1.初始化项目

```
$ mkdir zhufengskeleton
$ cd zhufengskeleton
$ npm init -y
$ cnpm i css-tree  @babel/core @babel/preset-env @babel/preset-react babel-loader cross-env fs-extra html-webpack-plugin  webpack webpack-cli webpack-dev-server -D
$ cnpm i react react-dom -S
$ cnpm i puppeteer -D
```

2.React项目构建

2.1 webpack.config.js

```
const HtmlWebpackPlugin = require('html-webpack-plugin');
const {resolve} = require('path');
module.exports = {
    mode:'development',
    devtool:false,
    entry: "./src/index.js",
    output: {
        path:resolve(__dirname,'dist'),
        filename: "main.js"
    },
    module: {
        rules: [{
            test: /\.js$/,
            use: [
                {
                    loader:'babel-loader',
                    options:{
                        presets:["@babel/preset-env","@babel/preset-react"]
                    }
                }
            ],
            exclude: /node_modules/
        }]
    },
    devServer: {
        contentBase: resolve(__dirname,'dist')
    },
    plugins: [
        new HtmlWebpackPlugin({
            template: './src/index.html'
        })
    ]
}
```

2.2 src\index.js

src\index.js

```
import React from 'react';
import ReactDOM from 'react-dom';
ReactDOM.render((
    <div>
        <img src="http://img.zhufengpeixun.cn/zhufengjg.jpg" width="100%"></img>
        <button>点我点我</button>
    </div>
),document.getElementById('root'));
```

2.3 src\index.html

src\index.html

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>skeleton</title>
</head>
<body>
    <div id="root"><!-- shell --></div>
</body>
</html>
```

3. 创建插件

3.1 skeleton\index.js

skeleton\index.js

```
const SkeletonPlugin = require('./SkeletonPlugin')
module.exports = {
  SkeletonPlugin
}
```

3.2 SkeletonPlugin.js

skeleton\SkeletonPlugin.js

```
const PLUGIN_NAME = 'SkeletonPlugin';
const defaultOptions = {

}
class SkeletonPlugin {
    constructor(options){
        this.options = {...defaultOptions,...options};
    }
    apply(compiler) {
        compiler.hooks.done.tap(PLUGIN_NAME, async () => {
            console.log(PLUGIN_NAME,'done');
        })
    }
}
module.exports = SkeletonPlugin;
```

3.3 webpack.config.js

```
const HtmlWebpackPlugin = require('html-webpack-plugin');
const {resolve} = require('path');
+const {SkeletonPlugin} = require('./skeleton');
module.exports = {
    mode:'development',
    devtool:false,
    entry: "./src/index.js",
    output: {
        path:resolve(__dirname,'dist'),
        filename: "main.js"
    },
    module: {
        rules: [{
            test: /\.js$/,
            use: [
                {
                    loader:'babel-loader',
                    options:{
                        presets:["@babel/preset-env","@babel/preset-react"]
                    }
                }
            ],
            exclude: /node_modules/
        }]
    },
    devServer: {
        contentBase: resolve(__dirname,'dist')
    },
    plugins: [
        new HtmlWebpackPlugin({
            template: './src/index.html'
        }),
+        new SkeletonPlugin({
+
+        })
    ]
}
```

4. 启动服务

4.1 webpack.config.js

webpack.config.js

```
const HtmlWebpackPlugin = require('html-webpack-plugin');
const {resolve} = require('path');
const {SkeletonPlugin} = require('./skeleton');
module.exports = {
    mode:'development',
    devtool:false,
    entry: "./src/index.js",
    output: {
        path:resolve(__dirname,'dist'),
        filename: "main.js"
    },
    module: {
        rules: [{
            test: /\.js$/,
            use: [
                {
                    loader:'babel-loader',
                    options:{
                        presets:["@babel/preset-env","@babel/preset-react"]
                    }
                }
            ],
            exclude: /node_modules/
        }]
    },
    devServer: {
        contentBase: resolve(__dirname,'dist')
    },
    plugins: [
        new HtmlWebpackPlugin({
            template: './src/index.html'
        }),
        new SkeletonPlugin({
+            staticDir: resolve(__dirname,'dist'),
+            port:8000,
+            origin:'http://localhost:8000'
        })
    ]
}
```

4.2 SkeletonPlugin.js

skeleton\SkeletonPlugin.js

```
const PLUGIN_NAME = 'SkeletonPlugin';
+const Server = require('./Server');
const defaultOptions = {

}
class SkeletonPlugin {
    constructor(options){
        this.options = {...defaultOptions,...options};
    }
    apply(compiler) {
        compiler.hooks.done.tap(PLUGIN_NAME, async () => {
+            await this.startServer();
+            await this.server.close();
        })
    }
+    async startServer(){
+        this.server = new Server(this.options);
+        await this.server.listen();
+    }
}
module.exports = SkeletonPlugin;
```

4.3 Server.js

skeleton\Server.js

```
const http = require('http')
const express = require('express');
class Server {
    constructor(options) {
        this.options = options;
    }
    listen() {
        const app = this.app = express();
        app.use('/',express.static(this.options.staticDir));
        this.listenServer = http.createServer(app);
        return new Promise( (resolve) =>{
            this.listenServer.listen(this.options.port, () => {
                console.log(`server listen at port: ${this.options.origin}`);
                resolve();
            })
        });
    }
    async close() {
        return new Promise( (resolve) =>{
            this.listenServer.close(() => {
                console.log('server closed!');
                resolve();
            })
        });
    }
}
module.exports = Server;
```

5. 启动puppeteer

5.1 webpack.config.js

```
const HtmlWebpackPlugin = require('html-webpack-plugin');
const {resolve} = require('path');
const {SkeletonPlugin} = require('./skeleton');
module.exports = {
    mode:'development',
    devtool:false,
    entry: "./src/index.js",
    output: {
        path:resolve(__dirname,'dist'),
        filename: "main.js"
    },
    module: {
        rules: [{
            test: /\.js$/,
            use: [
                {
                    loader:'babel-loader',
                    options:{
                        presets:["@babel/preset-env","@babel/preset-react"]
                    }
                }
            ],
            exclude: /node_modules/
        }]
    },
    devServer: {
        contentBase: resolve(__dirname,'dist')
    },
    plugins: [
        new HtmlWebpackPlugin({
            template: './src/index.html'
        }),
        new SkeletonPlugin({
            staticDir: resolve(__dirname,'dist'),
            port:8000,
            origin:'http://localhost:8000',
+           device: 'iPhone 6'
        })
    ]
}
```

5.2 SkeletonPlugin.js

skeleton\SkeletonPlugin.js

```
const PLUGIN_NAME = 'SkeletonPlugin';
const Server = require('./Server');
+const Skeleton = require('./Skeleton');
const defaultOptions = {

}
class SkeletonPlugin {
    constructor(options){
        this.options = {...defaultOptions,...options};
    }
    apply(compiler) {
        compiler.hooks.done.tap(PLUGIN_NAME, async () => {
            await this.startServer();
+            this.skeleton= new Skeleton(this.options);
+            await this.skeleton.initialize();
+            const skeletonHtml = await this.skeleton.genHtml(this.options.origin);
+            console.log('skeletonHtml',skeletonHtml);
+            await this.skeleton.destroy();
            await this.server.close();
        })
    }
    async startServer(){
        this.server = new Server(this.options);
        await this.server.listen();
    }
}
module.exports = SkeletonPlugin;
```

5.3 Skeleton.js

skeleton\Skeleton.js

```

let  puppeteer = require('puppeteer');
class Skeleton {
    constructor(options = {}) {
        this.options = options
    }
    async initialize() {
        this.browser = await puppeteer.launch({ headless: false });
    }
    async newPage() {
        const { device } = this.options;
        const page = await this.browser.newPage();
        await page.emulate(puppeteer.devices[device]);
        return page;
    }
    async genHtml(url) {
        const page = await this.newPage()
        const response = await page.goto(url, { waitUntil: 'networkidle2' });
        if (response && !response.ok()) {
            throw new Error(`${response.status} on ${url}`)
        }
        return 'html';
    }
    async destroy() {
        if (this.browser) {
            await this.browser.close();
            this.browser = null
        }
    }
}
module.exports = Skeleton;
```

6. 截取骨架内容

6.1 SkeletonPlugin.js

skeleton\SkeletonPlugin.js

```
const PLUGIN_NAME = 'SkeletonPlugin';
const Server = require('./Server');
const Skeleton = require('./Skeleton');
+const {resolve} = require('path');
+const {readFileSync,writeFileSync} = require('fs');
const defaultOptions = {

}
class SkeletonPlugin {
    constructor(options){
        this.options = {...defaultOptions,...options};
    }
    apply(compiler) {
        compiler.hooks.done.tap(PLUGIN_NAME, async () => {
            await this.startServer();
            this.skeleton= new Skeleton(this.options);
            await this.skeleton.initialize();
            const skeletonHtml = await this.skeleton.genHtml(this.options.origin);
+            const originPath = resolve(this.options.staticDir,'index.html');
+            const orgiginHtml = await readFileSync(originPath, 'utf8');
+            const finalHtml = orgiginHtml.replace('<!-- shell -->',skeletonHtml);
+            await writeFileSync(originPath,finalHtml,'utf8');
+            await this.skeleton.destroy();
+            await this.server.close();
+            process.exit(0);
        })
    }
    async startServer(){
        this.server = new Server(this.options);
        await this.server.listen();
    }
}
module.exports = SkeletonPlugin;
```

6.2 Skeleton.js

skeleton\Skeleton.js

```
let  puppeteer = require('puppeteer');
+let  {readFileSync} = require('fs');
+let  {resolve} = require('path');
+let  {sleep} = require('./utils');
class Skeleton {
    constructor(options = {}) {
        this.options = options
    }
    async initialize() {
        this.browser = await puppeteer.launch({ headless: false });
    }
    async newPage() {
        const { device } = this.options;
        const page = await this.browser.newPage();
        await page.emulate(puppeteer.devices[device]);
        return page;
    }
+    async makeSkeleton(page) {
+        const { defer = 5000 } = this.options;
+        const scriptContent = await readFileSync(resolve(__dirname, 'skeletonScript.js'), 'utf8');
+        await page.addScriptTag({ content: scriptContent })
+        await sleep(defer);
+        await page.evaluate((options) => {
+          Skeleton.genSkeleton(options);
+        }, this.options)
+    }
    async genHtml(url) {
        const page = await this.newPage()
        const response = await page.goto(url, { waitUntil: 'networkidle2' });
        if (response && !response.ok()) {
            throw new Error(`${response.status} on ${url}`)
        }
+        await this.makeSkeleton(page);
+        const { styles, html } = await page.evaluate(() => Skeleton.getHtmlAndStyle());
+        let result = `
+            <style>${styles.join('\n')}</style>
+            ${html}
+        `;
+        return Promise.resolve(result);
    }
    async destroy() {
        if (this.browser) {
            await this.browser.close()
            this.browser = null
        }
    }
}
module.exports = Skeleton;
```

6.3 skeletonScript.js

skeleton\skeletonScript.js

```
window.Skeleton = (function () {
    const $$ = document.querySelectorAll.bind(document);
    const REMOVE_TAGS = ['title', 'meta', 'style','script'];
    function genSkeleton(options = {}) {

    }
    function getHtmlAndStyle() {
        const styles = Array.from($$('style')).map(style => style.innerHTML || style.innerText);
        Array.from($$(REMOVE_TAGS.join(','))).forEach(ele => ele.parentNode.removeChild(ele));
        const html = document.body.innerHTML;
        return { html, styles };
    }
    return {genSkeleton,getHtmlAndStyle};
}());
```

6.4 utils.js

skeleton\utils.js

```
function sleep(duration) {
    return new Promise((resolve) => {
      setTimeout(resolve, duration)
    })
}
module.exports = {
    sleep
}
```

7. 元素转换

7.1 webpack.config.js

webpack.config.js

```
const HtmlWebpackPlugin = require('html-webpack-plugin');
const {resolve} = require('path');
const {SkeletonPlugin} = require('./skeleton');
module.exports = {
    mode:'development',
    devtool:false,
    entry: "./src/index.js",
    output: {
        path:resolve(__dirname,'dist'),
        filename: "main.js"
    },
    module: {
        rules: [{
            test: /\.js$/,
            use: [
                {
                    loader:'babel-loader',
                    options:{
                        presets:["@babel/preset-env","@babel/preset-react"]
                    }
                }
            ],
            exclude: /node_modules/
        }]
    },
    devServer: {
        contentBase: resolve(__dirname,'dist')
    },
    plugins: [
        new HtmlWebpackPlugin({
            template: './src/index.html'
        }),
        new SkeletonPlugin({
            staticDir: resolve(__dirname,'dist'),
            port:8000,
            origin:'http://localhost:8000',
            device: 'iPhone 6',
+             image: {
+                 color: '#EFEFEF',
+             },
+             button: {
+                 color: '#EFEFEF',
+             }
        })
    ]
}
```

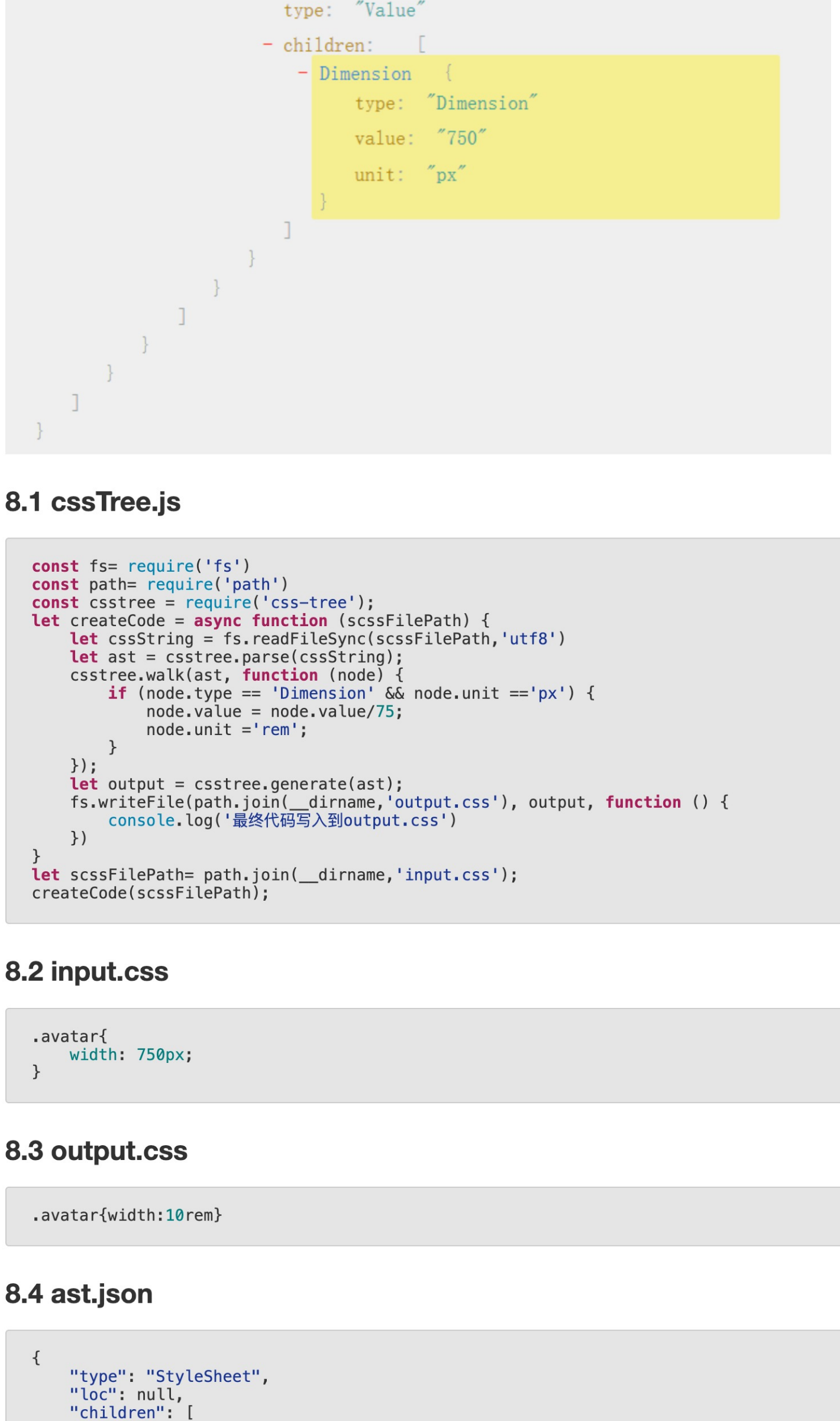
7.2 skeletonScript.js

skeleton\skeletonScript.js

```
window.Skeleton = (function () {
+    const SMALLEST_BASE64 = 'data:image/gif;base64,R0lGODlhAQABAIAAAAAAAP///yH5BAEAAAAALAAAAAABAAEAAAIBRAA7';
+    const CLASS_NAME_PREFEX = 'sk-';
    const $$ = document.querySelectorAll.bind(document);
    const REMOVE_TAGS = ['title', 'meta', 'style', 'script'];
+    const styleCache = new Map();
+    const setAttributes = (ele, attrs) => {
+        Object.keys(attrs).forEach(k => ele.setAttribute(k, attrs[k]));
+    };
+    const addStyle = (selector, rule) => {
+        if (!styleCache.has(selector)) {
+          styleCache.set(selector, rule)
+        }
+    }
+    function imgHandler(ele, options={}) {
+        const {width, height} = ele.getBoundingClientRect();
+        const attrs = {
+            width,
+            height,
+            src: SMALLEST_BASE64
+        };
+        setAttributes(ele, attrs);
+        const className = CLASS_NAME_PREFEX + 'image';
+        const rule = `{ background: ${options.color} !important;}`;
+        addStyle(`.${className}`, rule);
+        ele.classList.add(className)
+    }
+    function buttonHandler(ele,options={}) {
+        const classname = CLASS_NAME_PREFEX + 'button'
+        const rule = `{
+          color: ${options.color} !important;
+          background: ${options.color} !important;
+          border: none !important;
+          box-shadow: none !important;
+        }`
+        addStyle(`.${classname}`, rule)
+        ele.classList.add(classname)
+    }
    function genSkeleton(options = {}) {
+        const rootElement = document.documentElement;
+        ;(function traverse(options) {
+            let { button, image } = options;
+            const buttons = [];
+            const imgs = [];
+            ;(function preTraverse(ele) {
+                if (ele.children && ele.children.length > 0) {
+                    Array.from(ele.children).forEach(child => preTraverse(child))
+                }
+                if (ele.tagName === 'BUTTON') {
+                    return buttons.push(ele);
+                }
+                if (ele.tagName === 'IMG') {
+                    return imgs.push(ele)
+                }
+            })(rootElement);
+            buttons.forEach(e => buttonHandler(e, button))
+            imgs.forEach(e => imgHandler(e, image));
+        })(options);
+        let rules = ''
+        for (const [selector, rule] of styleCache) {
+            rules += `${selector} ${rule}\n`;
+        }
+        const styleEle = document.createElement('style')
+        styleEle.innerHTML = rules;
+       document.head.appendChild(styleEle)
    }
    function getHtmlAndStyle() {
        const styles = Array.from($$('style')).map(style => style.innerHTML || style.innerText);
        Array.from($$(REMOVE_TAGS.join(','))).forEach(ele => ele.parentNode.removeChild(ele));
        const html = document.body.innerHTML;
        return { html, styles };
    }
    return { genSkeleton, getHtmlAndStyle };
}());
```

8. cssTree

- astexplorer



```
- StyleSheet   {
    type:  "StyleSheet"
  - children:   [
    - Rule   {
        type:  "Rule"
      - prelude:  SelectorList   {
          type:  "SelectorList"
        - children:   [
          - Selector   {
              type:  "Selector"
            - children:   [
              - ClassSelector  = $node  {
                  type:  "ClassSelector"
                  name:  "avatar"
                }
              ]
            }
          ]
        }
      - block:  Block   {
          type:  "Block"
        - children:   [
          - Declaration   {
              type:  "Declaration"
              important:  false
              property:  "width"
            - value:  Value   {
                type:  "Value"
              - children:   [
                - Dimension   {
                    type:  "Dimension"
                    value:  "750"
                    unit:  "px"
                  }
                ]
              }
            }
          ]
        }
      }
    ]
  }
```

8.1 cssTree.js

```
const fs= require('fs')
const path= require('path')
const csstree = require('css-tree');
let createCode = async function (scssFilePath) {
    let cssString = fs.readFileSync(scssFilePath,'utf8')
    let ast = csstree.parse(cssString);
    csstree.walk(ast, function (node) {
        if (node.type == 'Dimension' && node.unit =='px') {
            node.value = node.value/75;
            node.unit ='rem';
        }
    });
    let output = csstree.generate(ast);
    fs.writeFile(path.join(__dirname,'output.css'), output, function () {
        console.log('最终代码写入到output.css')
    })
}
let scssFilePath= path.join(__dirname,'input.css');
createCode(scssFilePath);
```

8.2 input.css

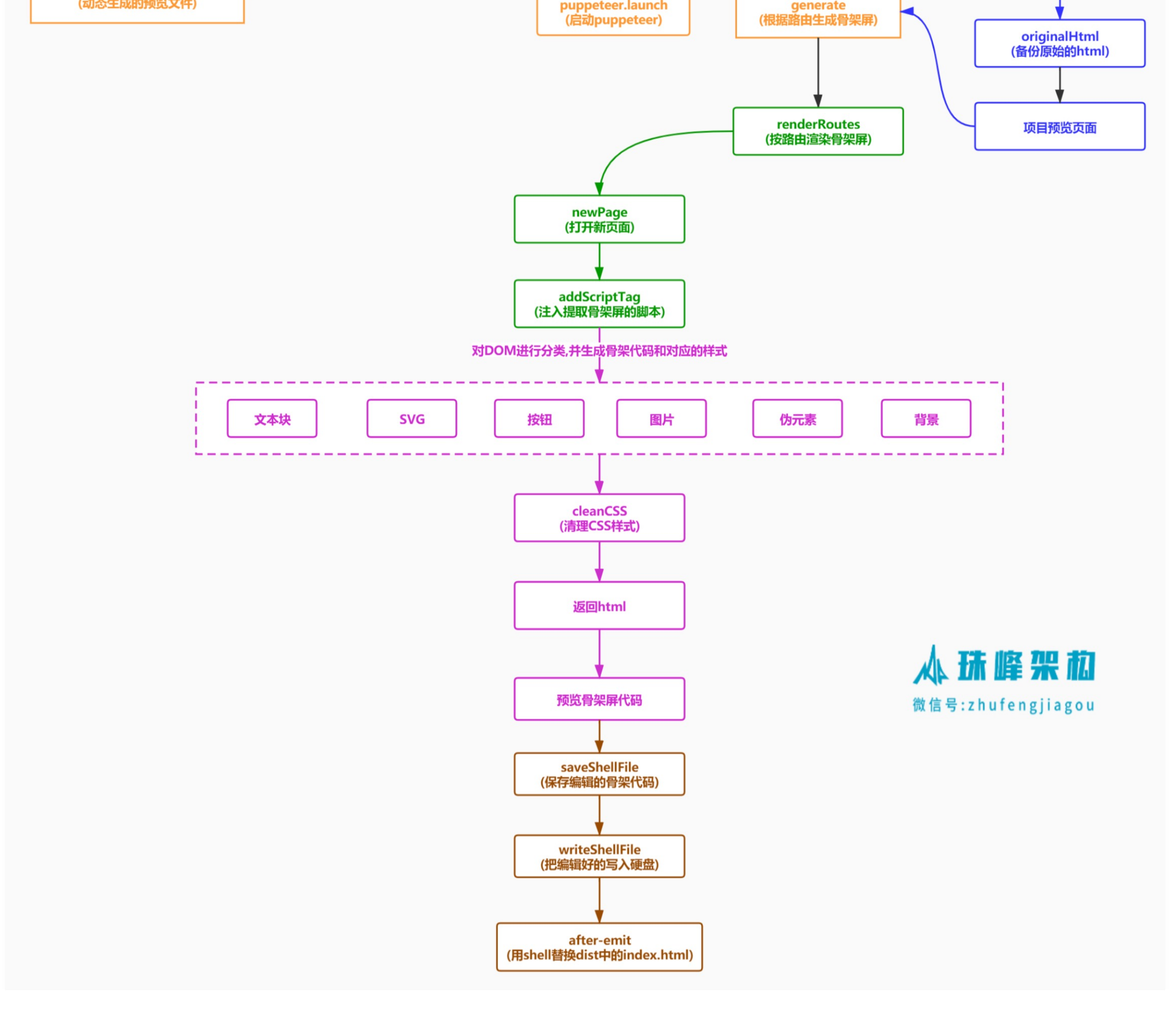
```
.avatar{
    width: 750px;
}
```

8.3 output.css

```
.avatar{width:10rem}
```

8.4 ast.json

```
{
    "type": "StyleSheet",
    "loc": null,
    "children": [
        {
            "type": "Rule",
            "prelude": {
                "type": "SelectorList",
                "children": [
                    {
                        "type": "Selector",
                        "children": [
                            {
                                "type": "ClassSelector",
                                "name": "avatar"
                            }
                        ]
                    }
                ]
            },
            "block": {
                "type": "Block",
                "children": [
                    {
                        "type": "Declaration",
                        "property": "width",
                        "value": {
                            "type": "Value",
                            "loc": null,
                            "children": [
                                {
                                    "type": "Dimension",
                                    "value": "750",
                                    "unit": "px"
                                }
                            ]
                        }
                    }
                ]
            }
        }
    ]
}
```

9. 参考