. Screen Mirroring. Upload .arduboy file or .hex file.
- [Download](#)



- Load games and power from Android
- Requires USB On-the-Go cable
 - Micro
 - Type C
- Free app in Google Play Store

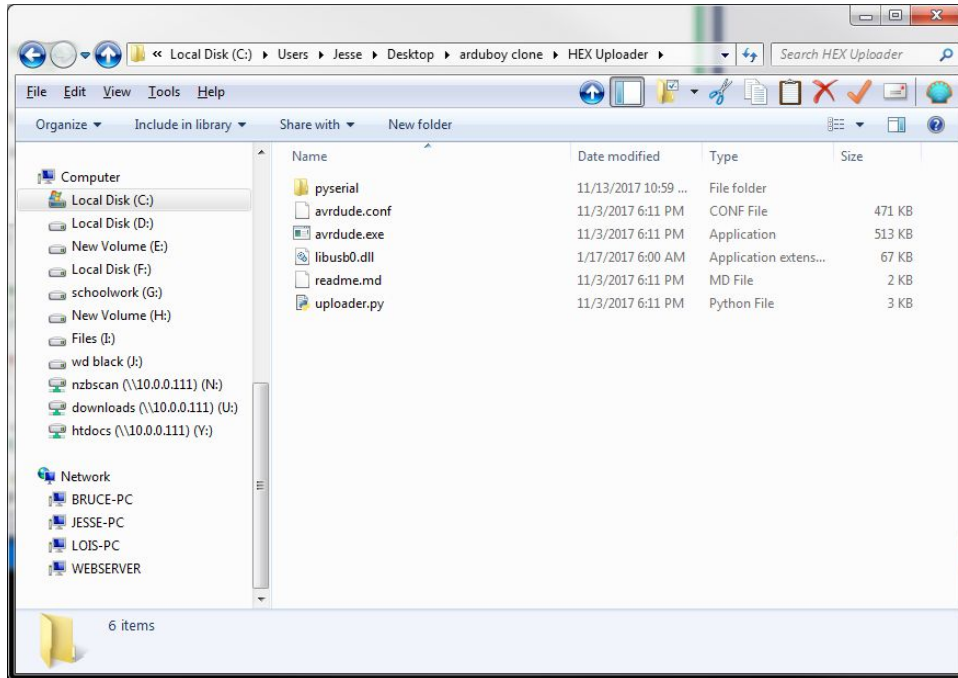


Upload HEX Files

1. HEX files are pre-compiled games that you can upload without using the Arduino IDE
2. Requires Python 2.7 and PySerial
3. Drag .HEX file to upload.py



Upload HEX Files



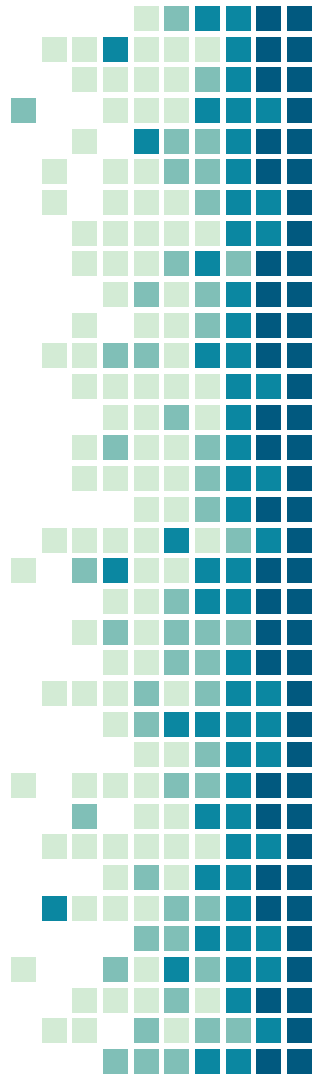
Upload HEX Files

> [Path to python2.7] [Path to upload.py] [path to
.HEX file]

> C:\Python27\python.exe

"\HEX Uploader\uploader.py"

"\Games\tiny_asteroids\test.hex"



Upload HEX Files

```
Administrator: C:\Windows\system32\cmd.exe

C:\Users\Jesse\Desktop\arduboy clone\HEX Uploader>C:\Python27\python.exe "C:\Users\Jesse\Desktop\arduboy clone\HEX Uploader\uploader.py" "C:\Users\Jesse\Desktop\arduboy clone\Games\tiny_asteroids\test.hex"
found Arduino Leonardo <COM55> at port COM55
Selecting bootloader mode...
found Arduino Leonardo bootloader <COM56> at port COM56

avrdude.exe: Version 6.3, compiled on Jan 17 2017 at 12:00:53
Copyright (c) 2000-2005 Brian Dean, http://www.bdmicro.com/
Copyright (c) 2007-2014 Joerg Wunsch

System wide configuration file is "C:\Users\Jesse\Desktop\arduboy clone\HEX Uploader\avrdude.conf"

Using Port                : COM56
Using Programmer           : avr109
Overriding Baud Rate      : 57600
AUR Part                   : ATmega32U4
Chip Erase delay          : 90000 us
PAGEL                      : PD7
BS2                        : PA0
RESET disposition         : dedicated
RETRY pulse               : SCK
serial program mode       : yes
parallel program mode     : yes
Timeout                   : 200
StabDelay                  : 100
CmdexeDelay               : 25
SyncLoops                 : 32
```

Upload HEX Files

```
Administrator: C:\Windows\system32\cmd.exe
avrdude.exe: safemode: hfuse reads as D8
avrdude.exe: safemode: efuse reads as CB
avrdude.exe: reading input file "C:\Users\Jesse\Desktop\arduboy clone\Games\tiny_asteroids\test.hex"
avrdude.exe: writing flash (16254 bytes):

Writing : ##### : 100% 1.66s

avrdude.exe: 16254 bytes of flash written
avrdude.exe: verifying flash memory against C:\Users\Jesse\Desktop\arduboy clone\Games\tiny_asteroids\test.hex:
avrdude.exe: load data flash data from input file C:\Users\Jesse\Desktop\arduboy clone\Games\tiny_asteroids\test.hex:
avrdude.exe: input file C:\Users\Jesse\Desktop\arduboy clone\Games\tiny_asteroids\test.hex contains 16254 bytes
avrdude.exe: reading on-chip flash data:

Reading : ##### : 100% 0.65s

avrdude.exe: verifying ...
avrdude.exe: 16254 bytes of flash verified

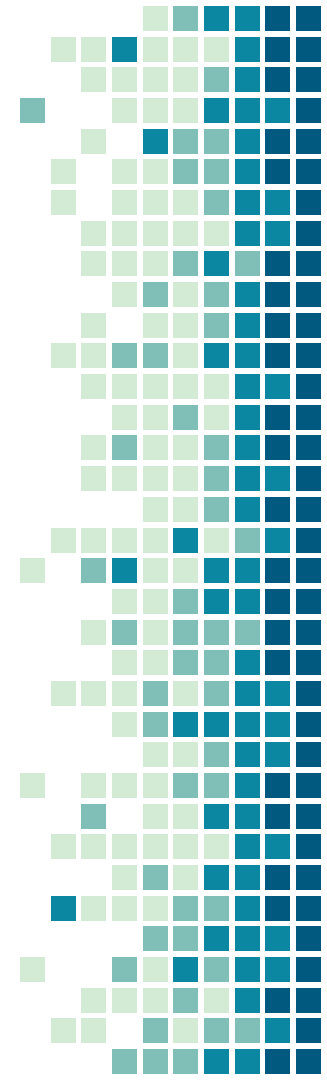
avrdude.exe: safemode: hfuse reads as D8
avrdude.exe: safemode: efuse reads as CB
avrdude.exe: safemode: Fuses OK (E:CB, H:D8, L:FF)

avrdude.exe done. Thank you.

C:\Users\Jesse\Desktop\arduboy clone\HEX Uploader>
```


Example Programs

- Matrix animation with midi music
- Bouncing balls demo
- Tetris clone with midi music



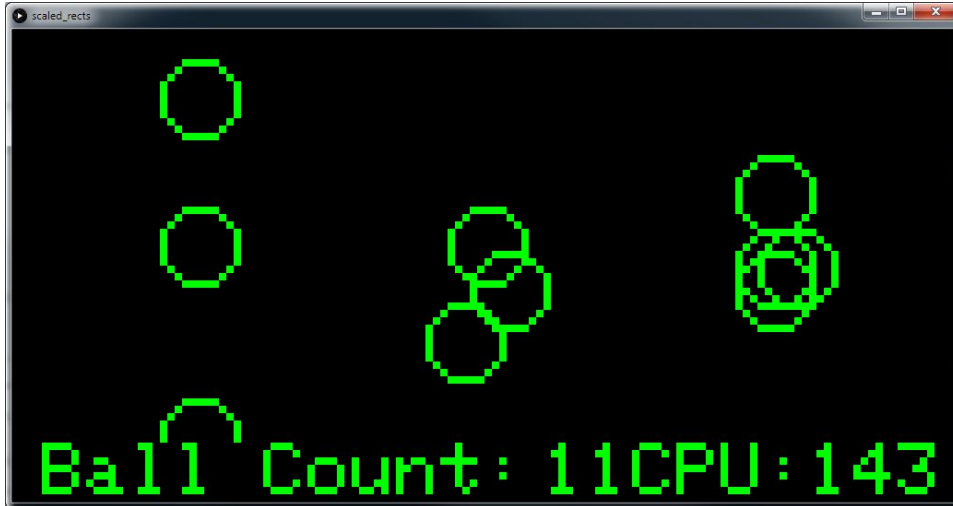
Example Programs

- Matrix animation



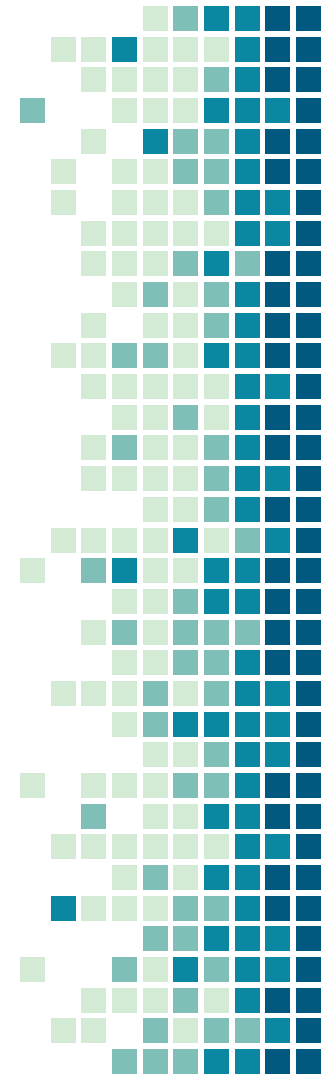
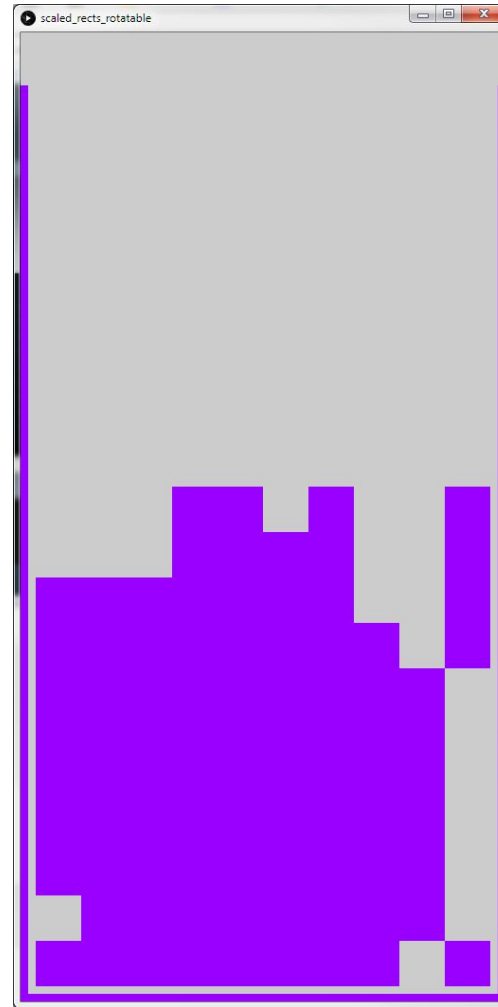
Example Programs

- Bouncing Balls Demo



Example Programs

- Tetris



Programming game cheats

- Look through program for variables related to lives and/or health. You can increase them to make the game difficult easier.
- Show example, CastleBoy



Play Games

Game Collections

1. Download ZIP file with games/utilities
 - a. <http://www.jbcse.com/downloads/arduboy/>
2. Other game download links:
 - a. <https://community.arduboy.com/c/games>
 - b. <http://arduboy.ried.cl/>
 - c. <http://blog.livedoor.jp/cobinee/search?q=arduboy>
 - d. <https://github.com/eried/ArduboyCollection>

Game List

1. Choose a game from the Games folder
 - a. Open .INO file using Arduino and upload
 - i. Press "Reset" when "PORTS ..." shows in Arduino Console
 - b. All files must be in a folder with the same name as the .INO file.
 - i. Ex: /jetpack/jetpack.ino

Emulator

- Use arrow keys, x key, and z key
- Hover on areas with pointer cursor to find hidden functions



Web-based Emulator

1. Play games from list:
 - a. <https://felipemanga.github.io/ProjectABE/>
2. Program your own from web page:
 - a. <https://felipemanga.github.io/ProjectABE/?url=new>
3. Upload HEX file from web:
 - a. <https://felipemanga.github.io/ProjectABE/?url=http://www.jbcse.com/downloads/tris.hex>

Screen Mirroring

It's possible to send the video display to a computer over Serial (via USB).

- $128 \times 64 = 8192$ bits
- Each char is 0 to 255
- 1024 8-bit bytes hold 8192 bits



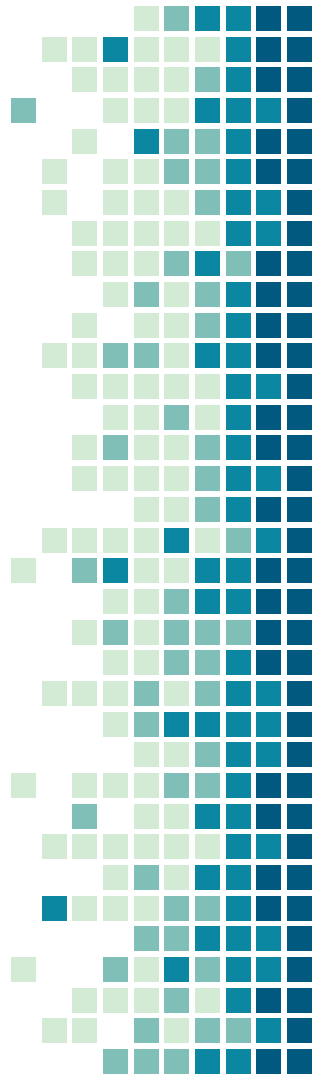
Screen Mirroring

- Add `Serial.begin(9600);` to the end of `void setup(){`
...
`Serial.begin(9600);`
};
- Add `Serial.write(arduboy.getBuffer(), 128 * 64 / 8);` before every `arduboy.display();` call



Upgrades - Screens

1. 1.3" 128x64 OLED screen (SH1106)
2. 1.54" 128x64 OLED screen (SSD1309)
3. 2.4" 128x64 OLED screen (SSD1309)

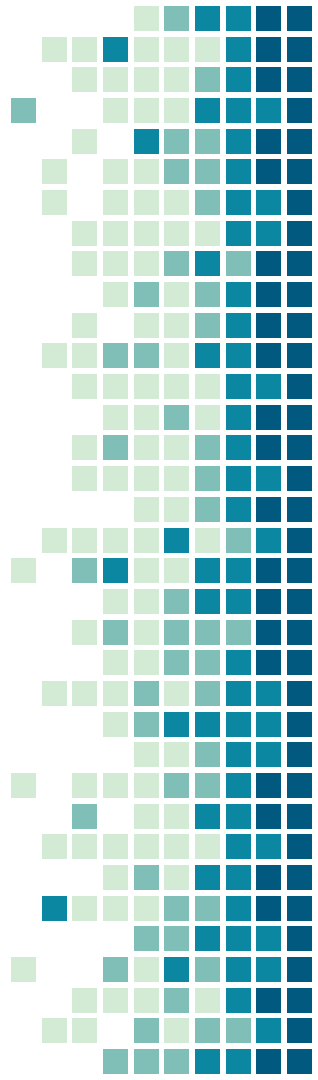


Upgrades – USB Power Banks

1. Search on eBay.com or AliExpress.com
 - a. Examples:
 - i. [Single 18650](#)
 - ii. [Double 18650](#)
 - iii. [Universal 5V 9V 12V 6 x 18650](#)

Modifications

1. [Check out the Arduboy Forums](#)



THANKS!

Any questions?

You can find me at:
@ www.jbcse.com

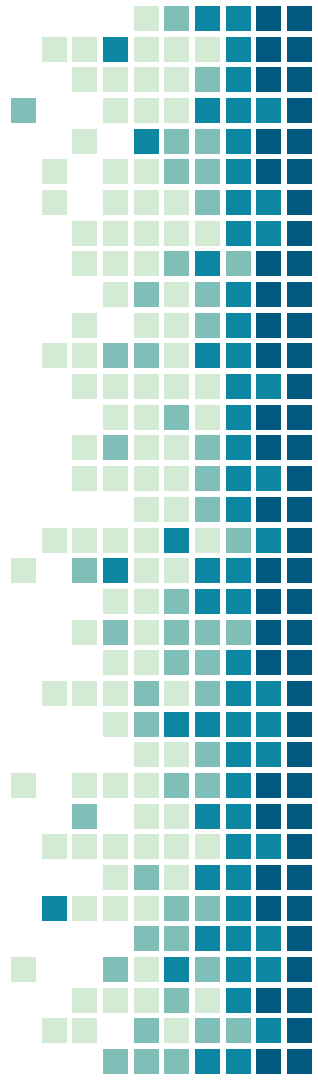


Presentation URL: <http://goo.gl/jFK3vv>

CREDITS

Special thanks to all the people who made and released these awesome resources for free:

- Presentation template by [SlidesCarnival](#)
- Photographs by [Unsplash](#)



PRESENTATION DESIGN

This presentation uses the following typographies and colors:

- Titles: **Dosis**
- Body copy: **Titillium Web**

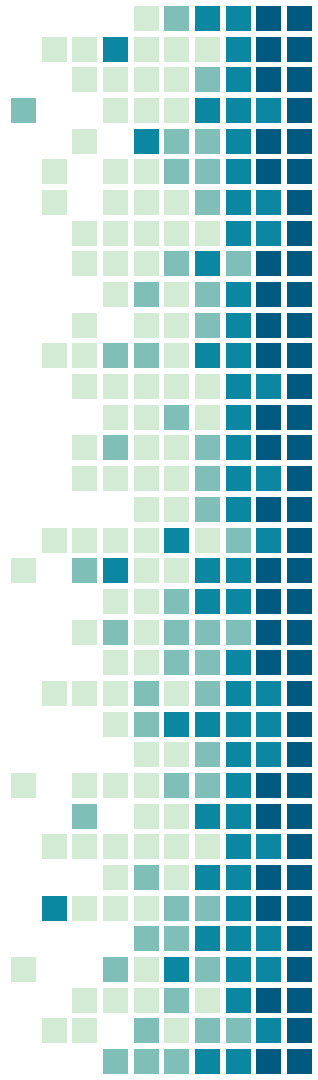
You can download the fonts on these pages:

<http://www.impallari.com/dosis>

<http://www.campivisivi.net/titillium/>

Pastel green **#d3ebd5** · Green **#80bf7** · Teal **#0b87a1** · Navy **#01597f** · Dark navy **#003b55**

You don't need to keep this slide in your presentation. It's only here to serve you as a design guide if you need to create new slides or download the fonts to edit the presentation in PowerPoint®



IN TWO OR THREE COLUMNS

Yellow

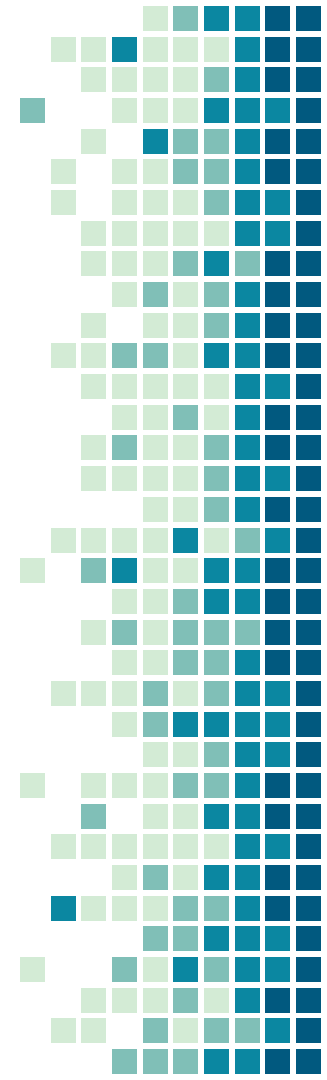
Is the color of gold, butter and ripe lemons. In the spectrum of visible light, yellow is found between green and orange.

Blue

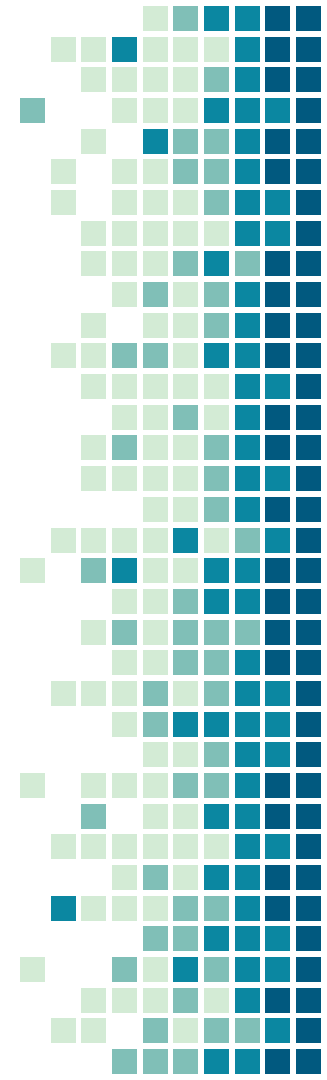
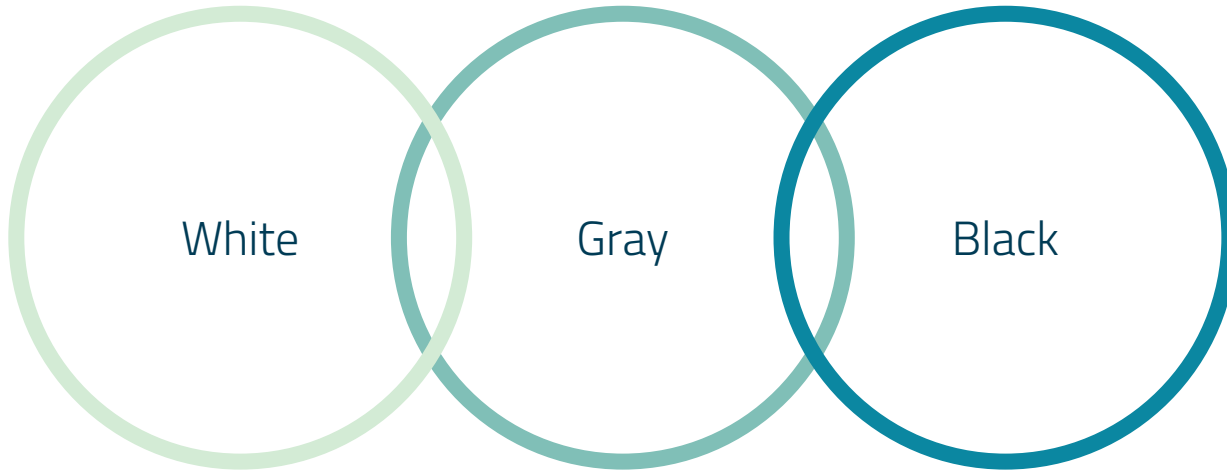
Is the colour of the clear sky and the deep sea. It is located between violet and green on the optical spectrum.

Red

Is the color of blood, and because of this it has historically been associated with sacrifice, danger and courage.



USE CHARTS TO EXPLAIN YOUR IDEAS



AND TABLES TO COMPARE DATA

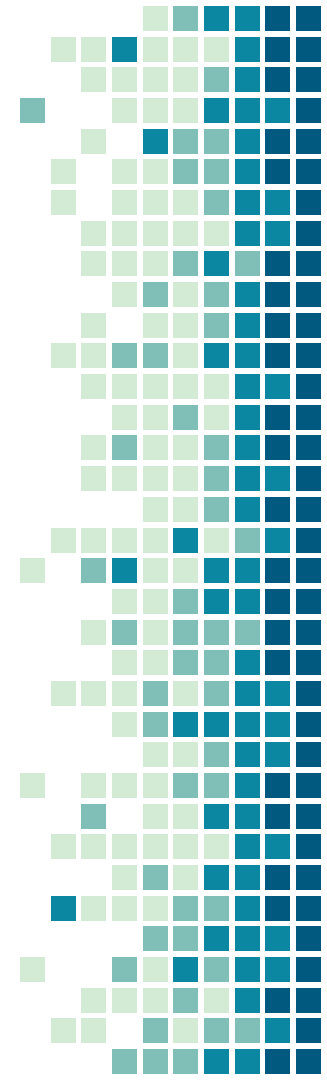
	A	B	C
Yellow	10	20	7
Blue	30	15	10
Orange	5	24	16

MAPS



89,526,124

Whoa! That's a big number, aren't you proud?



89,526,124\$

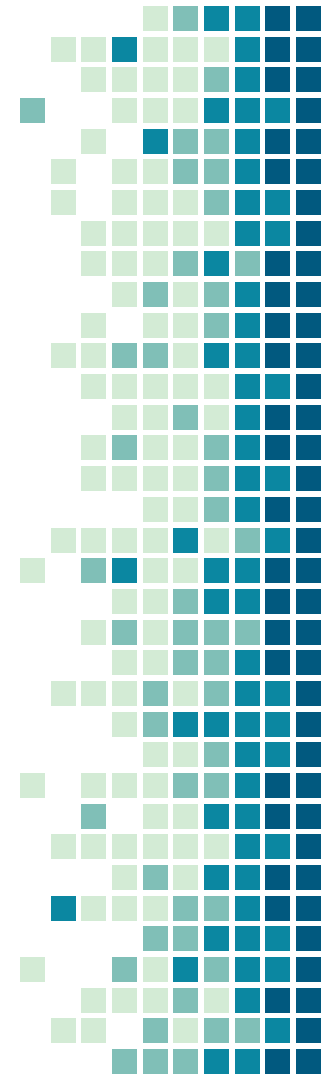
That's a lot of money

185,244 users

And a lot of users

100%

Total success!



LET'S REVIEW SOME CONCEPTS

Yellow

Is the color of gold, butter and ripe lemons. In the spectrum of visible light, yellow is found between green and orange.

Yellow

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Blue

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Blue

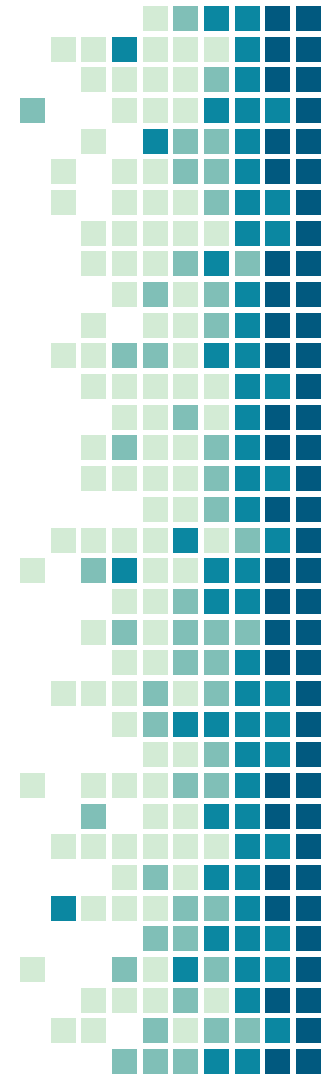
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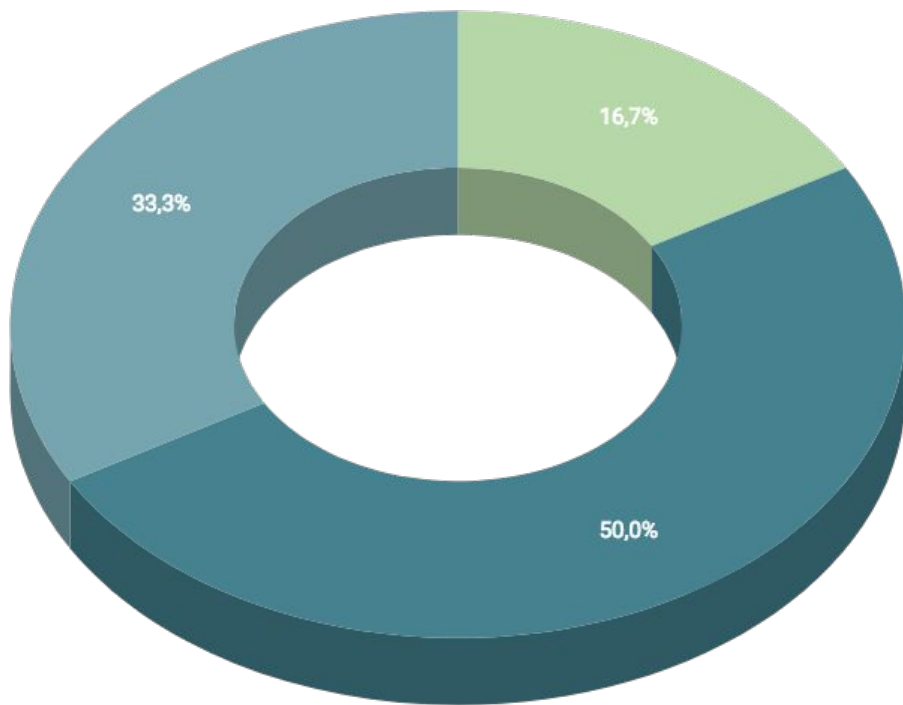
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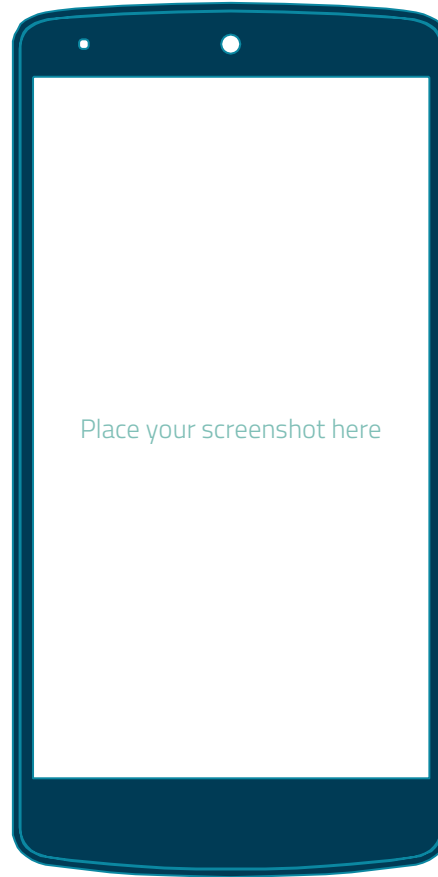




You can insert graphs from [Google Sheets](#)

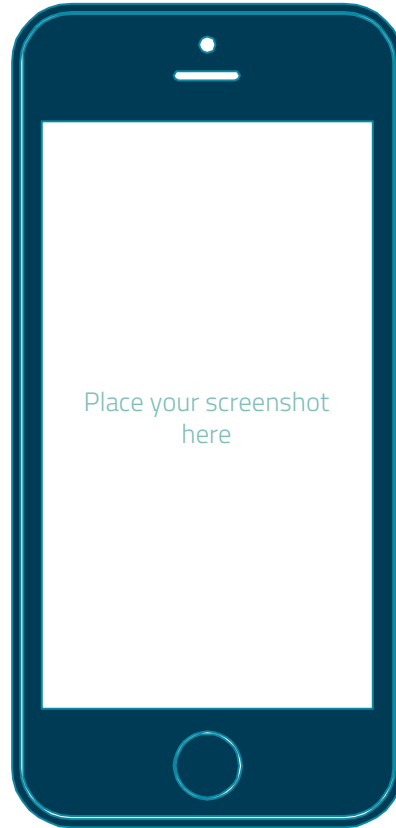
ANDROID PROJECT

Show and explain your web, app or software projects using these gadget templates.



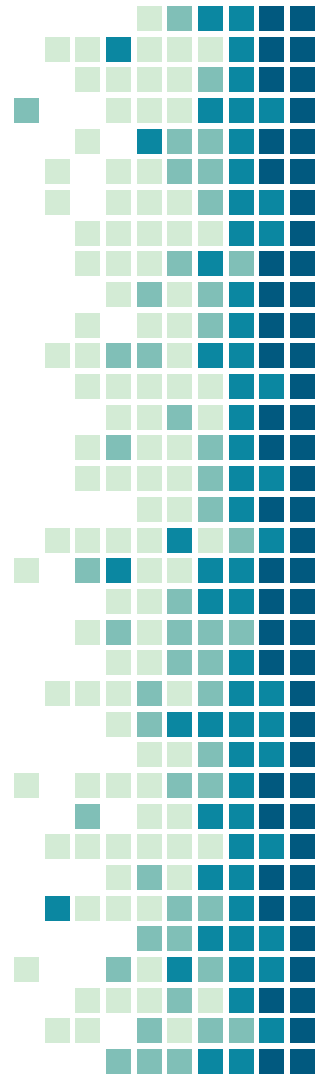
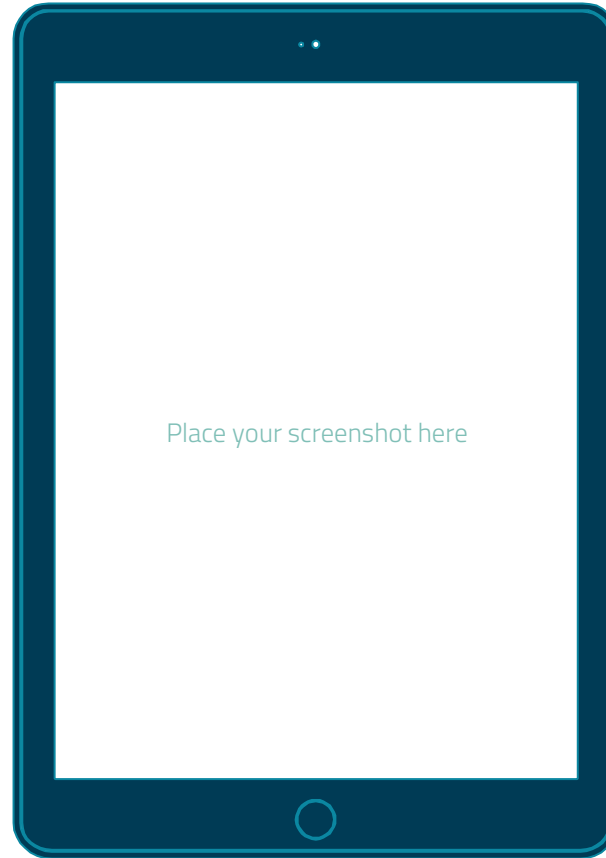
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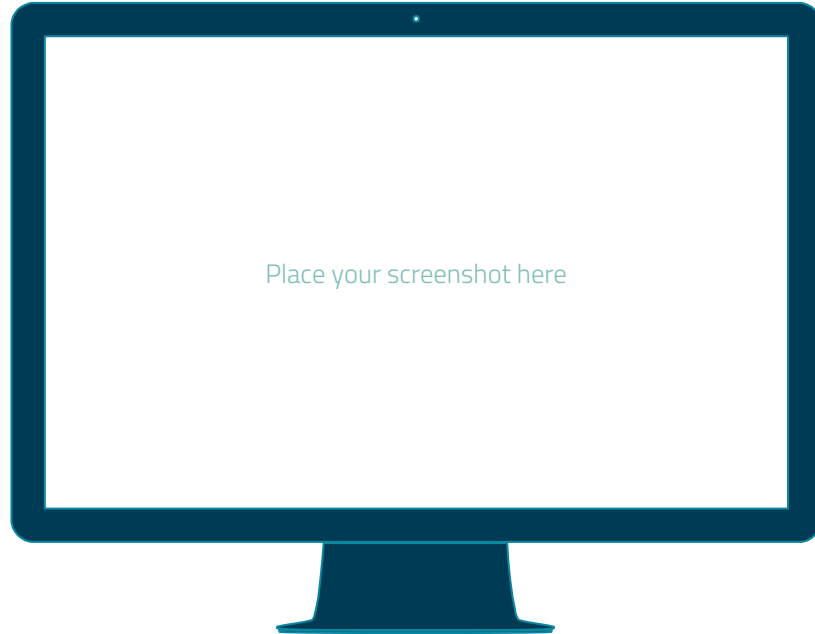
TABLET PROJECT

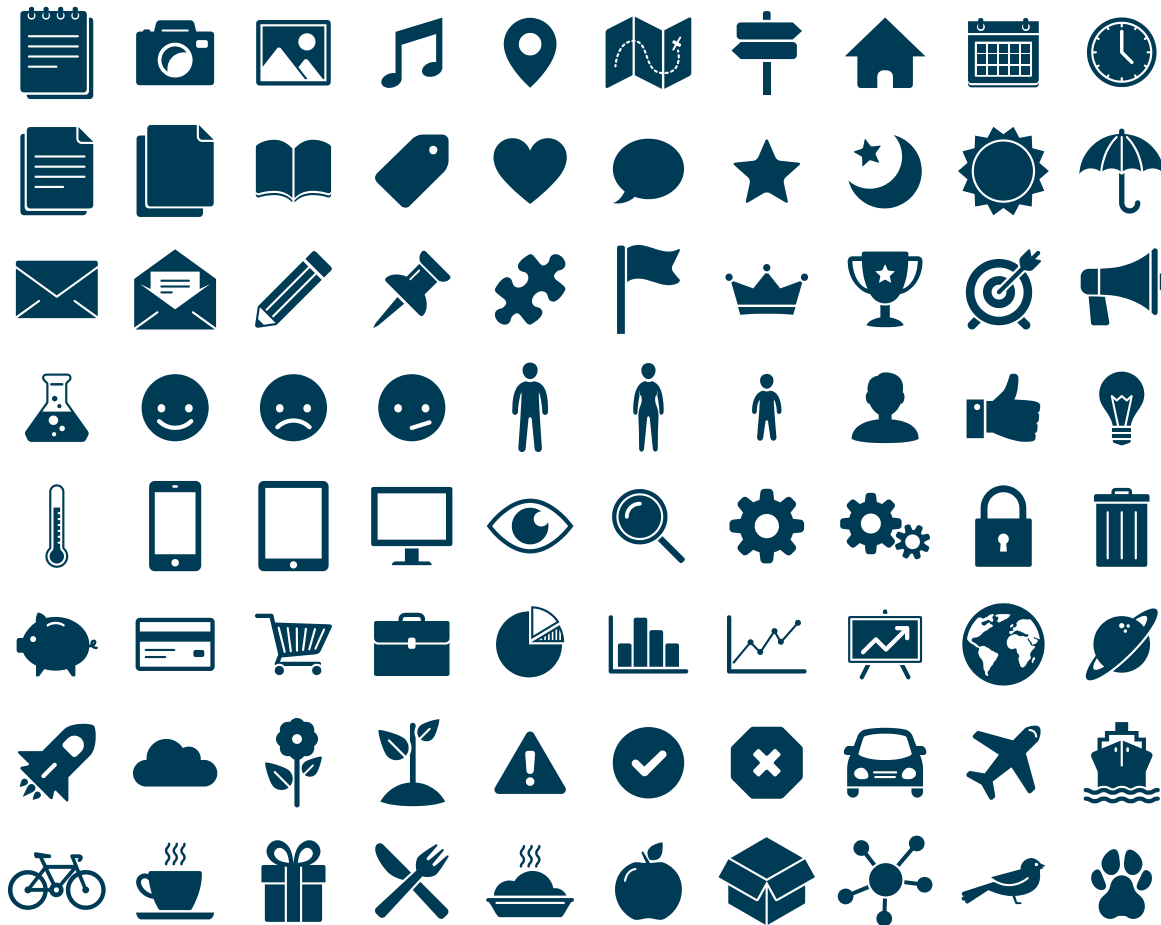
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DESKTOP PROJECT

Show and explain your web, app or software projects using these gadget templates.





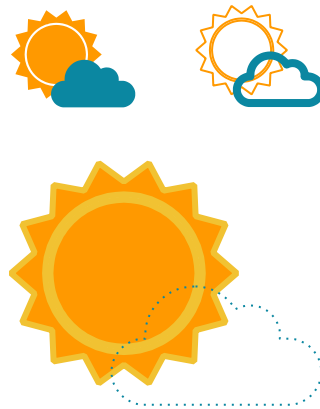
SlidesCarnival icons are editable shapes.

This means that you can:

- Resize them without losing quality.
- Change fill color and opacity.
- Change line color, width and style.

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Examples:





Now you can use any emoji as an icon!

And of course it resizes without losing quality and you can change the color.

How? Follow Google instructions

<https://twitter.com/googledocs/status/730087240156643328>



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“*Quotations are commonly printed as a means of inspiration and to invoke philosophical thoughts from the reader.*”

Options

White OLED Screen

Is the color of milk and fresh snow, the color produced by the combination of all the colors of the visible spectrum.

Blue OLED Screen

Is the color of coal, ebony, and of outer space. It is the darkest color, the result of the absence of or complete absorption of light.

