

2013 臺灣國際科學展覽會 優勝作品專輯(國外作品)

作品編號	110020
參展科別	電腦科學科
作品名稱	Rubik's Cube Solver
得獎獎項	二等獎

國 家	New Zealand
就讀學校	Bumside high school
作者姓名	James Watson

ABSTRACT OF EXHIBIT

TAIWAN INTERNATIONAL SCIENCE FAIR

Aim:

Over the years I became quite quick at solving the cube. I was keen to see if I could create a mechanical system that would do it in a similar time. Because of financial limitations and equipment I thought it impossible to achieve my usual times of around 1 minute and so settled on a target of 10 minutes.

So my aim became;

“To create a mechanical system that could solve the cube 100% reliably in less than 10 minutes”

What I did:

I started from the view that I wanted to get it to find a solution using the process that I usually use. The downside of this approach was that this approach meant that most internet research was irrelevant to my project. Also some methods I found were very sophisticated and expensive eg. the university professor who created a system to solve it in 6 seconds.

I wrote software capable of solving the cube, printed out its results then testing the instruction steps by manually manipulating the cube. This was improved until 100% reliable.

I then developed the user interface to input the colours on each face.

The building of the hardware to manipulate the cube proved my most difficult challenge. To get the cube flipped and rotated accurately using the 5 servos. I modeled this using lego and popsicle sticks until the movements met the accuracy and reliability outcomes I needed. Surprisingly these materials held up to the challenge.

Integrating the software and hardware functional models took a lot longer than anticipated to get the software instructions executed and coordinated. A great deal of fine tuning was required.

Outcome:

The system solves the cube 100% of the time. I was exceptionally pleased with this result in view of the lego and popsicle stick model. On reflection I have achieved a successful working model that university students have aspired to

and this gives me great satisfaction.

Conclusion:

While the outcome is pleasing I envisaged achieving a much faster system with easier data input using camera and colour recognition software. Unfortunately time and my budget restrictions prevented this from being developed. However this is a step I am interested in implementing in the future.

The speed could be improved by designing more efficient cube solving algorithms, implementing a camera with colour recognition, and possibly rethinking and redesigning my mechanical design. I would also like to

評語

1. This is an old topic with many different algorithms. However, a complete system has been built. The demo was most interesting.
2. If the proposed algorithm can be compared with other algorithms in the literature, would make this a more convincing project.
3. Please show your algorithm & analyze the complexity of your algorithm.