Developing an App

CSE 120 Spring 2017

Instructor: Justin Hsia

Teaching Assistants: Anupam Gupta, Braydon Hall, Eugene Oh, Savanna Yee

Emmanuel Macron and how political campaigns will never be the same

The internet has become so big that trolls started to have a significant influence on the results of the elections. If you think Macron's election proves that Facebook, Twitter, YouTube, 4chan, Reddit and other social media platforms don't have a fake news problem anymore, you're wrong. It's been a nightmare, and it's still going to be a nightmare for future elections.

It's still hard to fix all your security weaknesses. It's clear that all elections are going to be like this now. Political team members will all need to take a course on "Encryption 101" before joining a campaign.

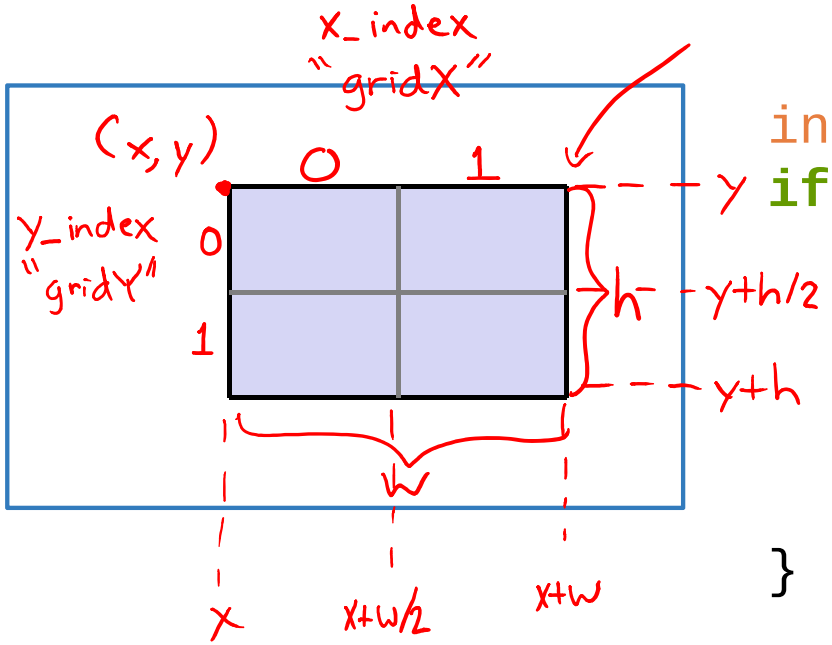
- https://techcrunch.com/2017/05/07/emmanuel-macron-and-how-political-campaigns-will-never-be-the-same/

Administrivia

- Assignments:
  - Word Guessing due Thursday (5/11)
  - Living Computers Museum Report due Sunday (5/14)
  - Birthday Visualization due Monday (5/15)
  - Innovation Exploration post (5/21)
- Guest lecture on Friday: Security
  - Reading Check (5/11) before lab section

Birthday Visualization

- Data visualization for birthday frequencies
  - Learn how to read file data into Processing
  - Use color to visualize numbers
  - Detection of mouse location within a *grid*




```
int x_index, y_index;
if( (mouseX >= x)     &&
    (mouseX <= x + w) &&
    (mouseY >= y)     &&
    (mouseY <= y + h) ) {
  x_index = (mouseX-x)/(w/2);
  y_index = (mouseY-y)/(h/2);
}
```

get rounded down to an integer

Goals for Today

- Collaborate!
  - TAs will also wander around to assist and answer questions
- Practice testing, debugging, and refactoring
- Don't just wait for solution!
  - The real learning comes from exploring, creating, and making mistakes
  - Any real-world problem requires *you* to come up with a solution, not just follow directions

Outline

- **The Game**
- Design Phase
- Coding Phase

15 Puzzle

- Sliding puzzle that consists of numbered square tiles in random order with one tile missing
  - Also known as “Mystic Square”

only the 7 and 13 can slide into the current open space

- We will program just the game mechanics
  - Won’t do winning condition, since not all game states are solvable

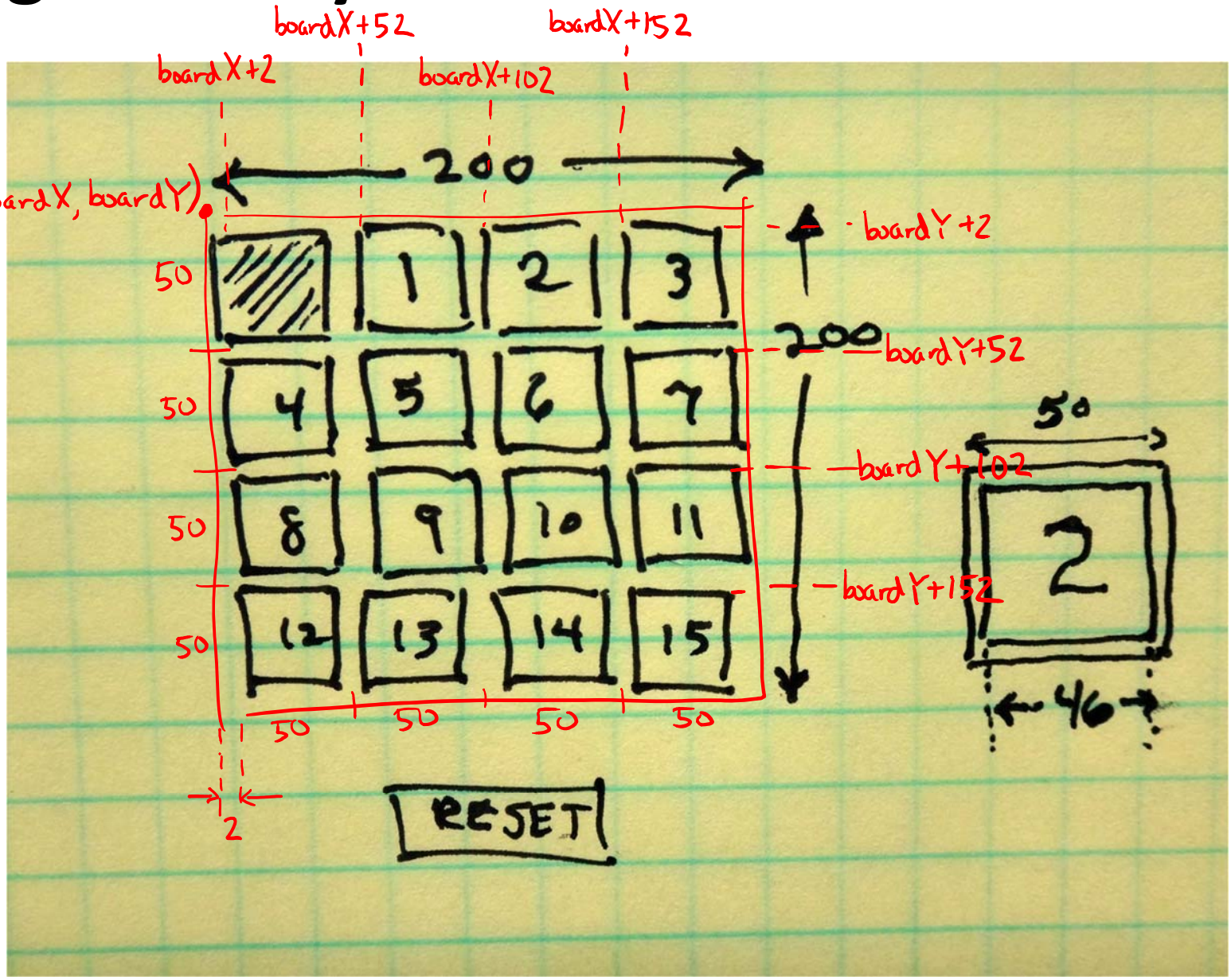
App Mechanics

- Tiles numbered 1-15 are shown on game board
  - One “open” or “empty” square
- Clicking a tile next to the empty square will “slide” that tile into the empty space
  - Clicking other tiles has no effect
  - Clicking outside of the game board has no effect
- Include a Reset button to return the game board to its initial state

Outline

- The Game
- **Design Phase**
- Coding Phase

Design the Layout

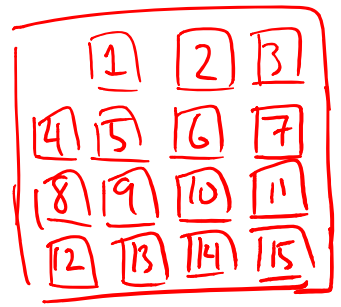


Coding Decisions

- How to represent the state of the game board?

int array of size 16

{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15} →



- How to implement the "slide" functionality?

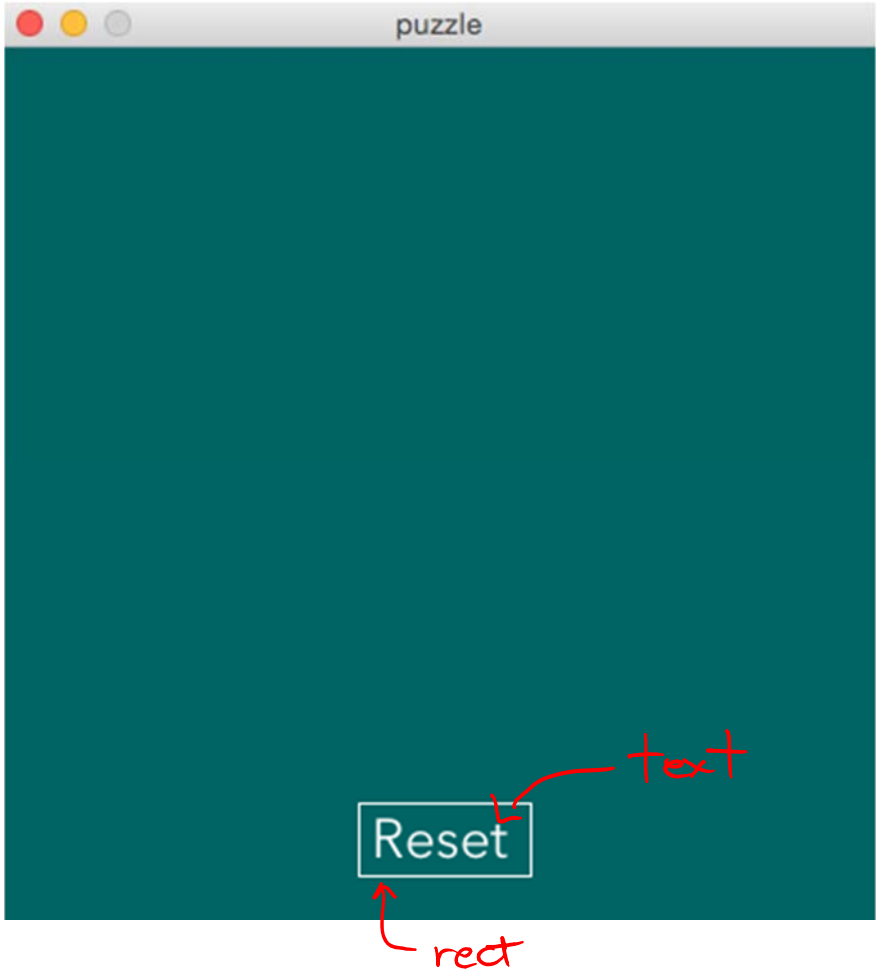
swap values in array

- How to respond to clicks?
  1. detect click on Reset button (reset)
     - ↳ rectangular region
  2. detect click on tile (possibly slide)
     - ↳ rectangular region of game board
     - ↳ calculate tile coordinates of click

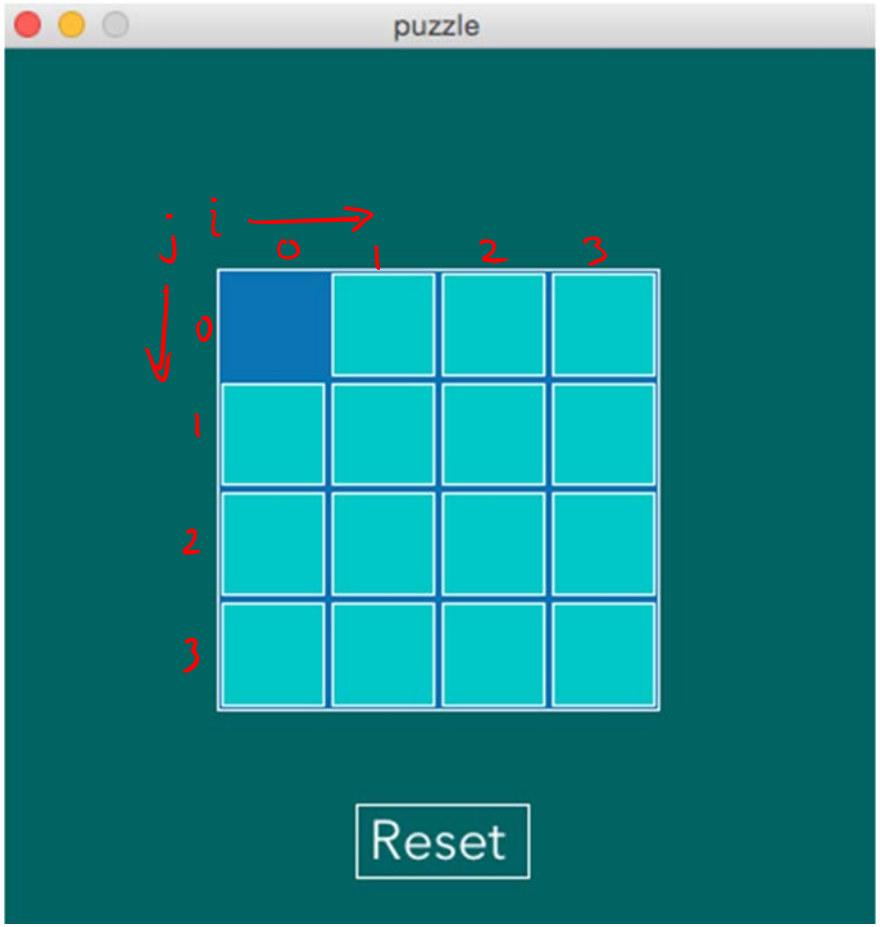
Outline

- The Game
- Design Phase
- **Coding Phase**

Create the Reset Button



Create the Tile Layout



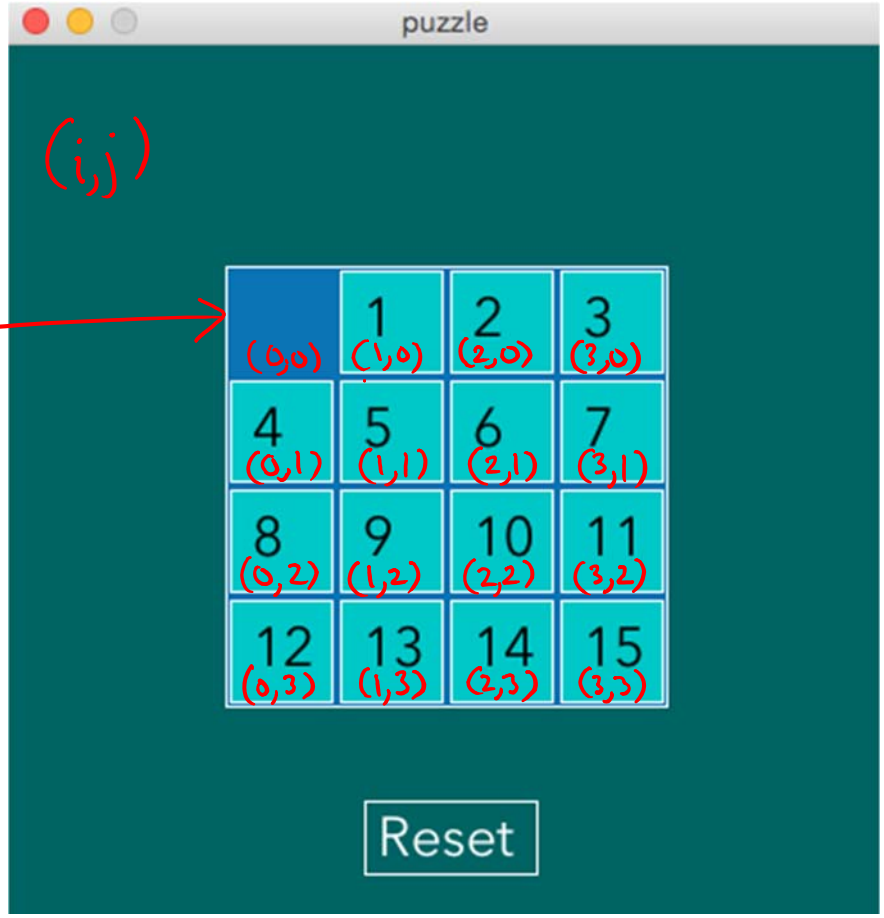
nested for-loops!

loop variable i will indicate column

loop variable j will indicate row

Add Numbers to Tiles

don't draw tile for open space (if tile value == 0)

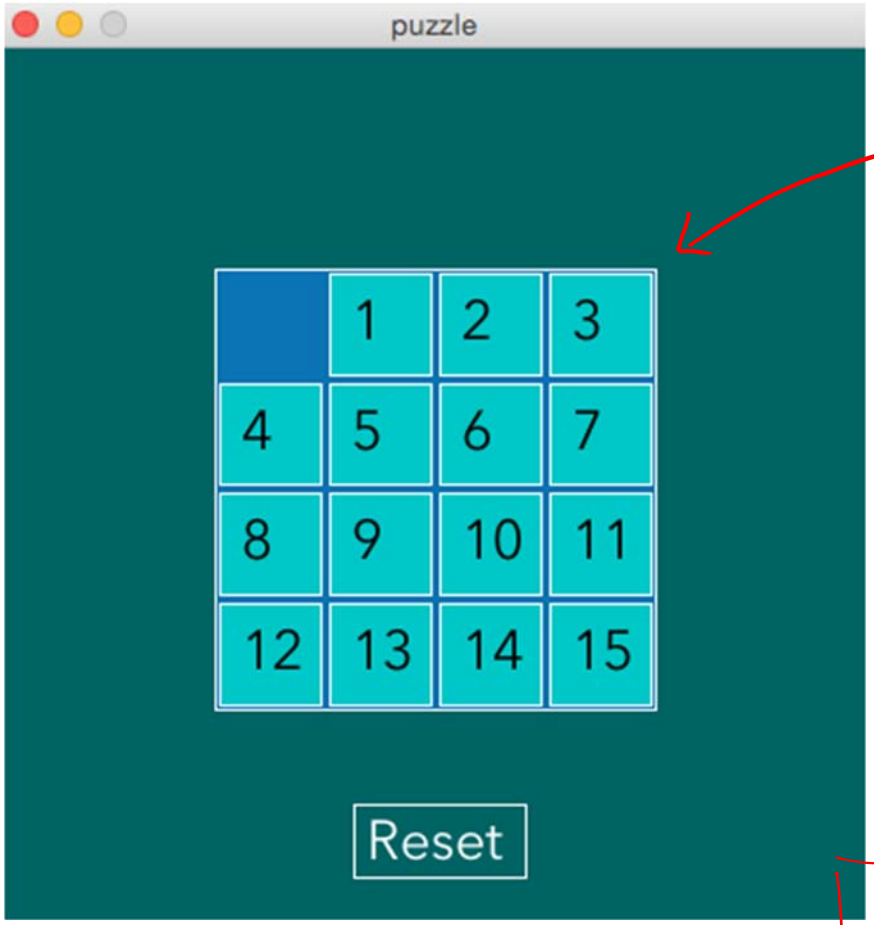


i	j	array index
0	0	0
1	0	1
2	0	2
3	0	3
0	1	4
1	1	5
2	1	6
3	1	7
0	2	8
⋮		⋮

index = 4*j + i

row ↑ ↑ col

Reset Functionality



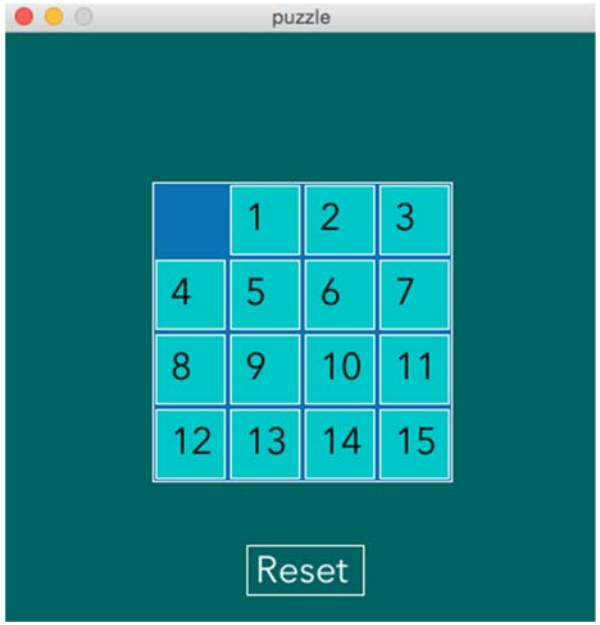
in this state, all tile values are equal to their array indices:

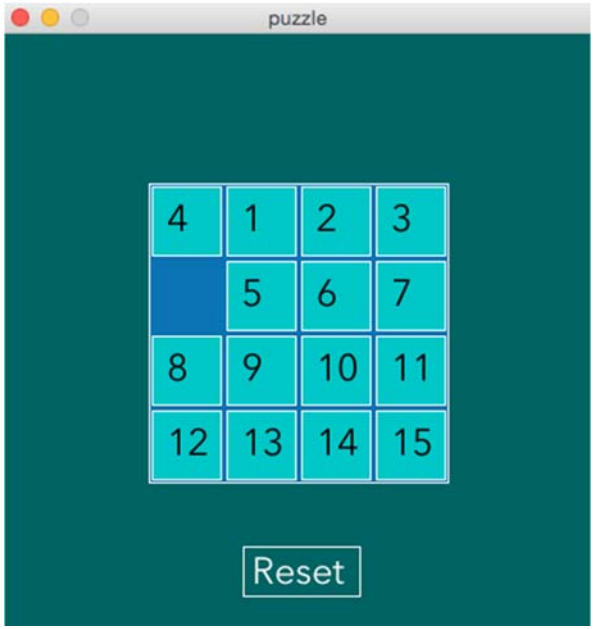
```
tiles[0] = 0;
tiles[1] = 1;
tiles[2] = 2;
   :
```

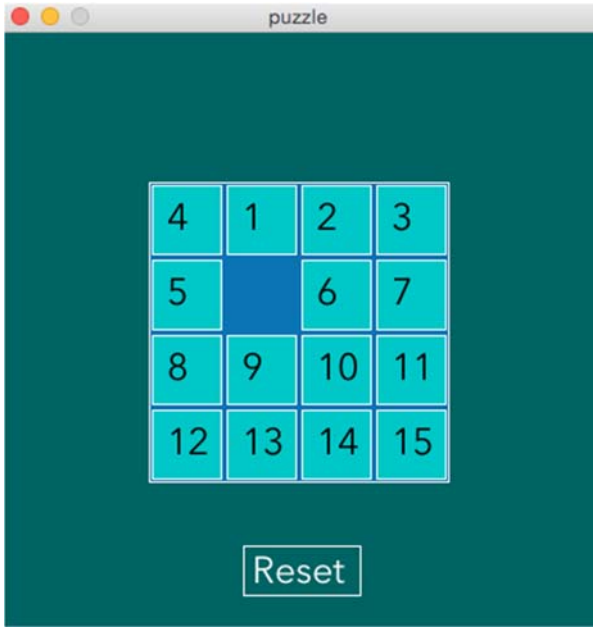
so can condense into for-loop:

```
for(int i=0; i<16; i=i+1) {
    tiles[i] = i;
}
```

Tile Movements







swap

```
int temp = a;
a = b;
b = temp;
```

If Time: Extensions

- Change Reset button hover color
  - Create `overReset()` function that returns a `boolean`
- Randomize initial tile placements
  - Tricky! How to avoid repeats?
- Check for win condition: tiles ordered 0-15
  - **Note:** This is not achievable for many randomized starting orderings

Summary

- Sketched the idea on paper
- Planned out coding representations
- Started with the things we knew how to do first
- Built on previous work by adding one function or idea at a time
- Ran the program after *every* improvement to make sure that it worked correctly
  - Unit and integration testing!!!