Solving Skewb with Monte Carlo

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PHYS 4061 Project B

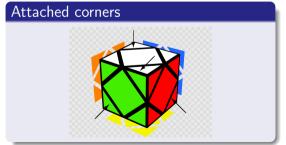
November 21, 2024

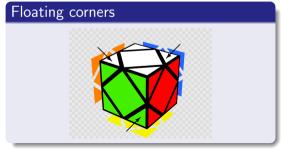
Aim of This Project

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

Understanding the Mechanism of a Skewb







God's Number

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

God's Number

- 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'
}</pre>
```

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

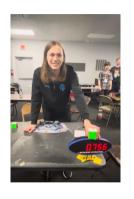
Solve skewb function

```
int solved = 0; //0: not vet solved, 1: solved
while (!solved&&iteration < MAX ITERATION) {
    for(int i=0; i<GODS_NUMBER; i++){</pre>
        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	RBL'U'L'RB'R'BRB	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	RB'U'BUBL'UB'UR	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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