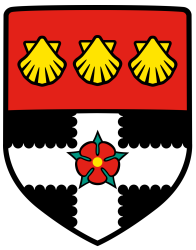

UNIVERSITY OF READING

DEPARTMENT OF COMPUTER SCIENCE

COMPUTER SCIENCE UNDERGRADUATE REPORT - RUBIK'S CUBE SOLVER

CALLUM CLATON DAVID MCLENNAN

Supervisor: MARTIN LESTER

A report submitted in partial fulfilment of the requirements of
the University of Reading for the degree of
Bachelor of Science in *Computer Science*

November 20, 2020

Declaration

I, Callum, Claton, David, McLennan, of the Department of Computer Science, University of Reading, confirm that all the sentences, figures, tables, equations, code snippets, artworks, and illustrations in this report are original and have not been taken from any other person's work, except where the works of others have been explicitly acknowledged, quoted, and referenced. I understand that if failing to do so will be considered a case of plagiarism. Plagiarism is a form of academic misconduct and will be penalised accordingly.

Callum David Claton McLennan
November 20, 2020

Abstract

random words that attract the reader

Glossary

Terminology

Cubie	One of many smaller cubes that make up the Rubik's cube.
Center	A cubie with one colour on the face in the center of the cube.
Edge	An edge cubie has two colours as they're on the edge of the cube.
Corner	A corner cubie has 3 colours and there are always 8, regardless of cube size.
Face	A face is a side of a Rubik's Cube. There are 6 faces regardless of size.
A letter by itself refers to a clockwise rotation of a single face by 90°.	
A letter with a ' ' ' is a 'prime move' which means the face rotates counter-clockwise 90°.	
A letter with the number 2 after it marks a double turn 180°.	
X, Y, Z rotations aren't normally required to solve a cube. These are whole cube rotations.	

Moves

	Front	Right	Up	Left	Back	Down	Entire cube rotation		
Normal moves	F	R	U	L	B	D	X	Y	Z
Prime moves	F'	R'	U'	L'	B'	D'	X'	Y'	Z'
Double moves	F2	R2	U2	L2	B2	D2	N/A		

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1 Introduction

This is the report for my Rubik's Cube Solver program. This paper will contain the process of creation behind my project as well as the factors that motivated my decisions behind why I chose the features/aspects/methods that I did.

1.1 Background

The Rubik's Cube is a well known puzzle all around the world and it's considered extremely difficult to solve... At least without the helpful guidelines and algorithms that are accessible online. After a gruelling summer of trying to solve the cube via a human algorithm, I want to feel the satisfaction of solving the traditional 3x3x3 cube and hopefully larger versions via computing algorithms.

1.2 Aims and Objectives

The original goal here is to use local search or a constraint solver although it's very likely I could stray to use a different, more efficient and well suited algorithm to solve the cube(s).
A cool feature I'm eager to add is a custom scramble where the user can manually change the digital cube to their real world physical cube's scrambled state then get my program to solve it and provide the algorithm (steps) to solving that particular scramble.

1.3 Research Hypothesis

Although this project is ambitious, I'm hoping that with my current experience and enthusiasm regarding Rubik's Cubes, this project moves forward more fluently than previous projects I've pursued and I'm able to diagnose and solve issues regarding the solving aspect of the project.
I'm excited to discover if I can create or piece together an algorithm that is versatile enough to solve different sized cubes but considering that I feel this project is a big challenge regarding just the 3x3x3 sized cube, I don't think I'll be too disappointed if I didn't succeed in creating an algorithm that can solve all sized cubes.

2 Literature review

3 Methodology

4 Results and analysis

5 Conclusions and future work