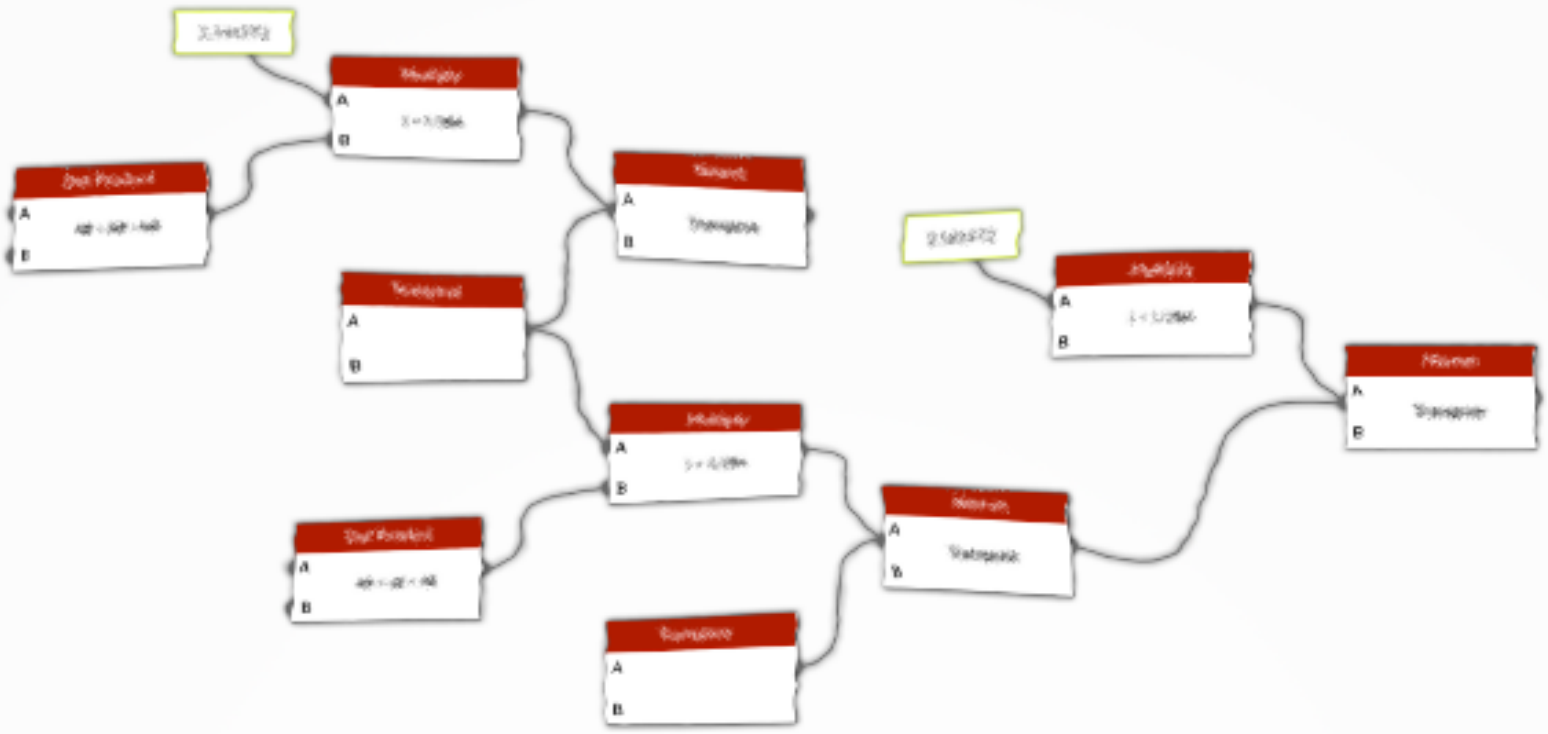
Computational Graphing

Compiax

Tender

May

2017



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Project Overview

Our Vision
Our vision of this project is a very easy to use, web based, interpreted programming language. We see this tool as a way for people, who may not be able to code, to write there own, short mathematical programs. It is important that this part of the tool be treated as any interpreter program would. Implementing typical interpreter components, such and lexical analysis and syntax analysis, is important to ensure that the libraries and packages, written by the user, preform in a reliable and consistent manner, such that the user can trust whatever output their functions return.

Our Vision
Our plan is try and write the interpreter in such a way that it can be run in either python or JavaScript on the client's side, to ensure that output is produced and displayed as fast as possible, as well as remove pressure from the server. However, we do see this interpreter possibly getting to larger to pass through to the client, depending on what functionality is already implemented for the user (mathematical operations, control structures, etc.), so running the interpreter on the server side may be the best option in order to keep the web tool light weight.

Goals and Requirements
It is also extremely important that the web tool is easy to learn and use, as it will be used primarily by people who do not necessarily understand computer programming. We do not want to overwhelm new users with too many options that they may not understand, but at the same time we do want to provide them with all the tools that they could possibly need to create any function, as well as provide them with any all the information, about their libraries, that they could need. This is where we see UI design being important. We will need to create the website in such as way that users will be able to find whatever they may want easily and without getting confused and frustrated. Our team fully believes in good, intuitive GUI design that will make the users feeling comfortable when using our software. We would like to make use of a popular HTML/CSS framework, such as materialize CSS, to give the final product a very clean and modern look, well also speeding up our production time. We would also plan to do multiple usability tests towards the end of our development, to ensure that potential users will feel comfortable, and that we have succeeded in making the application intuitive for the users.

Backend Technologies
It is important that all user information be stored in a safe an efficient manner on the back-end, and that information retrieval be fast. That is why we propose making use of the MEAN stack when creating the server and database. The MEAN stack will allow us to create a fast, custom, web-server to handle and request that the user may have. Such requests would include, logging into the users account, fetching

libraries that the user may currently be working on, exploring other users libraries and profiles, etc. A mongo database will allow for extremely fast data retrieval allowing the server to respond to more requests in a shorter time than a LAMP stack implementation. A MEAN stack implementation will allow us create a separate gateway for external components to access the libraries created by uses, as mentioned in the original brief.

Additional Features

A possible potential feature that we would like to add to this tool, is the ability to download libraries and packages as a Java, C++ or Python class. The user would simply create and test the library on the web application and then select an option to download it as a programming language class. The library would then be sent to the NodeJS server, which would translate the graph into a class, and return the file to the user. Users could also download any public libraries that someone else has implemented, to use in their own programs. The would not be such a tough feature to implement if we treat this application as an interpreter, as we will just be translating code. This feature will allow programmers the ability to quickly write and test mathematical functions which they can the use in their programs. This could help attract more users which a different skill set to the site.

The following is our proposed deployment of the system:

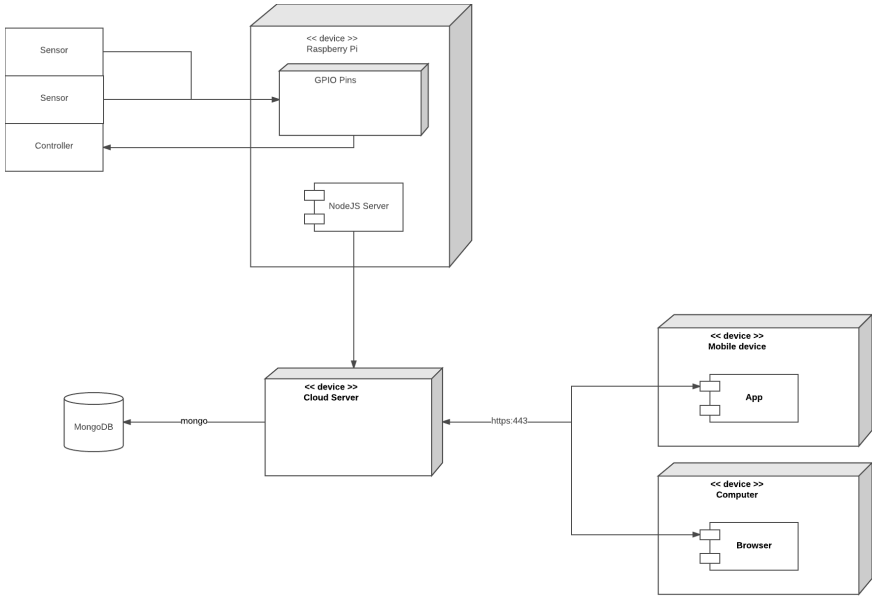


Figure 1: Deployment Diagram

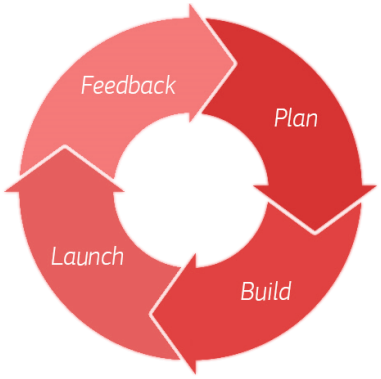
Proposed Methodology

We value the relationship formed between the client and our team and the importance of having a good relationship. So much so that we want to include you throughout the whole process of building your project by presenting demos and working with your feedback; as well as keeping you up-to-date on our progress.

Our Methodology
This all forms just one part of the methodology we've chosen to development your project. The agile method. Specifically, feature driven development. One of the biggest advantages about this is that we can quickly and easily incorporate feedback into the system.

Procedure
We will begin by developing an overall model of the system. The model will represent our solution and how we intend to develop it. Once we have agreed upon the system model we can begin working on the feature list. This list will contain all the features you wish your project to have. We will ranks each as either a major or minor feature and begin working through such accordingly. For each feature we intend to develop a plan to construct the feature.

Development
Lastly, develop the features. As we go through we'll go through each feature on the feature list we'll create the plan, develop the feature and move to the next feature. We believe this will provide the best experience for communication and producing the product.



Timeline

We would like to meet our clients as soon as possible to begin discussing your vision for the project and to clarify as much as possible before we begin work. Currently there are 3 demos assigned for this project:

- Demo 1: 26th May
- Demo 2: 28th July
- Demo 3: 1st September

During these demos we will show you the progress we have made and get feedback from you about what you like and what you would want changed. Our current plan for the demo meetings are as follows:

- Demo 1: Discuss requirement documentation that we have produced, as well as demo a mock front-end that we have produced to demonstrate how these requirements can be met.
- Demo 2: Discuss design documentation that we have produced, as well as demo the progress we have made with the various subsystems of the project.
- Demo 3: Demo the various subsystems of the project, and potentially have a working, integrated prototype of the full system, as well as present some user documentation.

During each of these demo sessions, we would appreciate any feedback that you may have. Any criticisms or advice that you may have for us will be greatly appreciated, as we greatly value your input and believe that it is important in order to deliver the product that you require. During the final evaluation phase, which begins on the 13th October, our client will receive all of documentation as well as a fully integrated system.

Please note that, as the client, you are more than welcome to adjust this timetable as you see fit. Additionally if you would like to have any additional meetings to check our progress, or make an adjustment to the specification, we would be more than happy to arrange it. We believe the more input we get from you as a client, then more refined the final product will be.

The Team

Dimpho Mahoko

Software Developer

I am an aspiring software developer looking to gain new skills and develop those I already have. Notable skills include web development, Java, C++, JavaScript, PHP, HTML.
Below are my accomplishments worth mentioning in no particular order.

- Second place in the Standard Bank IT challenge finals in 2016.
- Webmaster at Tuks FM from September 2016 till present. Responsibilities include maintaining the website and keeping it up to date.
- Mentor at The University of Pretoria EBIT Week for EBIT Marketing.
  Responsibilities include database administration, website maintenance and all other admin related responsibilities like communication with parents whose children wish to attend EBIT Week.
- 2016 Retro Rabbit Rabbiteer program attendee
  The program was focused mainly on giving programming students an idea of how work in the industry is actually done. Notable technologies learnt include GitHub integration with team work and cloud computing and hosting.

Jason van Hattum

Team Leader | Android Developer

I am a motivated developer and student with a passion for application and web-app development, currently studying a BSc(Computer Science). Technologies that I am fluent in include full-stack MEAN and LAMP development, Java, C++, Android, Python and Django. I have experience in project management, web-app development and Android application development.

I enjoy experimenting in my free time, especially working on side projects on my Raspberry Pi and building Android applications. I also enjoy making graphical programs in WebGL. My hobbies also include reading, playing games, and fishing.

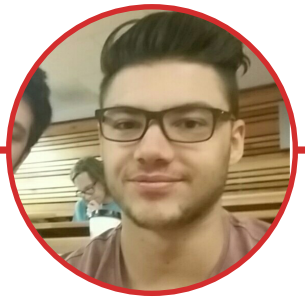
Projects that I have worked on include:

- A web application for the University of Pretoria used for peer-review and team evaluation within major projects (Can be found here.). Skills that I developed here include front-end languages such as HTML, CSS, and Javascript; Python and Django.
- A variety of Android applications as a freelancing developer, both front-end and back-end. Skills developed here include Android development, Google Firebase, interface design and NodeJS.

Accomplishments and work experience:

- A member of the Golden Key International Honours Society.
- A teaching assistant and tutor for multiple subjects since January 2016.
- Participated in the Standard Bank IT Challenge in 2016 and 2017; and ACM in 2016.

Kyle Erwin



UX Designer | Software Developer

Currently studying a BSc Computer science. I'm a well rounded programmer with many skills in many languages. My passion lies in artificial intelligence and creating applications with an intuitive design. I'm a harder worker that is known to be "on top of things" by my peers.

I've worked in many leader positions and understand the importance of synergy in a team. Most noteworthy, I was apart of the TukVillage residence committee and the graphic designer for all of the events (2015 - 2016). I launched a web development company, unhinged.co.za, with team member Keegan Ferrett. My work has also extended to app development and partnerships with small start-up companies.

In my free time I often find myself programming on personal projects, coming up with new concepts and focusing my time on perfecting my artificial intelligence skills.
More about me and my skills:

- Up-to-date with all the latest design trends.
- Used applications such as Google Analytics, webmaster and Google Trends.
- Written many C++ tutorials for beginner programmers.
- Business skills and working with clients.
- An understanding of scala, a programming language great for AI.

Joshua Cilliers

Graphic Design | Software Developer

I am currently in my final year of studying a BSc Computer Science and hoping to continue on to Honours. I'm an aspiring programmer with a broad set of skills that go beyond programming. I hope to move further into the development of complex systems, on both the front and back end of development. I enjoy broadening my experiences as much as possible and am always eager to attempt new projects and to learn more while doing so.

My programming experience includes being fully fluent in C++, Java, LAMP and MEAN stack development, and Python. I have also worked on projects for iOS and Android and have experience with tools and frameworks such as Ionic.

I offer freelance web development and social media marketing services in my free time when I'm not pursuing my own hobbies and interests.

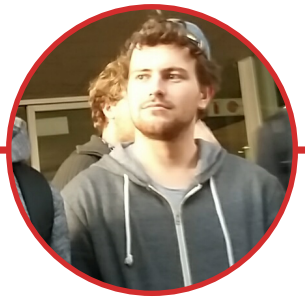
My current personal hobby is attempting to learn about the development process in Unreal Engine 4 so that I can contribute to the open-source Unreal Tournament project.

My other hobbies include photography, photo-editing and film-editing, tinkering with hardware, game development (specifically level and systems design), and reading and writing.

My skill-set and interests include:

- A focus on developing well rounded systems.
- Experience in designing the front-end of websites and a handful of systems.
- Experience in developing for the back-end of systems.
- A willingness to learn new languages and technologies.

Keegan Ferrett



Project Manager | Physical Computing

Currently in my final year of studying BSc Computer Science. I am an aspiring software developer with a love for mathematics and problem solving. I am a passionate programmer who is excited to develop my skills and knowledge. I enjoy taking on leadership roles and pushing myself with exciting and large projects.

I have launched a website designed and development business, unhinged.co.za, with another team mate Kyle Erwin. My role in the business is mostly backend development and running the business's accounting, however our vision is to one day extend into larger, and more complex projects, which we hope with this give up the experience to do.

During my free time I enjoy working on my Android app development skills, experimenting with physical computing (skilled with using Raspberry Pis and Arduinos), as well as competing in various programming and problem solving contests. Some contests that I have completed are: Standard Bank IT Challenge 2016 and 2017, ACM 2016, and HackFu challenge 2016.

Below are some of my passions and interests:

- Android App Development
- Mathematics
- Compiler Design and Construction
- Physical Computing and Electronic Engineering
- Computer Networks and Security

Why Albert Prime?

Compiler
Two of our members have both completed the compiler construction course at the University of Pretoria, and will be able to apply the knowledge gained from building a compiler into building the necessary components needed for the interpreter component of this project. It is important that this is done correctly to ensure that no unexpected errors or crashes occur when a user is testing their created library. Although this may be seen as a very basic interpreter, it will still be important to implement all the necessary components of an interpreter/compiler to ensure that, even as functions and projects get larger, the user can still be sure that they are getting reliable and consistent results, without running the risk of potentially crashing the NodeJS server. It will also give us the ability of being able to add more basic, such as if statements and loops, with little effort.

Frontend and Backend
Every member of our team has experience with working on front-end and back-end web development. This is necessary for this project as our vision for the final product would involve much of what the user is seeing, being done on the client's side, as well as having administrative tasks, being worked on on the back-end. The front-end needs aesthetically pleasing as well as being easy to use and intuitive, well the back-end needs to be secure, safe, and reliable to ensure that no personal data is lost and that the web server stays up and running at all times. Each member has experience working with the MEAN stack giving us the advantage of not needing to relearn the the technologies used in a MEAN stack implementation.
Finally, each member of our team is a skilled mathematician, having completed calculus, linear algebra, and discrete mathematics courses. This means we will not have any trouble implementing and testing the mathematical logic. We will be able to account for any possible need that a user may have, such as binary mathematics, discrete mathematics, or linear algebra operations.

Figure 2: The Squad