

Solving Skewb with Monte Carlo

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PHYS 4061 Project B

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Aim of This Project

- Allow user to solve skewb **easily**!
- Even without prior knowledge to skewb.

Understanding the Mechanism of a Skewb

Centre



Attached corners



Floating corners



God's Number

- Maximum number of moves needed to solve a Rubik's cube.

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- Maximum number of moves needed to solve a Rubik's cube.
- God's number for skewb is 11 moves.

Define Turns

- There are only 4 different sides to turn.
- 8 different turns in total.
- Map R to 0, R' to 1, and so on...

Monte Carlo

Theory

If you try hard enough, you will eventually find the solution.

Code

Generate a random move for each step, and check if the cube was solved.

Weighted Monte Carlo

Global array

```
int ratio[4] = {1, 1, 1, 1};
```

Weighted Monte Carlo function

```
int side = rand()%(ratio[0]+ratio[1]+ratio[2]+ratio[3]); //choose
which side to turn
int clockwise = rand()%2; //0: counterclockwise, 1: clockwise

if(side<ratio[0]){ //if right side is chosen
    if(clockwise==1){current_move = 0;} //set current move to R
    else{current_move = 1;} //set current move to R'
}
```


Check Duplicated Moves

Find next move function

```
int current_move;
if(last_move==0 || last_move==1){//if the last move was R or R',
    the next move should not contain R
    do{
        current_move = weighted_monte_carlo();
    }while(current_move==0 || current_move==1);
}
//...
```

Actual Solve

Solve skewb function

```
int solved = 0; //0: not yet solved, 1: solved
while(!solved&&iteration<MAX_ITERATION){
    for(int i=0; i<GODS_NUMBER; i++){
        current_move = find_next_move(last_move); //find next
            move that is different from previous move
        last_move = current_move; //store current move
        turn[current_move](); //turn the cube
        solved = check(); //check if the cube is solved
        if(solved==1){
            break; //then stop the iteration
        }
    }
}
```

Scan Cube Using Webcam

- Demo video: [Skewb solver programme demo](#)

Reviewing Carter Kucala Solves



Solve	Result	Scramble (11 moves)	Fewest number of moves
1	2.49	R B L' U' L' R B' R' B R B	9
2	1.77	U L U' B' U' B' U' L B U' R'	9
3	3.32	U L B U' B' L' B R' B' L U	7
4	4.65	R B' U' B U B L' U B' U R	8
5	0.75 (WR!)	B L R' B' L U B' R U' R U	8

- The third fastest solve (0.85) was done by Simon Kellum in this competition, solving the same scramble!

More Details

- If you are really interested, you are welcome to ask for the code.

The End

Thank
you

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