SDAT Feasibility Report Contribution

Programming Language Consideration

The following is a list of proposed programming languages that could be used to implement the proposed project, each language description discusses their pros and cons along with the development team’s experience in each.

### Java

The first language under consideration for a possible solution will be the Java programming language; the Java language offers a few advantages as well as a few disadvantages, both of which will be touched on here. The first and probably most significant advantage is that Java is compatible with any machine that supports the Java Virtual Machine, when a Java program is compiled it is compiled into an intermediary language that the Java Virtual Machine can interpret and run, this advantage contributes to working out Dr. Pennington’s need of having the system execute on multiple operating systems (i.e. OSX, Windows, Linux). The next advantage that will be touched on next is in that Java is object-oriented, this feature aids developers to design the implementation of a system in a modular way that separates the different concerns of the overall system. The next significant advantage of Java that will be touched on here is that Java can create multiple threads of execution without the need of many system calls to the operating system, this feature allows the program to perform several tasks at once thereby addressing Dr. Pennington’s requirement that the proposed system is to perform in near real time. In the context of the programming team’s (SDAT) familiarity with the Java programming language, each member is proficient in the language and have the knowledge necessary implement the proposed system in the Java language.

To bring light to the main disadvantage of the Java programming language we look at what is considered one of its strongest advantages the Java programming language has. Since Java compiles its code into an intermediary code that can be interpreted on any system it is an interpreted language, that means that every time the program executes the computer must first interpret the code and then execute it. In the context of the proposed system this disadvantage conflicts with the client’s needs of having the system perform in real time.

### ANSI C & C++

The next Programming language for consideration is the ANSI C Language. The first advantage of using C is that unlike Java, which we previously discussed, is that once a C program is compiled it is compiled specific to the computer’s specific hardware architecture allowing it to run on the system itself. Which makes the C programming language very powerful in the sense that the programmers are able to manipulate the lower levels of the computer system such as memory. In light of the fact that C is able to work with the hardware directly this gives the C programming language a speed advantage that Java does not have, in Java the programs must be executed on a virtual machine where in C it runs on the computer’s hardware, this satisfies the client’s need of having the system perform in near real time. The development team (SDAT) has a slight familiarity and little experience with programming in the ANSI C language, that is not to say that the team does not know how to program in the C language but rather there will need to be some time taken to deepen the understanding of the C language.

Since C++ and ANSI C are generally the same, we will also be talking about the advantages of C++ here. In comparison to ANSI C the only difference between the two languages is that C++ has the features of object oriented programming which as stated previously aids developers to implement their code in small modules. Like ANSI C when a C program is compiled into the computers specific hardware architecture it can run on the computer system itself, it is because of this the program can manipulate the computer’s lower level systems such as memory. It is also because the program can execute on the computer directly that allows the program to execute faster than languages like Java.

The largest disadvantage of the ANSI C programming language is that because it has the ability to work with the computer’s hardware directly, this is the language’s biggest advantage and disadvantage. The programmer(s) must take extra care when they write their code because even if the C compiler does not detect anything wrong with the code, it still may be harmful to the computer and could have disastrous consequences. The programming team’s (SDAT) need for a deeper familiarity with the C language, The development team (SDAT) has some knowledge and experience with the C language however some time will be needed in order to gain a more deeper knowledge of the language for the context of the proposed system.

To continue the earlier discussion of C++ we will discuss the disadvantages of using C++. To start, a major drawback of the C++ language is that even if it is done unintentionally the use of some libraries in the language can restrict the programs’ execution or limit it to certain computing operating systems. Another major disadvantage of C++ that is shared with ANSI C is that since the programs work directly on the computer system, great care must be taken when developing a program because if a program fails it may fail catastrophically and may cause harm to the computer system. Fundamentally ANSI C and C++ are basically the same, in this the SDAT development team has some basic knowledge of the language, but will need some time to gain a deeper knowledge of the language and become more proficient in it.

### Python

The Python language offers a couple of key advantages. The first of which is that Python is supported on multiple systems; this is made possible because the language is written in a portable ANSI C. Another feature of Python is its object-oriented capability, which, previously stated in the other object-oriented languages aids the developers in breaking down the larger components of the system into a smaller, more manageable modules.

Python contains a number of drawbacks, one of which is that it is not a good choice for programs that will be CPU intensive. This in the context of the proposed system would not be a good choice as the program will be doing analysis work to generate graphs and forecasting models, with this drawback in mind this language would not be suitable for this system at this time. The next disadvantage is that Python programs execute slower than programs written in ANSI C or C++, this is because Python is interpretive language. Which previously discussed, means that each time the program is to be executed the byte code that the program is compiled into must be interpreted before it starts its execution. Finally, since the Python language is still being developed and expanded there is a large amount of documentation available for current and past releases. The members of the development team (SDAT) have little to no knowledge programming in Python, because of this the team will need some time to become familiar with the language and its features.

### Javascript

Javascript offers several advantages and is under consideration to solve Dr. Pennington’s requirement of having the proposed system available through a web based solution. The first advantage is in Javascript it can create alerts to the user, this is advantageous because this meets Dr. Pennington’s request of having the system be able to alert the user of an anomaly. In web development something called a ‘Cookie’ might be saved to the user’s web browser, a ‘Cookie’ is a piece of data that relates to a web site that when retrieved by a website alerts the web site of the previous user’s activity on the web page. ‘Cookies’ were designed to remember the state or previous activities on a web page, they also contain data on what buttons were pressed, the log in information, ect. This brings us to the next advantage of using Javascript. Javascript has the ability to set and read ‘Cookies’ this can be helpful to the development of the web based solution that Dr. Pennington requested, at this time it is uncertain how this will be helpful; further research will need to be done. Another advantage of Javascript is that it is cross platform; this means that it is available to the different browsing applications such as Firefox, Safari, explorer, ect. This helps to meet Dr. Pennington’s request of the system to be available through a web-based solution because of its portability of web browsers.

Javascript has a few disadvantages that should be considered, the most key disadvantage deals with security. Javascript code executes on a user’s computer instead of executing on the server, this speeds up the execution and download of the code however this presents a great security issue. Since the code executes on the user’s computer, this feature can be exploited to allow malicious code to execute on user computers. Another issue is that there remains an element of unpredictability. In server side languages typically the program is interpreted and or run in one way and is distributed to the various client web browsers. Javascript however is interpreted and run on the client side, this brings about a level of unpredictability as to how the program will run on a particular client web browser. Lastly the SDAT development team has little knowledge and experience programming in Javascript, the team will need some time to gain a deeper understanding of the language.

### PHP

PHP will allow us to fulfill the request to have a web-based solution. An advantage PHP has is that it is platform dependent, meaning that it can run on different operating systems. Another advantage of PHP is that it can interface with databases; this is helpful since the system will access a database, we are looking at this language because the development team has some knowledge and experience programming in PHP to access and present information from a database. A major flaw in the PHP language is that it is primarily a web programming language, this in some ways limits what can the program can do. In order for the PHP language to be an effective solution to the system, the development team needs some time to become more familiar with the language.

These are the proposed languages that are under consideration to implement the proposed system, in most cases the SDAT development team needs some time to become familiar with some of the languages proposed here. These are the objective pros and cons of each language previously discussed along with the development team’s needs of each.