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Introduction to the project

What do we want to create?

We were asked to come up with a project idea that would have us use the Qt framework and its graphical user interface mechanisms as thoroughly as possible. The first few ideas that came to mind were game ideas because they are very demanding in GUI but we were not very enthused by the fact that we would have to be working with C++. So we thought about it a little further and the idea which came to us as the most interesting, that uses both GUI and C++ effectively, and that would produce a *useful* product is solving a Rubik’s Cube using a computer. The potential in that project lies in the fact that it would have to interact with the user in such a way that the latter can give the current status of their unsolved Cube and the program will solve the cube and output the series of moves to the user in a comprehensive way. The difficulty of this project lies in the implementation of the algorithmic hidden behind the resolution of the cube and using C++ lightens the amount of resources required to solve the cube, for this language handles RAM much better than Java, for instance, would.

Why did we choose this idea?

It actually came from the fact that Quentin and Thomas have learned how to solve Rubik’s Cubes over many years and have become very good at it; so good, that Quentin’s fastest cube resolution lies around the 20 seconds mark. As for Karim, he decided it would be very interesting to create an application that will have a utility beyond a simple game with no utility. This project is more a challenge than it is simply creating a program that uses GUI.

Researched information

The first step in starting this project was to do some research. We conveniently found a very diligent website called SolveTheCube that gathers many methods to solve Rubik’s Cubes in varying levels of difficulty. The method proposed by this website for “speedcubing” is called the Fridrich resolution, also known as CFOP, for it is the method used globally for solving cubes as fast as possible, but requires the *speedcuber* to learn and memorize 115 different algorithms each adapted for a very specific state that the cube is in. This means that the method is very case-based and the *speedcuber* has to verify constantly what is going on with the cube to know which algorithm to apply.

Notation

There exists an international notation for Rubik’s Cube solving also found on SolveTheCube. The basics are the following:

Moves are defined by the initials of the face it has to be executed in. For instance, the move U means that the Up face (relative to the way the cube is held) has to turn a quarter turn clockwise, and the move U' is a counter-clockwise turn of the Up face. Furthermore, the U2 move represents two clockwise quarter turn moves of the Up face.

For more details and a more in-depth explanation of the notation used for this project, the [notation](http://solvethecube.com/notation) page of SolveTheCube has all the information needed.

Inspired from program

As we didn’t know where to start with our project we looked over the internet if there were programs that already accomplished what we were trying to make. We found a few different programs written in different languages C#, Java, and C++ and the open source program [blank] was definitely the more user-friendly program, and was therefore more inspiring GUI-wise. Moreover, this program is open-source and we had a look at the code to see how the classes are implemented and what algorithm it uses to solve the cube. It has a function to solve the cube in the “god number” of moves, 20. Mathematicians and engineers have worked for years to finally discover that the maximum number of moves required to solve a cube as shuffled as it can be is 20. More information at the following [link](http://www.cube20.org/).