

Refactor Playgameoflife.live - Utilize JSXGraph the React Way

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Agenda

- Overview of Playgameoflife.live

- Architecture migration

- Refactor the usage of JSXGraph

- Implementation to decode/encode RLE



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Overview of Playgameoflife.live



Screenshot

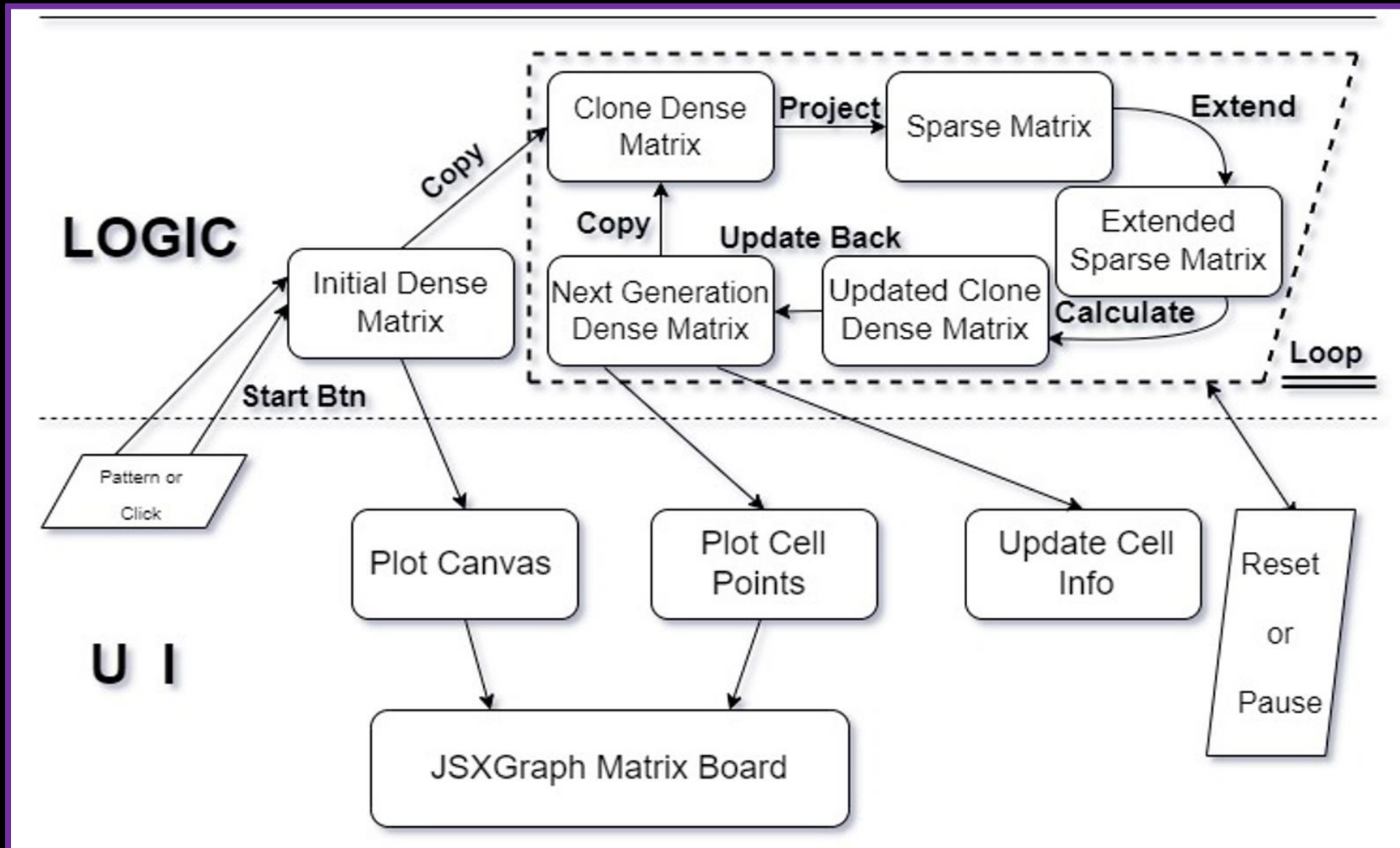
Game of Life | ©Leslie Wong - Game of Life Online | ©Leslie Wong

When autumn comes, you're drifting still like thistle down; You try to find the way to heaven, but you fail.

JSXGraph v1.4.3 Copyright (C) see <https://jsxgraph.org>

Reset Pause Original Number: 35 Remaining Lives: 68 Evolution Times: 225 Pattern ▲ Rate ?

Backbone





2

Architecture migration



Previous Architecture

FRONTEND

<%= **EJS** %>

Bootstrap

jQuery
write less, do more.


JSXGraph

BACKEND

node JS

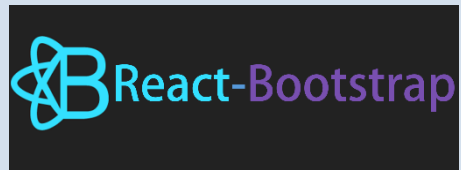
Express **JS**

 **HEROKU**

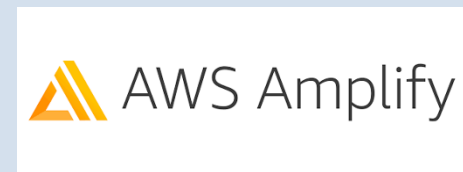
 **mongoDB**
Atlas

Current Architecture

FRONTEND



BACKEND



Outcome (Desktop)

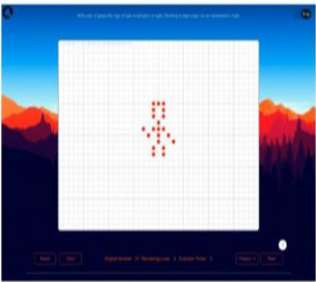
Diagnose performance issues
See detailed analysis and recommendations from loading your site in a simulated environment.

This URL
<https://playgameoflife.live/>

90
Performance

Values are estimated and may vary. The performance score is calculated directly from these metrics. [See calculator.](#)

▲ 0-49 ■ 50-89 ● 90-100

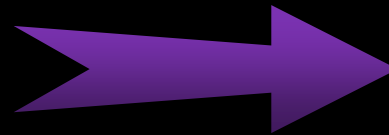



METRICS Expand view

● First Contentful Paint 0.8 s	● Time to Interactive 0.9 s
▲ Speed Index 2.3 s	● Total Blocking Time 10 ms
■ Largest Contentful Paint 1.5 s	● Cumulative Layout Shift 0

Captured at Feb 13, 2022, 5:10 PM GMT+8 Emulated Desktop with Lighthouse 9.0.0 Single page load
Initial page load Custom throttling Using HeadlessChromium 95.0.4638.69 with Ir

[View Treemap](#)

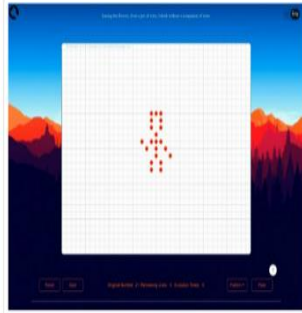


Diagnose performance issues

95
Performance

Values are estimated and may vary. The performance score is calculated directly from these metrics. [See calculator.](#)

▲ 0-49 ■ 50-89 ● 90-100




METRICS Expand view

● First Contentful Paint 0.3 s	● Time to Interactive 1.1 s
● Speed Index 0.8 s	● Total Blocking Time 70 ms
■ Largest Contentful Paint 1.5 s	● Cumulative Layout Shift 0

Captured at Sep 25, 2022, 1:16 AM GMT+8 Emulated Desktop with Lighthouse 9.6.6 Single page load
Initial page load Custom throttling Using HeadlessChromium 102.0.5005.115 with Ir

[View Treemap](#)



Outcome (Mobile)


Diagnose performance issues
See detailed analysis and recommendations from loading your site in a simulated environment.

This URL
<https://playgameoflife.live/>

55
Performance

Values are estimated and may vary. The performance score is calculated directly from these metrics. [See calculator.](#)

▲ 0-49 ■ 50-89 ● 90-100

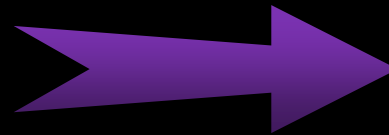
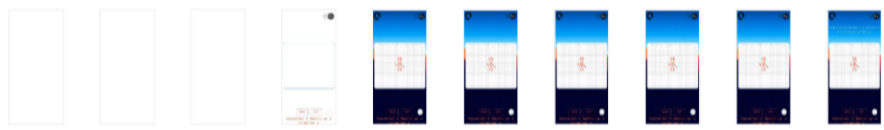


METRICS Expand view

▲ First Contentful Paint 3.5 s	■ Time to Interactive 5.3 s
▲ Speed Index 6.9 s	■ Total Blocking Time 290 ms
▲ Largest Contentful Paint 6.8 s	● Cumulative Layout Shift 0

Captured at Feb 13, 2022, 5:10 PM GMT+8 Emulated Moto.G4 with Lighthouse.9.0.0 Single page load
Initial page load Slow 4G throttling Using HeadlessChromium.95.0.4638.69 with Ir

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Diagnose performance issues

65
Performance

Values are estimated and may vary. The performance score is calculated directly from these metrics. [See calculator.](#)

▲ 0-49 ■ 50-89 ● 90-100

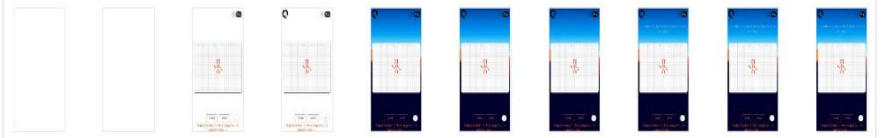


METRICS Expand view

● First Contentful Paint 1.1 s	■ Time to Interactive 5.1 s
■ Speed Index 4.0 s	■ Total Blocking Time 320 ms
▲ Largest Contentful Paint 6.9 s	● Cumulative Layout Shift 0

Captured at Sep 25, 2022, 1:16 AM GMT+8 Emulated Moto.G4 with Lighthouse.9.6.6 Single page load
Initial page load Slow 4G throttling Using HeadlessChromium.102.0.5005.115 with Ir

[View Treemap](#)



3

Refactor the usage
of JSXGraph

```
<% index.ejs    JS gameofLife.js X    ▶ ◀
```

```
GameofLife > public > js > JS gameofLife.js > ...
```

```
10 |
11 |   var matrix = [];
12 |   // var initialPlotMatrix = [];
13 |   var copyMatrix = [];
14 |   var sparseMatrix = [];
15 |   var extendedSparseMatrix = [];
16 |   var plotMatrix = [];
17 |   var matrixRow, matrixColumn;
18 |   var start = document.getElementsByClassName("start")[0];
19 |
20 |   // var stop = document.getElementsByClassName("stop")[0];
21 |   var random = document.getElementById("random");
22 |   var glider = document.getElementById("glider");
23 |   var smallexploder = document.getElementById("smallexploder");
24 |   var exploder = document.getElementById("exploder");
25 |
26 |   var tencellcolumn = document.getElementById("tencellcolumn");
27 |
28 |   var lightweightspaceship = document.getElementById("lightweightspaceship");
29 |   var tumbler = document.getElementById("tumbler");
```

https://github.com/Leslie-Wong-H/game_of_life/blob/sparse_matrix_version/public/js/gameofLife.js

```
<% index.ejs  X
GameofLife > views > <% index.ejs > html > body > script
349     </div>
350     </div>
351     <div class="col-xs-12" style="visibility: hidden">3 of 3</div>
352 </div>
353 </div>
354 <!-- <script src="js/hideTriangles.js"></script> -->
355 <!-- <script src="js/desktopFirst.js"></script> -->
356 <script type="text/javascript" src="js/gameofLife.js"></script>
357 <script src="js/languageSwitcher.js"></script>
358 <script src="js/chinesePoetry.js"></script>
359 > <script> ...
379 </script>
380 </body>
381 </html>
382
```

https://github.com/Leslie-Wong-H/game_of_life/blob/sparse_matrix_version/views/index.ejs

```
TS index.ts 9+ X
GameofLife > src > components > JxgContainer > gameOfLife > TS index.ts > GameOfLife
28 // In case of board.off not working, use this instead to keep function address
   consistent:
29 let mouseDownActionStore = () => {};
30
   You, 4 months ago | 1 author (You)
31 export default class GameOfLife { You, 7 months ago via PR #77 • refactor:
32     public send: (action: string, payload: unknown) => void;
33     public matrixRow: number;
34     public matrixColumn: number;
35     private matrix: number[][];
36     private copyMatrix: number[][];
37     public sparseMatrix: [number, number][];
38     private extendedSparseMatrix: [number, number][];
39     private plotMatrix: ("" | JXG.Board)[];
40     private gameState: GameState;
```

https://github.com/Lealie-Wong-H/game_of_life/blob/master/src/components/JxgContainer/gameOfLife/index.ts

ReactJXGBoard.tsx 9+ X

GameofLife > src > components > JxgContainer > ReactJXGBoard.tsx > ...

```
197
198 // called only after initial render
199 // now that div exists, create new JSXGraph board with it
200 useEffect(() => {
201   // set "send" of XState to GameOfLife so that it can dispatch the
   // number-update events
202   const GOL = new GameOfLife(send);
203   GOL.initMatrix();
204   GOL.initBoard();
205   GOL.easterEgg();
206   GOL.resizeThrottlerWrapper();
207   GOL.scrollHandler();
208   setGOLInstance(GOL);
209 }, [""]);
210
211 return <div id="box" className="jxgbox" />;
212 };
213
214 export default ReactJXGBoard;
215 |
```

https://github.com/Leeslie-Wong-H/game_of_life/blob/master/src/components/JxgContainer/ReactJXGBoard.tsx

4

Implementation to
decode/encode RLE



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Run Length Encoded

The **Run Length Encoded** (or **RLE** for short) **file format** is commonly-used for storing **patterns**. It is more cryptic than some other file formats such as **plaintext** and **Life 1.06**, but is still quite readable. Many features of the RLE file format are incorporated in the **MCell** file format. RLE files are saved with a `.r1e` file extension.

Contents [\[hide\]](#)

- [Description of format](#)
 - [# lines](#)
 - [Other features](#)
- [Examples](#)
- [Downloading LifeWiki patterns](#)
- [See also](#)
- [External links](#)

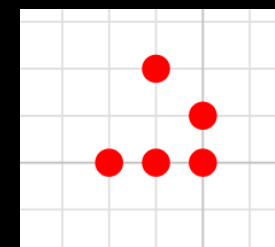
https://conwaylife.com/wiki/Run_Length_Encoded

```
RLpattern.rle
1 #C This is a glider.
2 x = 3, y = 3, rule = B3/S23
3 bo$2bo$3o!
4
```

Encode RLE

```
▼ {result: Array(5)} ⓘ
  ▼ result: Array(5)
    ▶ 0: (2) [13, 19]
    ▶ 1: (2) [14, 20]
    ▶ 2: (2) [15, 18]
    ▶ 3: (2) [15, 19]
    ▶ 4: (2) [15, 20]
    length: 5
    ▶ [[Prototype]]: Array(0)
    ▶ [[Prototype]]: Object
```

Decode RLE



Decode RLE

```
99  /*****  
100 /* rle-decoder starts */  
101 /*****  
102  
103 //on number repeat next letter number of times.  
104 //End by splitting on $ creating multiple lines  
105 let decoded: mediumDecodedPattern = rleString  
106   .slice(0, -1)  
107   .replace(/(\d+)(\D)/g, function (match, num) {  
108     return match.split(num)[1].repeat(num);  
109   })  
110   .split("$");  
111  
112 //replace letter 'o' with 1's & b with 0's ie - alive: 1 , dead: 0  
113 decoded = decoded.map((row) => row.replace(/o/g, "1"));  
114 decoded = decoded.map((row) => row.replace(/b/g, "0"));  
115  
116 //for each row split into its own arrow containing single #'s  
117 decoded = decoded.map((row) => [...row.split("#")]);  
118  
119 //row length less than specifications add filler 0's  
120 decoded = decoded.map((row) => {  
121   if (row.length < x) {  
122     const filler = new Array(x - row.length).fill(0);  
123     const value = row.concat(filler);  
124     return value;  
125   } else {  
126     return row;  
127   }  
128 });  
129  
130 //convert all string numbers to type of Number  
131 decoded = decoded.map((row) => row.map((string) => Number(string)));  
132  
133 /*****  
134 /* rle-decoder ends */  
135 /*****
```

['bo', 'bbo', 'ooo']

['01', '001', '111']

[['0', '1', 0], ['0', '0', '1'], ['1', '1', '1']]

[[0, 1, 0], [0, 0, 1], [1, 1, 1]]

```
RLPattern.rle  
1 #C This is a glider.  
2 x = 3, y = 3, rule = B3/S23  
3 bo$2bo$3o!  
4
```

```
*****  
/* rle-decoder ends */  
*****  
  
if (decoded.length === y) {  
  let widthOffset = Math.floor((40 - x) / 2);  
  let heightOffset = Math.floor((30 - y) / 2);  
  widthOffset = widthOffset > 0 ? widthOffset : 0;  
  heightOffset = heightOffset > 0 ? heightOffset : 0;  
  for (let i = 0; i < y; i++) {  
    for (let j = 0; j < x; j++) {  
      if (decoded[i][j] === 1) {  
        const tempcoord: [number, number] = [  
          heightOffset + i,  
          widthOffset + j,  
        ];  
        result.push(tempcoord);  
      }  
    }  
  }  
}
```

[[13, 19], [14, 20], [15, 18], [15, 19], [15, 20]]

Encode RLE (Mainly reverse the logic of decoding RLE)

```
53  /**
54   * RLE Decipher, rule description: https://conwaylife.com/wiki/Run\_Length\_Encoded
55   * @param rawRLEtext the raw RLE text
56   * @returns Object { width:number, height:number, result:CoordinatedPattern}
57   */
58  > function RLEDecipher(rawRLEtext: string): RLEDecipherResult { ...
158  }
159
160  /** You, 4 months ago via PR #105 • 🦉 feat: add RLEEncipher and its test set
161   * RLE Encipher, rule description: https://conwaylife.com/wiki/Run\_Length\_Encoded
162   * @param Object { width:number, height:number, result:CoordinatedPattern}
163   * @return rawRLEtext the raw RLE text
164   */
165  > function RLEEncipher(patternInfo: RLEDecipherResult): string { ...
251  }
252
```

Thanks for
your
listening