

DISCRETE MATHS ASSIGNMENT 1

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Overview

This programme is designed to make some basic set operations implemented in c++ programming language in its functional diagram.

Goals

1. Union, intersection and difference operations implementation on sets.

Specifications

This c++ code separated into some basic sections:

1. Take the members of the universal set by knowing its size then read its components.
2. Take number of subsets and read them one by one like done in univesel.
3. By using 2D bit mask array we could implement our sets as 1's and 0's.
4. By avoiding some possible errors may be done from the user we handled some of them.
5. Using bit wise operations we manipulate our sets.

Bits

1-intersection:

since we made all our subsets to boolean array which having same size of Universal so traverse throw the two subset in same time and use "||" operation as we need it in at least one of them "true".

2-union:

with the same logic but we used "&&"operation as we need element in the two sets

3-difference

it was a bit complex as we need the element in the first set but not in the second set so we use "first && !second"

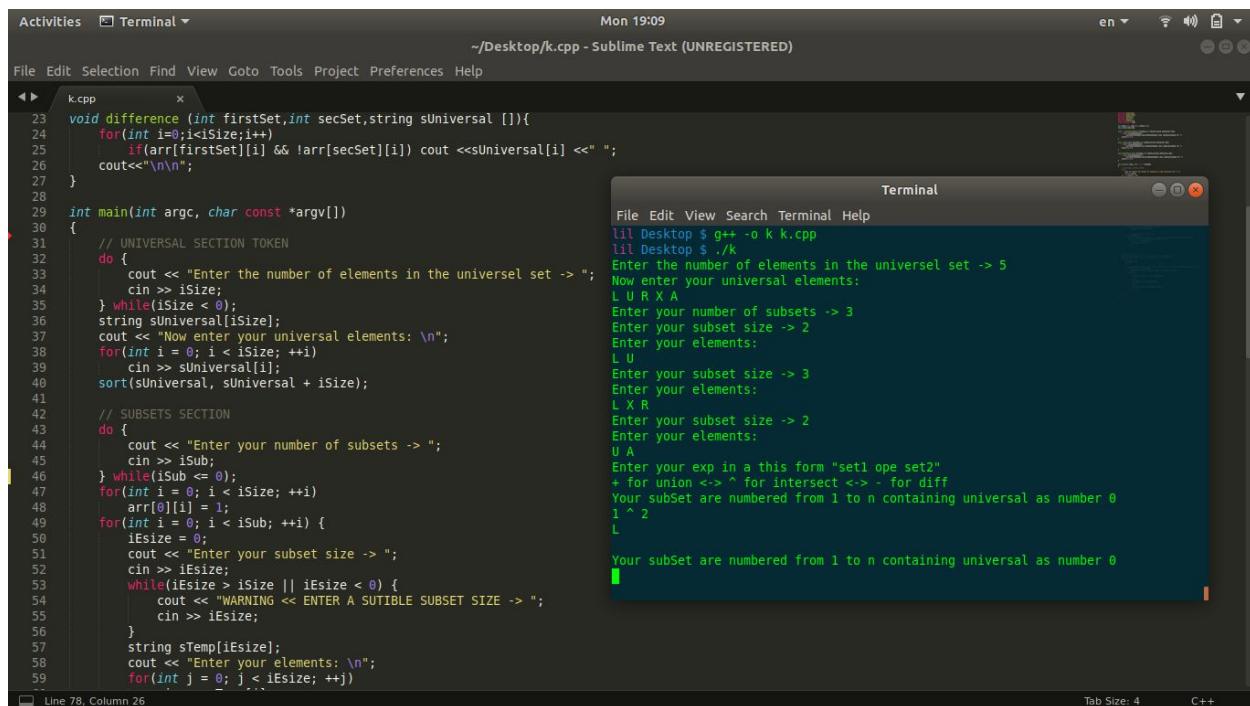
Used data Structure

1. We use "arr" as a global variable "a 2D bit mask array to mark our subsets.
2. Using 1D array for the universal set.
3. Temp array of size universal to read our sub sets.

Error handling

1. Checks if the number of elements in universal and subsets is +ve value.
2. Checks for if a subset has an element that doesn't belong to the uni one.
3. Checks for the expression is suitable or not like the operator.

Sample runs



```

k.cpp
23 void difference (int firstSet, int secSet, string sUniversal []){
24     for(int i=0; i<iSize; i++){
25         if(arr[firstSet][i] && !arr[secSet][i]) cout << sUniversal[i] << " ";
26         cout << "\n\n";
27     }
28 }
29 int main(int argc, char const *argv[])
30 {
31     // UNIVERSAL SECTION
32     do {
33         cout << "Enter the number of elements in the universal set -> ";
34         cin >> iSize;
35     } while(iSize < 0);
36     string sUniversal[iSize];
37     cout << "Now enter your universal elements: \n";
38     for(int i = 0; i < iSize; ++i)
39         cin >> sUniversal[i];
40     sort(sUniversal, sUniversal + iSize);
41
42     // SUBSETS SECTION
43     do {
44         cout << "Enter your number of subsets -> ";
45         cin >> iSub;
46     } while(iSub <= 0);
47     for(int i = 0; i < iSize; ++i)
48         arr[0][i] = 1;
49     for(int i = 0; i < iSub; ++i) {
50         iEsize = 0;
51         cout << "Enter your subset size -> ";
52         cin >> iEsize;
53         while(iEsize > iSize || iEsize < 0) {
54             cout << "WARNING << ENTER A SUTIBLE SUBSET SIZE -> ";
55             cin >> iEsize;
56         }
57         string sTemp[iEsize];
58         cout << "Enter your elements: \n";
59         for(int j = 0; j < iEsize; ++j)

```

```

Terminal
File Edit View Search Terminal Help
lil Desktop $ g++ -o k k.cpp
lil Desktop $ ./k
Enter the number of elements in the universal set -> 5
Now enter your universal elements:
L U R X A
Enter your number of subsets -> 3
Enter your subset size -> 2
Enter your elements:
L U
Enter your subset size -> 3
Enter your elements:
L X R
Enter your subset size -> 2
Enter your elements:
U A
Enter your exp in a this form "set1 ope set2"
+ for union <-> ^ for intersect <-> - for diff
Your subset are numbered from 1 to n containing universal as number 0
1 ^ 2
L
Your subset are numbered from 1 to n containing universal as number 0

```

Here we make a very simple inputs and their outputs without errors.

The screenshot displays a Linux desktop environment. At the top, the system clock shows 'Mon 19:11'. The top panel includes icons for 'Activities', a file manager, and network status. The main window is 'Sublime Text (UNREGISTERED)', editing a file named 'k.cpp'. The code defines a function 'difference' that takes two sets and a string, and a 'main' function that prompts the user for set sizes and elements, then calculates and displays the difference between the sets. A terminal window is open in the foreground, showing the program's execution. It prompts for the number of elements in the universal set (1), the number of subsets (2), and the elements of the subsets (1, 2 and L, R, U, X). The output shows the difference between the two subsets as '1 + 2'.

```
k.cpp
23 void difference (int firstSet, int secSet, string sUniversal []) {
24     for (int i = 0; i < iSize; ++i)
25         if (arr[firstSet][i] && !arr[secSet][i]) cout << sUniversal[i] << " ";
26     cout << "\n\n";
27 }
28
29 int main (int argc, char const *argv[])
30 {
31     // UNIVERSAL SECTION TOKEN
32     do {
33         cout << "Enter the number of elements in the universal set -> ";
34         cin >> iSize;
35     } while (iSize < 0);
36     string sUniversal[iSize];
37     cout << "Now enter your universal elements: \n";
38     for (int i = 0; i < iSize; ++i)
39         cin >> sUniversal[i];
40     sort(sUniversal, sUniversal + iSize);
41
42     // SUBSETS SECTION
43     do {
44         cout << "Enter your number of subsets -> ";
45         cin >> iSub;
46     } while (iSub <= 0);
47     for (int i = 0; i < iSize; ++i)
48         arr[0][i] = 1;
49     for (int i = 0; i < iSub; ++i) {
50         iESize = 0;
51         cout << "Enter your subset size -> ";
52         cin >> iESize;
53         while (iESize > iSize || iESize < 0) {
54             cout << "WARNING << ENTER A SUTIBLE SUBSET SIZE -> ";
55             cin >> iESize;
56         }
57         string sTemp[iESize];
58         cout << "Enter your elements: \n";
59         for (int j = 0; j < iESize; ++j)
```

```
Terminal
File Edit View Search Terminal Help
Enter your exp in a this form "set1 ope set2"
+ for union <-> ^ for intersect <-> - for diff
Your subSet are numbered from 1 to n containing universal as number 0
1 ^ 2
L
Your subSet are numbered from 1 to n containing universal as number 0
1 + 2
L R U X
Your subSet are numbered from 1 to n containing universal as number 0
1 - 2
U
Your subSet are numbered from 1 to n containing universal as number 0
0 - 2
A U
Your subSet are numbered from 1 to n containing universal as number 0
3 + 0
A L R U X
Your subSet are numbered from 1 to n containing universal as number 0
[]
```

Line 78, Column 26 C++ Tab Size: 4

```

Mon 19:16
Terminal
en  🔊 📶 🔒 🔍
File Edit View Search Terminal Help
lll Desktop $ ./k
Enter the number of elements in the universal set -> 9
Now enter your universal elements:Set,int secSet,string sUniversal []({
0 P R T H J S A I int i=0;i<ISize;i++)
Enter your number of subsets-> 51 %&& larr[secSet][i]. cout <<sUniversal[i] <<" ";
Enter your subset size -> 3
Enter your elements:
I H T
Enter your subset size -> 7 char *ans1 *argv[]})
Enter your elements:
P R T H J S I UNIVERSEAL SETION TOKEN
Enter your subset size -> 1
Enter your elements: << "Enter the number of elements in the universal set -> ";
P cin >> ISub;
Enter your subset size-> 2 0);
Enter your elements:sUniversal[iSize];
H 0 cout << "Now enter your universal elements: \n";
Enter your subset size-> 3 i < ISize; ++i)
Enter your elements:- sUniversal[i];
A I R sUniversal,sUniversal + iSize);
Enter your exp in a this form "set1 ope set2"
+ for union <-> ^ for intersect <-> - for diff
Your subset are numbered from 1 to n containing universal as number 0
2 ^ 1 cout << "Enter your Number of subsets-> ";
H I T cin >> ISub;
{ while(ISub <= 0);
Your subSet are numbered from 1 to n containing universal as number 0
4 + 3 arr[i][j] = 1;
H O P for(int i = 0; i < ISub; ++i) {
    50 iEsize = 0;
Your subSet are numbered from 1 to n containing universal as number 0
4 ^ 3 cin >> iEsize;
    55 while(iEsize > ISize || iEsize < 0) {
        58 cout << "WARNING << ENTER A SUBTILE SUBSET SIZE -> ";
Your subSet are numbered from 1 to n containing universal as number 0
2 - 3 }
H I J R S T string sTemp[iEsize];
    50 cout << "Enter your elements: \n";
Your subSet are numbered from 1 to n containing universal as number 0
|_ New File Command...
Tab Size: 4 C++

```

The screenshot shows a macOS Terminal window with a dark background. The title bar at the top indicates the window is titled "Terminal" and is part of a workspace with "Activities" and "Mon 5:22". The terminal content shows a C++ program being executed. The program prompts the user for the universal set, its size, the number of subsets, and the subset size, then outputs all possible subsets. The user has entered the following inputs: universal set "K L A E W", size 5, number of subsets 3, and subset size 2. The program outputs the following subsets: K, L, A, E, W, K L, K A, K E, K W, L A, L E, L W, A E, A W, E W, K L A, K L E, K L W, K A E, K A W, K E W, L A E, L A W, L E W, A E W, K L A E, K L A W, K L E W, K A E W, L A E W, A E W, K L A E W.

```
ll Desktop $ ./k
Enter the number of elements in the universal set -> 5
Now enter your universal elements:Set, int secSet, string sUniversal []}{
K L A E W      for (int i=0; i< iSize; i++)
Enter your number of subsets-> 3 55  [arr[secSet][i]] cout <<sUniversal[i] <<" ";
Enter your number of subsets -> 0
Enter your number of subsets -> -77
Enter your number of subsets -> 00
Enter your number of subsets-> 3 001 *argv[]})
Enter your subset size -> 15
WARNING << ENTER A SUTIBLE SUBSET SIZE -> 0
Enter your elements:
Enter your subset size -> 2ter the number of elements in the universal set -> ";
Enter your elements: >> 15126;
K W      (iSize < 0);
Enter your subset size-> 3 01[iSize];
Enter your elements: Now enter your universal elements: \n";
E W A      for (int i = 0; i < iSize; ++i)
Enter your exp in a this form "Set1 ope set2"
> for union <= ^ for intersect <= < for diff <=
Your subSet are numbered from 1 to n containing universal as number 0
1 ^ 2
1 2      {
1 3      cout << "Enter your number of subsets -> ";
Your subSet are numbered from 1 to n containing universal as number 0
1 * 2      } 0 15Sub <= 0);
Your subSet are numbered from 1 to n containing universal as number 0
2 + 3      arr[i][j] = 1;
A E K W      for (int i = 0; i < iSub; ++i) {
00      iSize = 0;
Your subSet are numbered from 1 to n containing universal as number 0
52      cin >> iSize;
53      while(iSize > iSize || iSize < 0) {
54          cout << "WARNING << ENTER A SUTIBLE SUBSET SIZE -> ";
55          cin >> iSize;
56      }
57      string sTemp[iSize];
58      cout << "Enter your elements: \n";
59      for(int j = 0; j < iSize; ++j)
```

```
Activities Terminal Mon 19:29 en [audio icon] [wifi icon] [battery icon] [close icon]
Terminal
File Edit View Search Terminal Help
lil Desktop $ g++ -o k k.cpp
lil Desktop $ ./k
Enter the number of elements in the universal set -> 2
Now enter your universal elements:0; ++1) {
A Set
    iEsize = 0;
Enter your number of subsets->3 ur subset size -> ?;
Enter your subset size -> 2 re;
Enter your elements: (iEsize > iSize || iEsize < 0) {
A D: cout << "WARNING << ENTER A SUITBLE SUBSET SIZE -> ";
WARNING << there is an element isn't exist in the universal set
Enter your subset again please:
Enter your subset size -> 0 p[iEsize];
58     cout << "Enter your elements: \n";
59     for(int j = 0; j < iEsize; ++j)
60         cin >> sTemp[j];
61     sort(sTemp, sTemp + iEsize);
62     for(k, x;
63         for(x = 0, k = 0; x < iSize && k < iEsize;)
64             if(sTemp[k] != sUniversal[x])
65                 ++x;
66             else
67                 arr[1+][x] = 1, ++x, ++k;
68         if(k == iEsize) {
69             cout << "WARNING << there is an element isn't exist in the universal set\n";
70             cout << "Enter your subset again please:\n";
71             for(x = 0; x < iSize; ++x)
72                 arr[1+][x] = 0;
73             --i;
74             continue;
75         }
76     }
77
78 // OPERATIONS SECTION
79 cout << "Enter your exp in a This form A'set1 ope set2\ \n";
80 cout << "+ for union <-> " for Intersect <-> "-" for diff\n";
81 while(1) {
82     int lOne, lTwo;
83     char x;
84     do {
```

