Easy As Pi

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Motivation

Help elementary school students practice math through computer generated math problems

Goals

- Create engaging, easy to use interface
- Support major math problem types
- Provide progression system and statistic tracking

Requirements

Functional:

- Display 6 different types of computer generated math problems
- Track student progress and statistics and increase difficulty of math problems as student progresses
- Allow teacher to view student progression and set daily math problem types in their virtual classroom

Non-Functional:

- Fetching math problems must take less than 100ms
- Support all common screen sizes (750x1334 through 1440x2960)
- Authentication details protected with no critical information stored in database

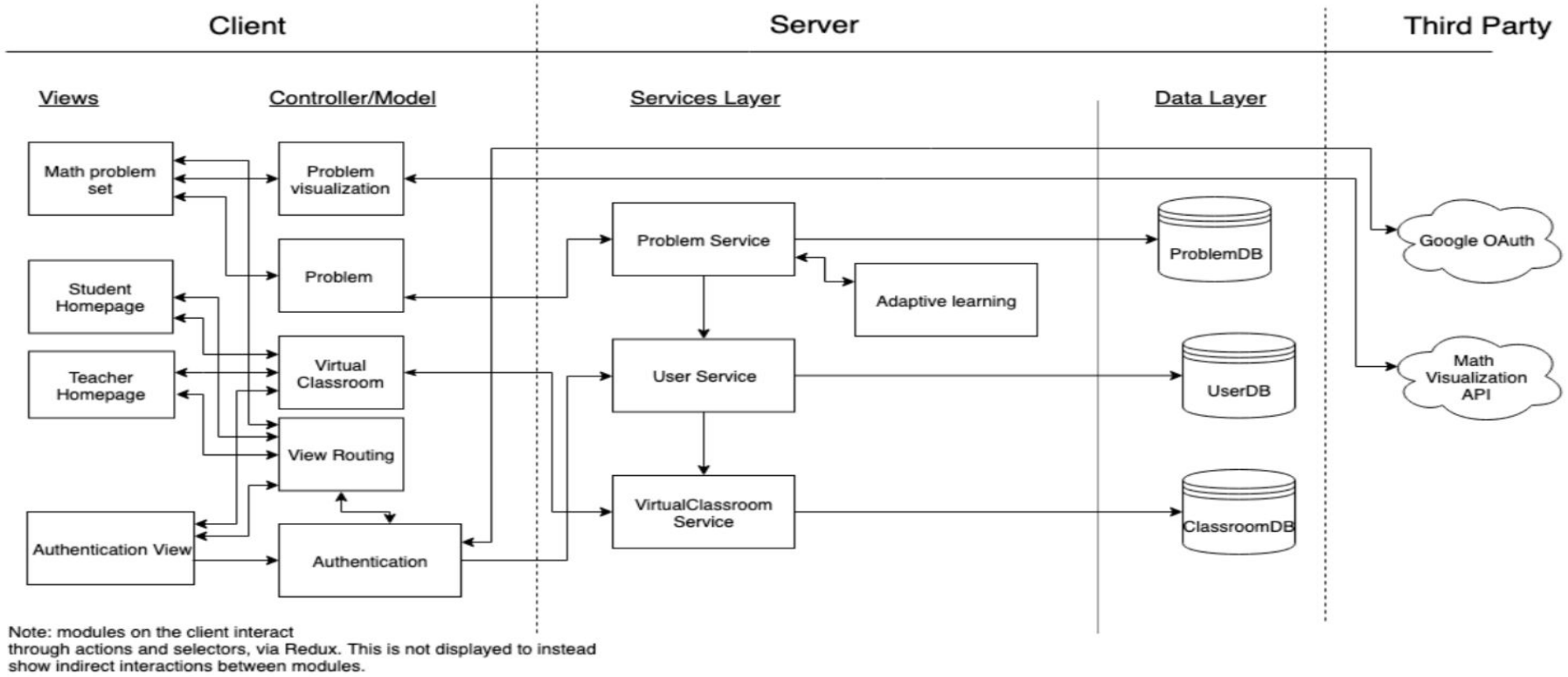
Use Cases

- Student can complete daily problem sets of computer generated math problems that are tailored to their skill level
- When students finish their daily problem set, their teacher will receive a push notification about their progression
- Teachers can define which problem types their students will practice on a daily basis
- Students and teachers can create accounts in the app via Google OAuth

Architecture

Front-End: React-Native, Redux, Redux Sagas, Axios, Expo

Back-End: Express, Node.js, Typescript, Mongoose, MongoDB



Testing

Front-End:

- Cavy

Run Results:

Register: registers a student ✓
Register: handle wrong classroom passcode ✓
Register: handle invalid name for student registration ✓
Register: handle invalid classroom name for student registration ✓
Register: handle invalid classroom passcode for student registration ✓
Register: registers a teacher ✓
Register: handle invalid name for teacher registration ✓
Register: handle invalid classroom name for teacher registration ✓
Register: handle invalid classroom passcode for teacher registration ✓
Register: handle no internet connection ✓
Login: logins a student ✓
Login: logins a teacher ✓
Login: handle no internet connection ✓
Math problems: correctly handles a correct answer ✓
Math problems: correctly handles an incorrect answer ✓
Math problems: allows switching between solution and problem ✓
Math problems: shows a done screen when the problem set is complete ✓
Math problems: handle no internet connection ✓

Back-End:

- Jest, Supertest, Mockingoose

Run Results and Coverage:

```
 PASS  src/__tests__/classroomService.test.ts
 PASS  src/__tests__/nextProblemService.test.ts
  pi:route problemType: addition difficulty: g1e +0ms
 PASS  src/__tests__/mathService.test.ts
 PASS  src/__tests__/generateGeometryProblem.test.ts
 PASS  src/__tests__/masteryService.test.ts
 PASS  src/__tests__/userService.test.ts
 PASS  src/__tests__/generateArithmeticProblem.test.ts
 PASS  src/__tests__/generateNumbers.test.ts
 PASS  src/index.test.ts
-----------------------------|---------|----------|---------|---------|-------------------
File                         | % Stmts | % Branch | % Funcs | % Lines | Uncovered Line #s
-----------------------------|---------|----------|---------|---------|-------------------
All files                    |   68.56 |     49.5 |   65.71 |   68.15 |
 database                    |   94.23 |       50 |       0 |   93.75 |
  achievements.ts            |     100 |      100 |     100 |     100 |
  classroom.ts               |     100 |      100 |     100 |     100 |
  index.ts                   |   86.36 |       50 |       0 |   83.33 |          25,30,32
  mockData.ts                |     100 |      100 |     100 |     100 |
  users.ts                   |     100 |      100 |     100 |     100 |
 database/mastery            |     100 |      100 |     100 |     100 |
  mastery.ts                 |     100 |      100 |     100 |     100 |
  problemMinimumDifficulties.ts |     100 |      100 |     100 |     100 |
 database/templates          |     100 |      100 |     100 |     100 |
  arithmeticProblemTemplate.ts |     100 |      100 |     100 |     100 |
  geometryProblemTemplates.ts |     100 |      100 |     100 |     100 |
 service                     |   52.61 |    36.44 |   55.81 |   51.76 |
  classroomService.ts        |   48.94 |    17.86 |      60 |   47.62 | ... 97,103,104,108
  masteryService.ts          |   30.48 |    16.67 |   21.43 |   30.77 | ... 39,340,342,349
  nextProblemService.ts      |   71.43 |    55.88 |   81.82 |   71.23 | ... 82,191,192,194
  userService.ts             |   79.49 |       65 |      75 |   77.78 | ... 58,69,76,77,78
 service/math                |   79.31 |    68.75 |    91.3 |   79.58 |
  generateArithmeticProblem.ts |   71.05 |    56.25 |      90 |   70.42 | ... 99,300,329,330
  generateGeometryProblem.ts |      80 |    58.33 |     100 |   80.77 | ... 63,164,170,182
  generateNumbers.ts         |   86.44 |      100 |      80 |    87.5 | ... 63,164,165,169
  mathService.ts             |   92.31 |       75 |     100 |   91.67 |                25
 service/utils               |     100 |      100 |     100 |     100 |
  mongo.ts                   |     100 |      100 |     100 |     100 |
-----------------------------|---------|----------|---------|---------|-------------------

Test Suites: 9 passed, 9 total
Tests:       33 passed, 33 total
Snapshots:   0 total
Time:        3.9s
Ran all test suites.
Done in 5.00s.
```

Most Important Lesson

Communicating and coordinating effectively amongst group members is a difficult challenge