

CV Systems Programming UE, 183.587

Choice of Topic & Implementation Proposal

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This document should give a short overview of the topic that has been chosen for the exercise 'Computer Vision Systems Programming' and how it will be implemented.

1 Topic: Automatic Rubiks Cube Solver

The Rubik's Cube (Figure 1) is a well known 3D mechanical puzzle that has been invented in 1974 and is considered to be the worlds best-selling toy. For the exercise an automatic solver for this cube based on visual methods will be developed. The main focus will be on the visual recognition and processing of the cube, and not on the computation of the actual solution since there are already several algorithms available to public for this problem.

The first part of the project will be a simple implementation that tries to detect the faces of the cube. For this purpose a video stream from a static camera and a predefined order of showing the faces of the cube will be used. After the recognition process the initial state of the cube should be known and a solution will be computed in a fast and efficient way.

After the basic implementation of the Rubik's Cube solver in a desktop application the program will be ported to a mobile platform. This part also focuses on the visual processing of the cube but introduces further problems like non-static video acquisition and limited computing power. This part of the project is also about getting familiar with abilities in terms of solving Computer Vision problems on mobile platforms.

In addition to the basic implementation and the simple port to a mobile platform, extension and improvements to the solver on one or both platforms

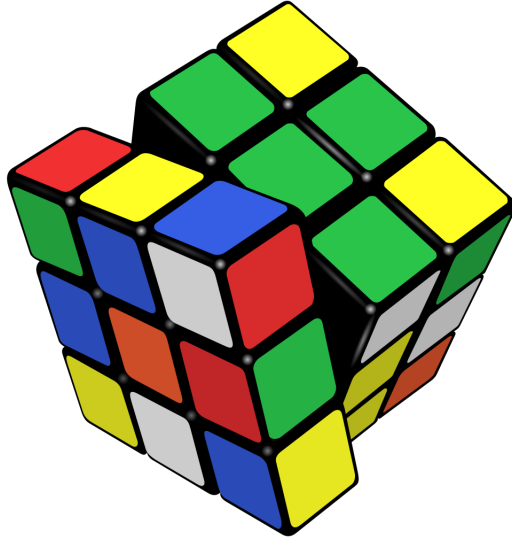


Figure 1: Image showing the Rubik' Cube.

may be introduced if the effort is reasonable and the projects scope allows for it. Improvements could be the automatic detection of the cube rotation to be able to discard the need for a predefined order of showing the faces of the cube, an enhanced solving algorithm for more simple solutions, non-static video acquisition in the case of the desktop application or performance as well as interface improvements.

2 Implementation

The basic implementation of the solver will be done in MATLAB in order to take advantage of fast prototyping and easy debugging abilities. The video streams that should be processed will be captured in advance for simplicity nevertheless the implementation should be able to run in realtime.

The mobile port will be done using an Android device with a built in camera. Therefore the program will be implemented in an Android application with the help of the OpenCV library for Android.