CSD311-AI

Assignment 1 (Marks <15>): Group of 2-3 students from the same lab group.
- Posting Date: <28th Aug 2021>;
- Due date of submission <9th Sept 2021>

Instructions:

- Serious penalty for plagiarism and cheating.
- Demo: TA will announce demo Schedule during Lab timings on <TBD>
- Student doing assignment alone will be given extra 2 marks if marks obtained in the assignment are >80%. This situation will be entertained if there is no partner left in the lab group. Inform in advance.

Develop and implement the following in C/C++

a. (<3> marks) Write a program to generate a 3-D magic cube (Description available in lecture notes OR find at https://en.wikipedia.org/wiki/Magic_cube).
b. (<8> marks) Write program for 3-D Tic Tac Toe using magic square concept approach discussed in the class.
     i. Winner is the one who makes first 10 collinear lines which satisfy magic square condition.
c. (<2> marks) Display the board position (you can display 3 separate boards) after each turn along with a list of contents for both the players.
d. (<2> marks) For well documented program.
     i. Write all algorithms used should in a doc file and put comments explaining each module in the program

Questions at the time of evaluation:

1. Magic square – generalization (start from any cell and generate magic square; Using some formula, using backtracking, ..)
2. Tic-Tac –toe (Updation of both the lists after each play, display of board position)
3. Will be asked to change a code of specific activity.

Winning Strategy:

A winning line is formed when the sum of the three numbers is 42 on the magic square, **and** the three points are collinear i.e each row, column, pillar, four main space diagonals.
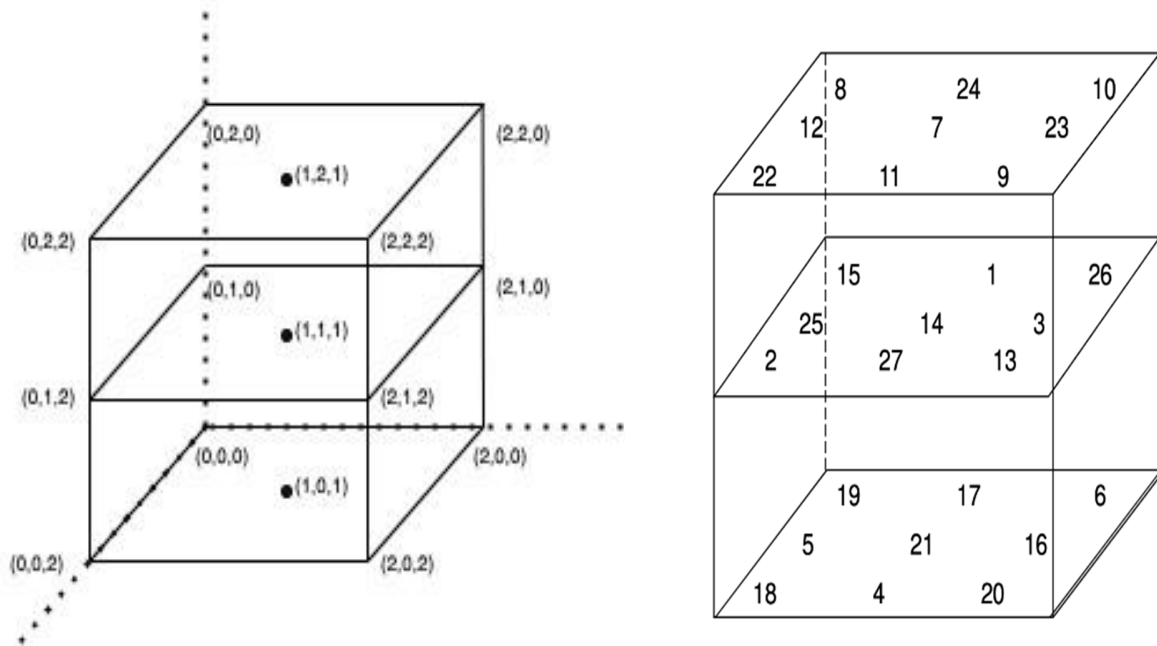
Hint: One of the working solutions would be to test if the three points in 3-D space have the sum as 42 **and** the three points are collinear.

Formula for showing 3 points are collinear:

Let us consider three points A $(x1,y1,z1)$, B$(x2,y2,z2)$ and C$(x3,y3,z3)$ as 3-D co-ordinates. In order to prove that the three points are collinear we need to show:

$$\overrightarrow{AB} = \lambda \overrightarrow{AC}$$
$$(x2 - x1, y2 - y1, z2 - z1) = \lambda (z3 - x1, y3 - y1, z3 - z1)$$

Sample Explanation:

Winning Lines:

1. **Row**: Taking the points on the top surface (0,2,0) - (1,2,0) - (2,2,0), the slope is the same between the three points and the sum of the three points is 42.
2. **Column:** Take the points on the middle surface (2,1,2) - (2,1,1) - (2,1,0), the slope is the same between the three points and the sum of the three points is 42.
3. **Pillar**: Take the points on the right surface (2,2,0) - (2,1,0) - (2,0,0), the slope is the same between the three points and the sum of the three points is 42.
4. **Major Diagonal:** Take the points on the right surface (0,2,0) - (1,1,1) - (2,0,2), the slope is the same between the three points and the sum of the three points is 42.

Incorrect Lines:

1. Diagonal on Top Surface: The points are collinear but the sum is not 42.
2. Three random points with sum 42: Eg - (0,2,0) - (1,2,1)- (1,1,2), the sum is 42 but the slope is different i.e they are non collinear.