

# 情報可視化論

第1回ガイダンス

システム情報学研究科

計算科学専攻

坂本尚久, 陰山聡

2017年4月11日

# Information Visualization

W01: Guidance

Graduation School of System Informatics

Department of Computational Science

**Naohisa Sakamoto, Akira Kageyama**

Apr. 11, 2017

# Purpose

- The importance of data visualization technique as a key component for the knowledge discovery from complicated and sophisticated Big Data is rising concurrent with recent advances in technology.
- The course discusses the elemental techniques of data visualization widely used in scientific, medical and industry fields in addition to computer graphics techniques.
- The purpose of the course is to understand the elemental algorithms of computer graphics and data visualization, and its implementations with GPU acceleration techniques.

# 目的

- 近年の爆発的な情報技術の進歩に伴い大規模・複雑化するデータから、そこに隠された特徴や変化を見逃さず、新たな知見を得るための情報可視化技術は、欠かすことのできない基盤技術として重要性が増している。
- 本講義では、コンピュータグラフィックスの要素技術に関する説明に加え、多くの分野で活用されている可視化の基本アルゴリズムについて解説する。
- 本講義では、コンピュータグラフィックスおよび可視化基本アルゴリズムとGPU(シェーダ)を使ったプログラミングの習得を目標とする。

# Keyword

- Computer Graphics
- GPU
- Shader
- Data Visualization
- Isosurface Extraction
- Volume Rendering

# Schedule

- General information
  - Q1
  - Tue (13:20 - 14:50)      Classroom lecture
  - Wed (13:20 - 14:50)      Programming exercise

# Schedule

- W01 4/11 Guidance
- W02 4/12 Setup
- W03 4/18 Introduction to Data Visualization
- W04 4/19 CG Programming
- W05 4/25 Rendering Pipeline
- W06 4/26 Coordinate Systems and Transformations
- W07 5/09 Shading
- W08 5/10 Shader Programming
- W09 5/16 Visualization Pipeline
- W10 5/17 Data Model and Transfer Function
- W11 5/23 Scalar Data Visualization 1 (Isosurface Extraction)
- W12 5/24 Implementation of Isosurface Extraction
- W13 5/30 Scalar Data Visualization 2 (Volume Rendering)
- W14 5/31 Implementation of Volume Rendering
- W15 6/06 Student Presentations

# Schedule

•	W01	4/11	Guidance	INTRODUCTION
•	W02	4/12	Setup	
•	W03	4/18	Introduction to Data Visualization	
•	W04	4/19	CG Programming	
•	W05	4/25	Rendering Pipeline	CG
•	W06	4/26	Coordinate Systems and Transformations	
•	W07	5/09	Shading	
•	W08	5/10	Shader Programming	
•	W09	5/16	Visualization Pipeline	VIS
•	W10	5/17	Data Model and Transfer Function	
•	W11	5/23	Scalar Data Visualization 1 (Isosurface Extraction)	
•	W12	5/24	Implementation of Isosurface Extraction	
•	W13	5/30	Scalar Data Visualization 2 (Volume Rendering)	
•	W14	5/31	Implementation of Volume Rendering	
•	W15	6/06	Student Presentation	



# Grading and requisites

- Grading is based on results of each exercise and one final report.
- Although JavaScript and Three.js will be used in the exercises, the experiences of JavaScript programming won't necessarily be required.
- Textbooks will be appropriately instructed for each class.

# Website

- <https://goo.gl/YM49ts>

<https://sites.google.com/site/kobeinfovis2017>

## 情報可視化論2017年

▼ Information Visualization

[W01: Guidance](#)

[W02: Exercise - Setup](#)

[サイトマップ](#)

### Information Visualization

The importance of data visualization technique as a key component for the knowledge discovery from complicated and sophisticated Big Data is rising concurrent with recent advances in technology. The course discusses the elemental techniques of data visualization widely used in scientific, medical and industry fields in addition to computer graphics techniques. The purpose of the course is to understand the elemental algorithms of computer graphics and data visualization, and its implementations with GPU acceleration techniques.

**Keywords:** Computer Graphics, GPU, Shader, Data Visualization, Isosurface Extraction, Volume Rendering

#### GENERAL INFORMATION

Tuesday, 13:20 - 14:50, Classroom lecture  
Wednesday, 13:20 - 14:50, Programming exercise

#### INSTRUCTOR

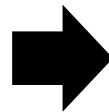
Naohisa Sakamoto, Akira Kageyama

#### SCHEDULE

**Week 01.** 4/11, Guidance  
**Week 02.** 4/12, Exercise (Setup)  
**Week 03.** 4/18, Introduction to Data Visualization  
**Week 04.** 4/19, Exercise (CG Programming)  
**Week 05.** 4/25, Rendering Pipeline  
**Week 06.** 4/26, Exercise (Coordinate Systems and Transformations)  
**Week 07.** 5/09, Shading  
**Week 08.** 5/10, Exercise (Shader Programming)  
**Week 09.** 5/16, Visualization Pipeline  
**Week 10.** 5/17, Exercise (Data Model and Transfer Function)  
**Week 11.** 5/23, Scalar Data Visualization 1 (Isosurface Extraction)  
**Week 12.** 5/24, Exercise (Implementation of Isosurface Extraction)  
**Week 13.** 5/30, Scalar Data Visualization 2 (Volume Rendering)  
**Week 14.** 5/31, Exercise (Implementation of Volume Rendering)  
**Week 15.** 6/06, Student Presentations

# Polling

- Take the poll



W01: Guidance

2017/04/11

\*必須

Student ID Number \*

回答を入力

Name \*

回答を入力

What do you want from this class? \*

回答を入力

送信

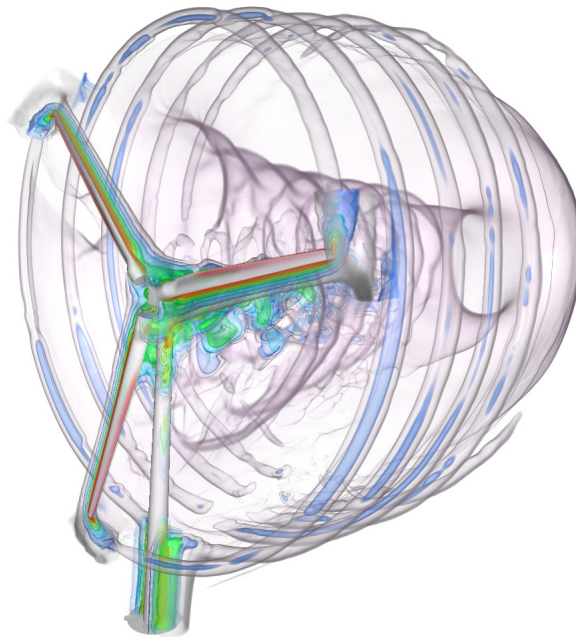
Google フォームでパスワードを送信しないでください。

# Goal

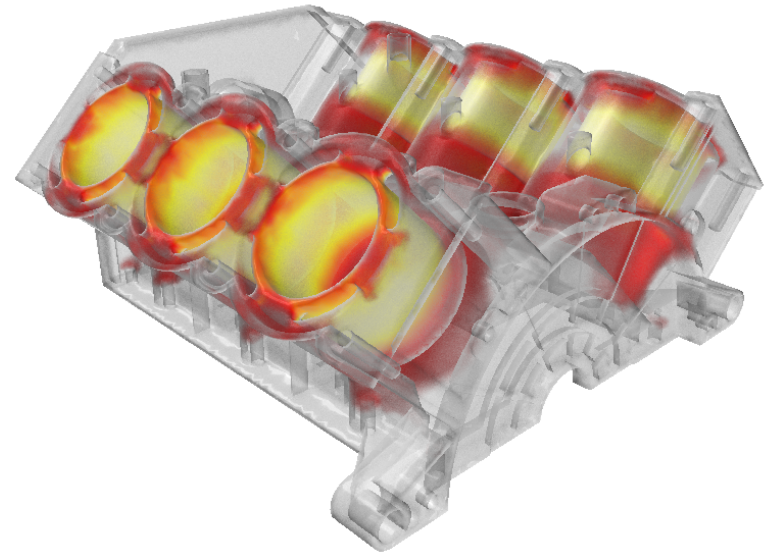
- Final goal of this course is to implement **Volume Rendering** method for the volume dataset with **JavaScript**.



[S.Bruckner, et al., EuroVis 2005]



[M.Shih, et al., LDAV2014]



[N.Sakamoto, et al., PacificVis (VisNotes) 2014]

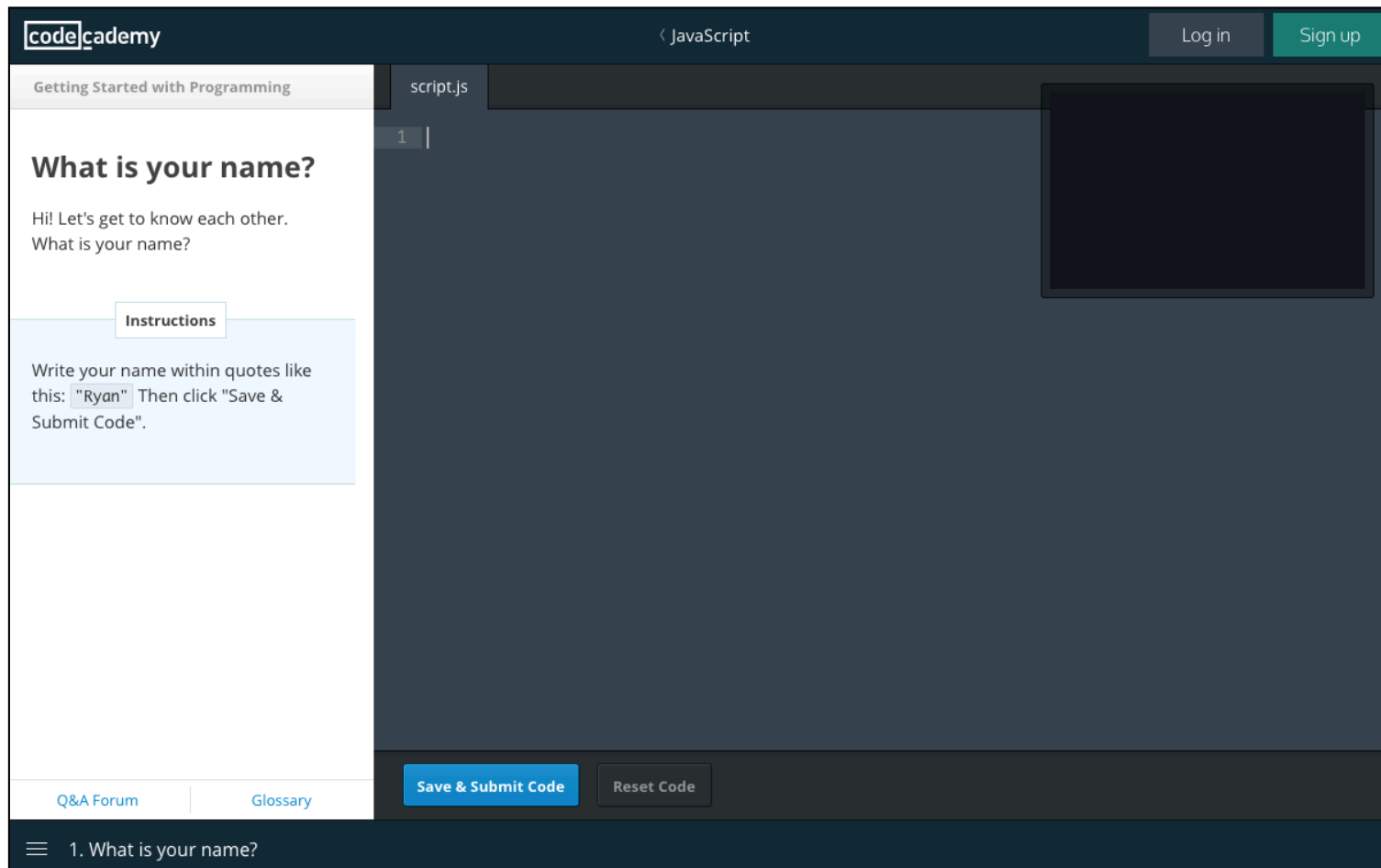
# JavaScript

- A high level, dynamic, untyped and interpreted programming language
- Standardized in ECMAScript language specification

```
<html>
  <head>
    <title>Sample</title>
  </head>
  <body>
    <script>
      document.write("Hello World!");
    </script>
  </body>
</html>
```

# Code Academy

- [www.codecademy.com](http://www.codecademy.com)



# WebGL

- WebGL = Web Graphics Library
- JavaScript API for rendering interactive 2D and 3D graphics within web browser

WebGL - 3D Canvas graphics - OTHER Global 57.51% + 26.35% = 83.86%

Method of generating dynamic 3D graphics using JavaScript, accelerated through hardware

Current aligned Usage relative Show all

IE	Edge *	Firefox	Chrome	Safari	Opera	iOS Safari *	Opera Mini *	Android Browser *	Chrome for Android
								4.3	
8			47					4.4	
9		44	48	9		8.4		4.4.4	
11	13	45	49	9.1	36	9.2	8	47	49
	14	46	50	TP	37	9.3			
		47	51		38				
		48	52						

<http://caniuse.com/#feat=webgl>

# Enable WebGL in Safari

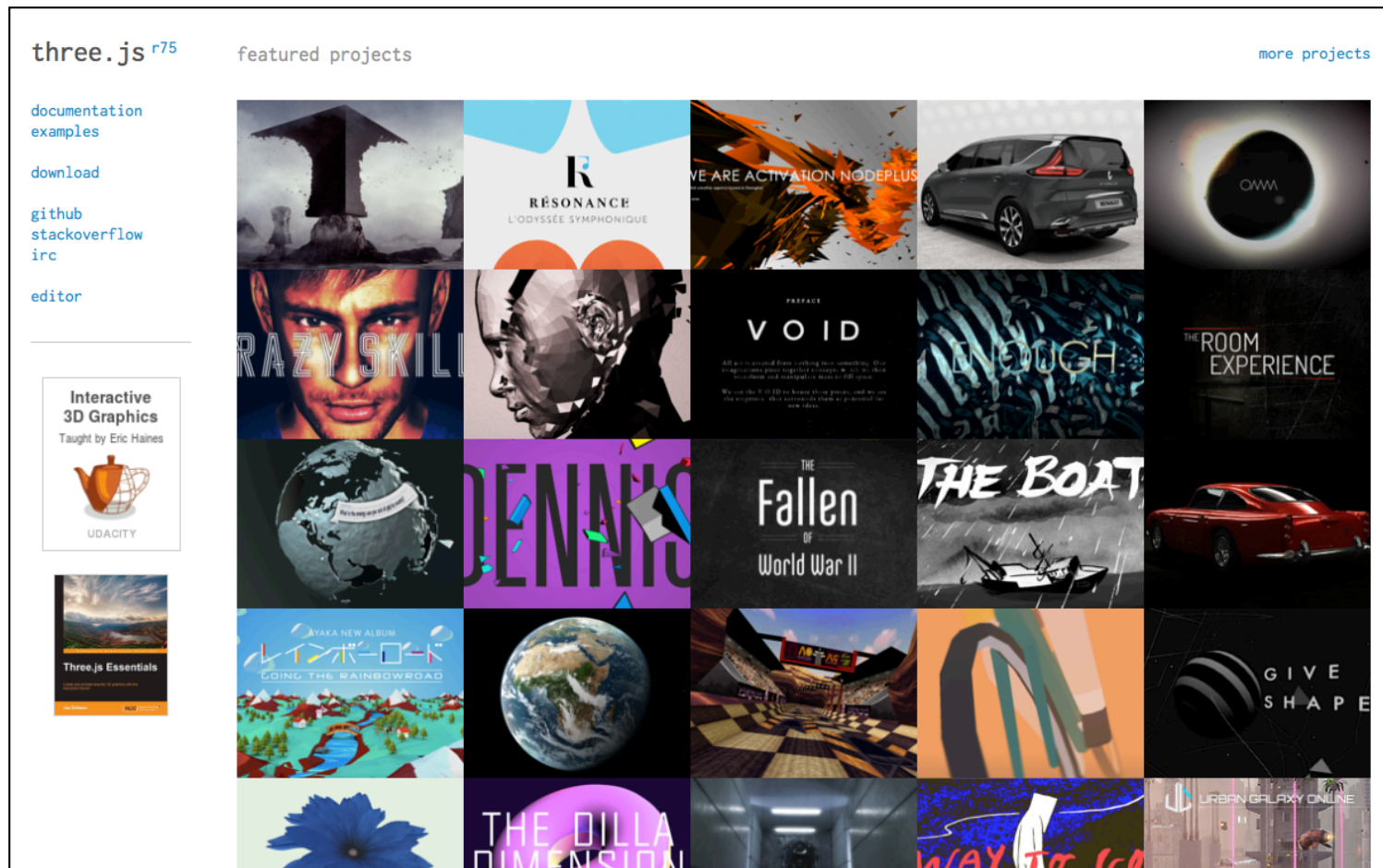
- Safari 8 or later
  - WebGL is enabled by default
  - Menu bar : Safari > Preference (環境設定)





# Three.js

- [threejs.org](https://threejs.org)



# Three.js

- [github.com/mrdoob/three.js](https://github.com/mrdoob/three.js)

The screenshot shows the GitHub repository page for `mrdoob / three.js`. The repository is a JavaScript 3D library with 14,823 commits, 3 branches, 67 releases, and 588 contributors. The page includes a navigation bar with links to Pull requests, Issues, and Gist. Below the repository name, there are buttons for Watch (1,608), Star (24,174), and Fork (7,853). The main content area shows a list of files and folders, including `.github`, `build`, `docs`, `editor`, `examples`, `src`, `test`, `utils`, `.gitignore`, `.npmignore`, `LICENSE`, and `README.md`. Each item is accompanied by a description of the change and the time since the last commit.

JavaScript 3D library. <http://threejs.org/>

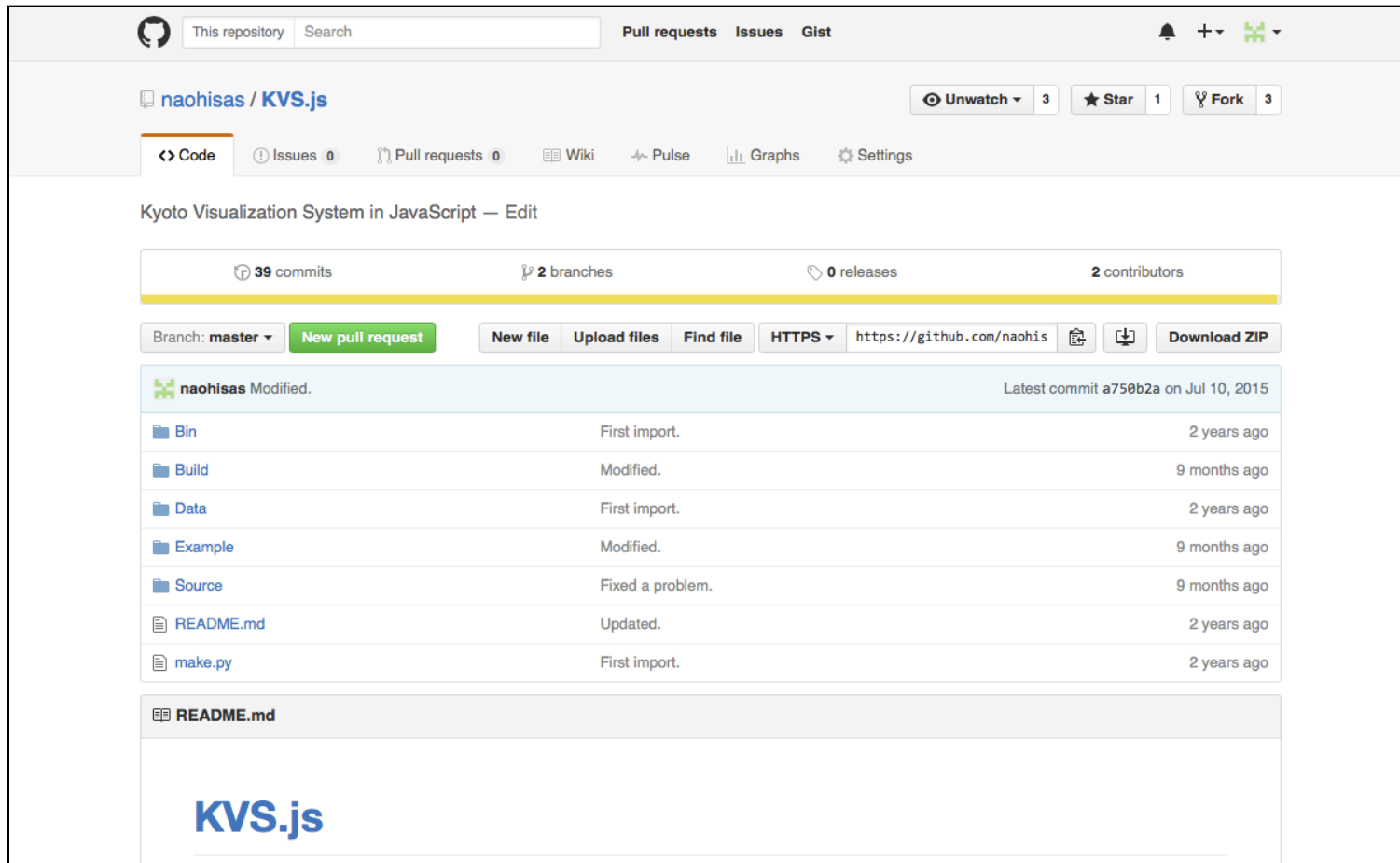
14,823 commits 3 branches 67 releases 588 contributors

Branch: master New pull request New file Upload files Find file HTTPS https://github.com/mrdoob Download ZIP

File	Commit	Time
mrdoob Merge pull request #8442 from toji/standing_vr	7492dd8	13 days ago
.github	Update ISSUE_TEMPLATE.md to allow r75	20 days ago
build	r75	21 days ago
docs	Merge pull request #8334 from Mugen87/dev	22 days ago
editor	remove unused shareDepthFrom	23 days ago
examples	Added support for standing space to VRControls	15 days ago
src	r75	21 days ago
test	TorusKnotBufferGeometry: Parameter changes	a month ago
utils	New LatheBufferGeometry	27 days ago
.gitignore	Merged changes from master- into dev-branch #17	7 months ago
.npmignore	Removed the src/extras from npmignore, which is already included in t...	5 months ago
LICENSE	Update LICENSE	3 months ago
README.md	Fixed jsfiddle. See #8185.	a month ago

# KVS.js

- [github.com/naohisas/KVS.js](https://github.com/naohisas/KVS.js)



This repository Search

naohisas / KVS.js

Unwatch 3 Star 1 Fork 3

Code Issues 0 Pull requests 0 Wiki Pulse Graphs Settings

Kyoto Visualization System in JavaScript — Edit

39 commits 2 branches 0 releases 2 contributors

Branch: master New pull request

New file Upload files Find file HTTPS https://github.com/naohis Download ZIP

naohisas Modified. Latest commit a750b2a on Jul 10, 2015

Bin	First import.	2 years ago
Build	Modified.	9 months ago
Data	First import.	2 years ago
Example	Modified.	9 months ago
Source	Fixed a problem.	9 months ago
README.md	Updated.	2 years ago
make.py	First import.	2 years ago

README.md

## KVS.js

# Polling

- Take the poll
  - Student ID Number
  - Name
  - What programming languages do you have experience with?
  - What do you want from this course?