Summary

The motivation of the developer was to implement his graduation project from 9th grade. He built a Rubik's Cube solving robot and coded it.

Product requirements / specification of the product

The functional requirement is 1 Lego Ev3 brick, 3 large Ev3 motors, 1 Ev3 color sensor, Lego building blocks, Ev3 wire, sw. robot, source code. These items cost around 400 Fr.- The developer needed five to seven hours to build the final robot and about 200 hours to finalize the code.

Result / product

The robot can figure out the colors of the cube and solve it. The algorithms name is "x and o's". The robot can be taken along in a school bag and is powered by batteries.

Not all requirements are fulfilled. Another robot with 2 bricks was planned but the developer can't connect this two bricks. Bluetooth, wlan, usb are not supported by any compiler at this time. The final robot cannot solve the cube under a minute. He has only one arm instead of two which was planned. Many cube stones are moved over the middle plane, and that's his weak point.

Project planning: resources, time schedule, risk management

The resources were good distributed. The budget is 100.- and the expected costs are 750.- The project has two phases:

#1: build robot

#2 Program the code.

Many solution paths can be simulated in an external program coded by the developer. So thousands cube settings will be solved in minutes and error messages are outputted directly in the console. For the construction the developer has no instructions.

The developer sees no future problems in this project.

Performance

In contrast to the scheduled process the measured progress exceeded the deadline. The amount of code increased and the overview of the code got better than in the last project. The developer worked every week on the project and in the finalization nearly every day. The developer built a second robot. The second robot was built according to instructions from the internet. The source code needed to be converted to fit the new definitive situation where just one robot was used. The total costs are 823,90.- and the budget was 100.-. The developer resells the parts as the project is done. He hopes the budget will not exceed after getting the resale paid back.

The project plan has been followed until to the point where the second robot was built.

Retrospective / conclusion, evaluating the project

The project was completed successfully. The developer has learned more than he expected to do but many more hours were needed. Next time he will be better informed about the components because the older brick just supported data transfer between two NTX bricks.

The Lego products 31313 are needed to build the robot by the internet instruction. Robotc, the compiler which was used, is free software.