

# COL 215 ASSIGNMENT 1

Amish Kansal (2021CS50622) - Group 5

Parth Thakur (2021CS50615) - Group 5

Approach:

We divided the problem statement into 2 parts and dealt with them separately as follows;

*Part 1: Identifying top left and bottom right corners of the region described using the given term.*

- Firstly we identify the number of Boolean variables involved in the K-map which is equal to the length of the *term* parameter.
- We know that  $2 < \text{term} < 4$  and hence we make 3 separate case for  $\text{term} = 2, 3, \text{ or } 4$ .
- First we try to find the Y coordinate. For 2 variables it will depend only on the 1<sup>st</sup> member in term. For 3 or 4 variables it will depend on the 1<sup>st</sup> and 2<sup>nd</sup> members.
- Each member in term can take 3 values: 0, 1, and None. Thus for the case of 2 variables we have 3 separate subcases while for 3 or 4 variables, we can have  $3 * 3 = 9$  subcases.
- Each subcase corresponds to a specific value of Y for the top left and bottom right corners, which are assigned to the variables *y\_start* and *y\_end* respectively.
- A similar algorithm is implemented for finding the X coordinates which are assigned to the variables *x\_start* and *x\_end*.

*Part 2: Checking the region described by the start and end coordinates for legality.*

- On the basis of the start and end coordinates, the coordinates of all the squares in the region are determined
- This is not very straightforward as the region may be discontinuous, that is it may go over some edge.
- These coordinates are then used to get the values in those squares
- All these values are then checked, if any 0 is present, the region is declared illegal

Test Cases:

1. For 2 variable K-Map  $[[1, 'x'], [0, 1]]$ 
  - a. Term = [None, None], Output = ((0, 0), (1, 1), False)
  - b. Term = [1,1], Output = ((1, 1), (1, 1), True)
  - c. Term=[0, None], Output = ((0, 0), (1, 0), False)

2. For 3 variable K-Map  $[[1, 'x', 0, 1], ['x', 1, 0, 'x']]$
- a. Term=[None,0,None], Output= ((0, 3), (1, 0), True)
  - b. Term=[None, None, None], Output= ((0, 0),(1, 3), False)
  - c. Term=[0,1,0], Output= ((0, 1), (0, 1), True)
3. For 4 variable K-Map  $[[1, 0, 'x', 0], [1, 1, 1, 0], [1, 'x', 'x', 0], [1, 0, 1, 0]]$
- a. Term=[None,0,None,0], Output= ((3, 3),(0, 0), False)
  - b. Term=[None,None,None,0], Output= ((3, 0),(0, 3), False)
  - c. Term=[1,1,0,0], Output= ((0, 2),(0, 2), True)
  - d. Term=[None, None, None, None], Output= ((0, 0),(3, 3), False)