ENGINEERING METHOD

MEMBERS:

Daniel Ramirez

Brian Stiven Romero Restrepo

Sebastian Navia Ramirez - A00369304.

ALGORITHMS AND DATA STRUCTURES

UNIVERSITY ICESI

2021-2

**Problematic Context**

A medium-scale software development company has requested the implementation of a tool for the management of large information and that operations on this information be efficient in terms of time, this due to the fact that it will be dealing with a large database from of the statistics of many players belonging to the NBA which are useful for agencies associated with the analysis of player data to make use of this software.

**Solution development**

To solve the previous situation, the Engineering Method was chosen to develop the solution following a systematic approach and in accordance with the problematic situation raised.

Based on a summary from Chapter 5 of the Introduction to Engineering book. Paul H. Wright defined the next steps to follow to apply the engineering method, as well as a brief description of what will be done in each step of the method.:

**PHASE 1: IDENTIFICATION OF THE PROBLEM**

Proper identification and formulation of a problem is a crucial step in solving it. Here we will proceed to identify the problem for which this company has decided to develop this data management software.

**PHASE 2: COLLECTION OF THE NECESSARY INFORMATION**

Once the problem is identified and the needs are properly defined, the information and data necessary to solve it begins to be collected. We will perform a requirements elicitation, as well as all the necessary applications to create a solution.

**PHASE 3: SEARCH FOR CREATIVE SOLUTIONS**

We will develop a brainstorming session among the selected team members to carry out this problem.

**PHASE 4: TRANSITION FROM FORMULATION OF IDEAS TO PRELIMINARY DESIGNS**

In this phase, ideas that are not feasible are discarded and promising ideas are molded and modified to form workable plans and designs.

**PHASE 5: EVALUATION AND SELECTION OF THE BEST SOLUTION**

As the engineering design process evolves, we will evaluate the solution that best fits the problem.

**PHASE 6: PREPARATION OF REPORTS AND SPECIFICATIONS**

Once the best design has been selected, the most important aspects of the project will be documented.

**PHASE 7: DESIGN IMPLEMENTATION**

Once the preliminary project, specifications and engineering reports are finalized, the design of the best solution will be implemented to generate the solution system to the problem.

Now we proceed to make a detailed description of what was done in each phase of the method

**Phase 1 Identification of the problem:**

Basketball, one of the most popular sports worldwide due to many factors such as the simplicity of the game, massive practice around the world among other things, invented more than a century ago, has evolved as the analysis or storage technologies of Data among many other things are advancing, for example, there is more and more data on professional basketball players such as the times that a player scored points per game, passes, blocks, etc. Based on this, more and more tools are needed to store all this information that will gradually increase over time, that is why the problem that has been presented is the effective storage of this data and also that the operations related to a database is equally effective, since we will not only need to store a lot of information but also, for example, search very quickly for data so that experts in the field can analyze the data of professional players.

In addition to this, we proceed to elicit functional requirements for a deep and correct identification of the present problem:

RF1 Manage a basketball player

RF1.1 Add a basketball player with name, age, team he belongs to and 5 statistics

RF1.2 Modify any parameter of a basketball player

RF1.3 Eliminate any basketball player

RF1.4 Search ABBs for basketball players based on any of their parameters

RF2 Improve the effectiveness of player searches by parameters using ABBs

RF3 Import csv files that will contain basketball players, this will be another additional means to add players

RF4 Show the time it takes to search for players based on some parameter

RF5 Show the status of the program at all times using a graphical interface for this process

**Phase 2: Gathering the Necessary Information**

To solve this problem we need the following information

**GitHub**: It is a hosting platform, owned by Microsoft, that offers developers the possibility of creating code repositories and allows them to be stored in the cloud safely. It will be the tool used to work collaboratively.

**Generics:** Generics are a mechanism for providing compile-time checks.

It means parameterized types. Parameterized types are important because they allow you to create classes, interfaces, and methods in which the data type on which they operate is specified as a parameter. A class, interface, or method that works with a parameter type is called a generic, like a generic class or generic method.

**TAD:** In computer science an abstract data type (ADT) or abstract data type (ADT) is a mathematical model composed of a collection of operations defined on a set of data for the model.

**BST:** Binary Search is an efficient algorithm for finding an item in an ordered list of items.

**BBT:** AVL tree is a self-balancing Binary Search Tree (BST) where the difference between heights of left and right subtrees cannot be more than one for all nodes.

**Scene builder:** Scene Builder is written as a JavaFX application, supported on Windows, Mac OS X and Linux. It is the perfect example of a full-fledge JavaFX desktop application.

**IntelliJ IDEA:** is an integrated development environment for developing computer programs. It is developed by JetBrains, and is available in two editions: Community Edition and Commercial Edition.

**CSV:** CSV files are a simple open-format document type for representing data in table form, in which columns are separated by commas and rows by line breaks.

**Phase 3: Search for creative solutions**

For this phase, we decided to brainstorm ideas that we believe will be adequate to provide a solution to the problem, these solutions are as follows:

**Idea 1:**

Use the implementation of an appropriate design in a mobile application in order to facilitate access to information to the user at all times, this in turn would also give the advantage of being able to include mobile users and not only computer users as originally proposed in the problem**,** además de ello, la información se tratará por medio de archivos como los csv.

**Idea 2:**

Create a software that allows to store a large amount of data that will be stored in a data algorithm that helps us manage a large amount of information, the software will mainly be oriented to use in the IDE console to be used

**Idea 3:**

Create a software that allows to store a large amount of data that will be stored in the ABB and AVL data structures, these will allow effective operability for the easy and fast handling of this large amount of information, the visualization of the status of the software will be through a graphical interface

Apart from the 3 ideas proposed, sketches were created of what could possibly be the graphical interface of the solution model

Preliminary design submitted by Brian RomeroDiagrama

Descripción generada automáticamente

Preliminary designs submitted by Sebastian

Interfaz de usuario gráfica

Descripción generada automáticamente Interfaz de usuario gráfica

Descripción generada automáticamente

Interfaz de usuario gráfica

Descripción generada automáticamente Interfaz de usuario gráfica

Descripción generada automáticamente

Gráfico, Gráfico de embudo

Descripción generada automáticamente Gráfico, Gráfico de rectángulos

Descripción generada automáticamente

Preliminary designs presented by Daniel Ramirez

Diagrama

Descripción generada automáticamente

Gráfico

Descripción generada automáticamente

Imagen que contiene Diagrama

Descripción generada automáticamente

PHASE 4: transition from formulation of ideas to preliminary designs

In this phase, we proceed to evaluate the proposed solutions the one that comes closest to an adequate solution to the problem by filtering ideas.

When making this filter we realized that the ideas are not very far from an adequate solution, they all approach a certain point, although in the same way they have negative points, then we will make a detailed study of each of the solutions mentioning their points negative and positive of these.

**Idea 1:**

For this idea we discard the use of the mobile application since for this we need other knowledge as well as tools to implement a solution in these media but even so, from this idea what can be incorporated into an idea closer to the ideal solution is saving the information in csv files since this will allow the storage of large amounts of information that are already in the databases and thus save the time of having to add to the software player by player.

**Idea 2:**

This idea is considered very close to an appropriate solution, we must use an algorithm to store this great information and it will also be taught through a graphical interface.

**Idea 3:**

Analyzing this idea carefully, we notice a great similarity with idea number two which makes it close to an ideal or appropriate solution, but at the same time, it includes what type of algorithm this data will be stored in, these will be the ABB and AVL which allow an effective handling of large amounts of data.

After gathering the best and worst of each idea, the idea number one is discarded, except for the csv files, and from the idea number 2, the use of any algorithm except the way the program is displayed is discarded, then a solution will be created. ideal subject to changes during the project that best suits its proper functioning.

PHASE 5: evaluation and selection of the best solution

Reformulating the idea and putting together the best of the previous ideas, a solution that is probably the most effective is reached, which is the following

Create a software which allows to manage the data of the basketball players, this software will have a visualization through a graphical interface and will also use ABB and AVL as a means of managing the data, which reduce the time of each process that is carried out. run in the software thus delivering an optimal result so that those who wish to use this program for analysis can do so with confidence and efficiency.

In addition to this, sketches are presented to illustrate this adequate solution

Interfaz de usuario gráfica, Sitio web

Descripción generada automáticamente

Interfaz de usuario gráfica, Sitio web

Descripción generada automáticamente

Imagen que contiene Interfaz de usuario gráfica

Descripción generada automáticamente

Imagen que contiene Aplicación

Descripción generada automáticamente

Imagen que contiene Texto

Descripción generada automáticamente

Interfaz de usuario gráfica, Sitio web

Descripción generada automáticamente

Interfaz de usuario gráfica, Sitio web

Descripción generada automáticamente

Phase 6: Preparation of reports and specifications

In this phase, the documents that will support all the documents related to the project's solution will be located in the docs folder in the github repository.

Phase 7**:** design implementation

The implementation of this project will be carried out in the Java programming language and its code will be in a github repository, its access will be through the following link: