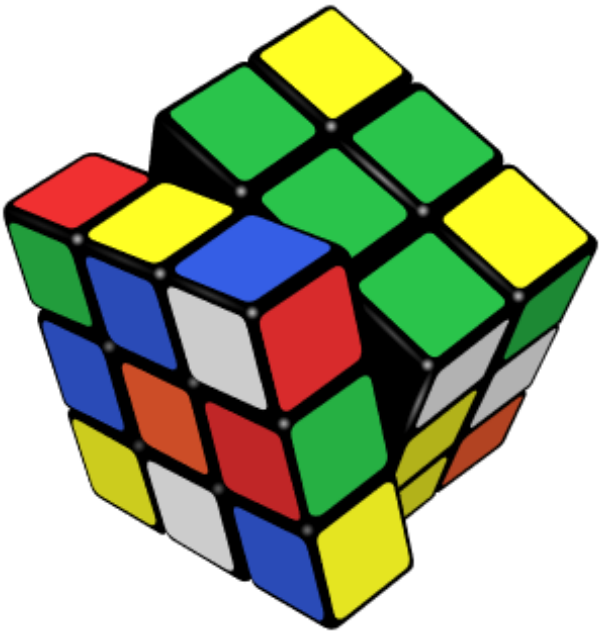
Rubik's Cube Solver

Project Introduction

Invented by Ernõ Rubik in 1974, the Rubik's Cube is a world famous mechanical 3D-puzzle. This simple but ingenious toy has throughout the years become an icon in popular culture. Taking on the task of solving the puzzle, can lead to hours of frustration. The potential headache is often overweighed by the sense of accomplishment, when you finally are able to return the scrambled cube back to its original arrangement.



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The orignal (3x3x3) cube with its relative simple it is design, has a fascinating complexity. Consisting of eight corner, twelve egdes, and six faces, the cube has approximately 43 quintillion possible permutations. Where only one of these satifies being the solved arrangment. Recent research has shown that, for a any initial permutations, a 3x3x3 can be teoretical solved in 20 moves or less. This number is known as "God's number" for Rubik's Cube.

Speedcubing is competetive genre, where the task is to solve for an arbitrary scramble cube as fast as possible. International competitions are held for the most advanced solvers, where the current world record is at a staggering 3.47 [s].

NOV would like to challenge students to design and build a Rubik's Cube solver. The machine should be an automatic system, capable of identifying, handling and solving for any arbitrary scramble of the original 3x3x3 sized cube.

Project Description

1. Model, design, and instrumentation of a Rubik's Cube solver

The student(s) should design and build a Rubik's Cube machine, capable of handling and solving the size of an original 3x3x3 sized cube. A combination of 3D-printed and machined parts is suggested as materials for the machine. Arduino, Raspberry Pi, or NVIDIA Jetson as a control platform, and stepper/servo motors, encoders, and other small electronics should be considered for the instrumentation of the system.

2. Vision system cube detection

A vision system, capable of detecting and recognizing the current scramble of the cube needs to be established. The required number of cameras for detecting the permutation, needs to be evaluated by the student(s), with the suggested idea of using consumer web cameras.

3. Solving algorithm

Develop a Rubik's Cube solving algorithm for the established machine. The algorithm should be able to solve for any arbitrary permutation of a 3x3x3 cube, and send commands to machine to handle the steps of correctly arranging the faces of the cube. A desire is also develop a automatic scrambling function.

Project Describing Keywords:

- Modelling
- Instrumentation
- Control Systems
- Programming
- Mechatronics
- Vision System

Project Level

Master

Non-Disclosure Agreement

Yes

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