

UNIVERSITY OF ASIA PACIFIC

Department of Computer Science & Engineering

Report on Family Tree Assignment

Course Code : CSE 404

Course Title : Artificial Intelligence and Expert Systems Lab

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Problem Title:

Implement a basic family relationship tree structure of your own family using Prolog. Write rules to determine the degree and removal for up to the 3rd degree and twice removed situation for cousin relationships.

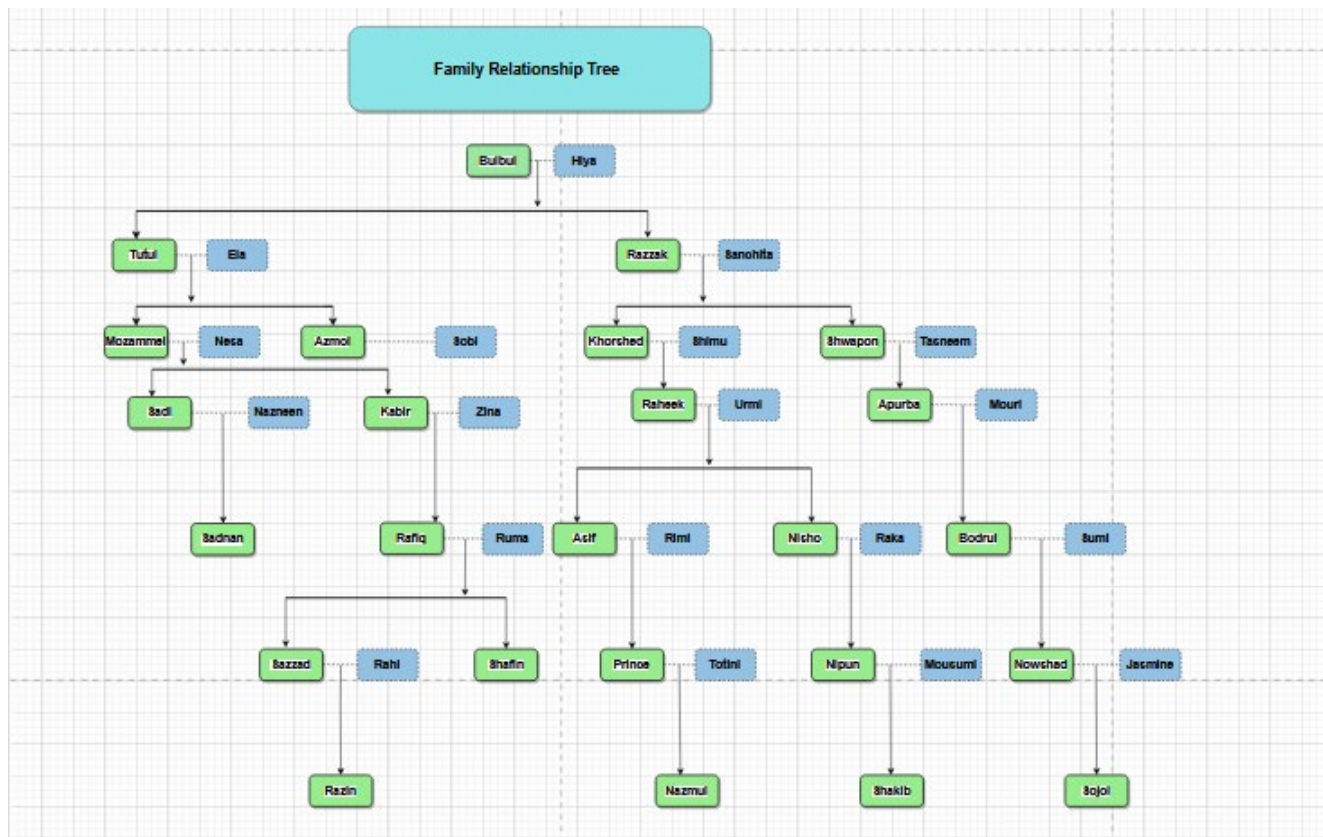
Problem Description:

Task is to create a family relationship tree using Prolog, defining family members' genders and roles. Also writing rules to identify cousin relationships up to the 3rd degree and in twice removed situations. Utilize Prolog queries to demonstrate cousin relationships among family members. This exercise aims to teach Prolog's logical programming while modeling intricate family ties.

Tools And Languages used:

1. Draw.io / Lucidchart
2. SWI-Prolog
3. Adobe Acrobat DC
4. Microsoft Word

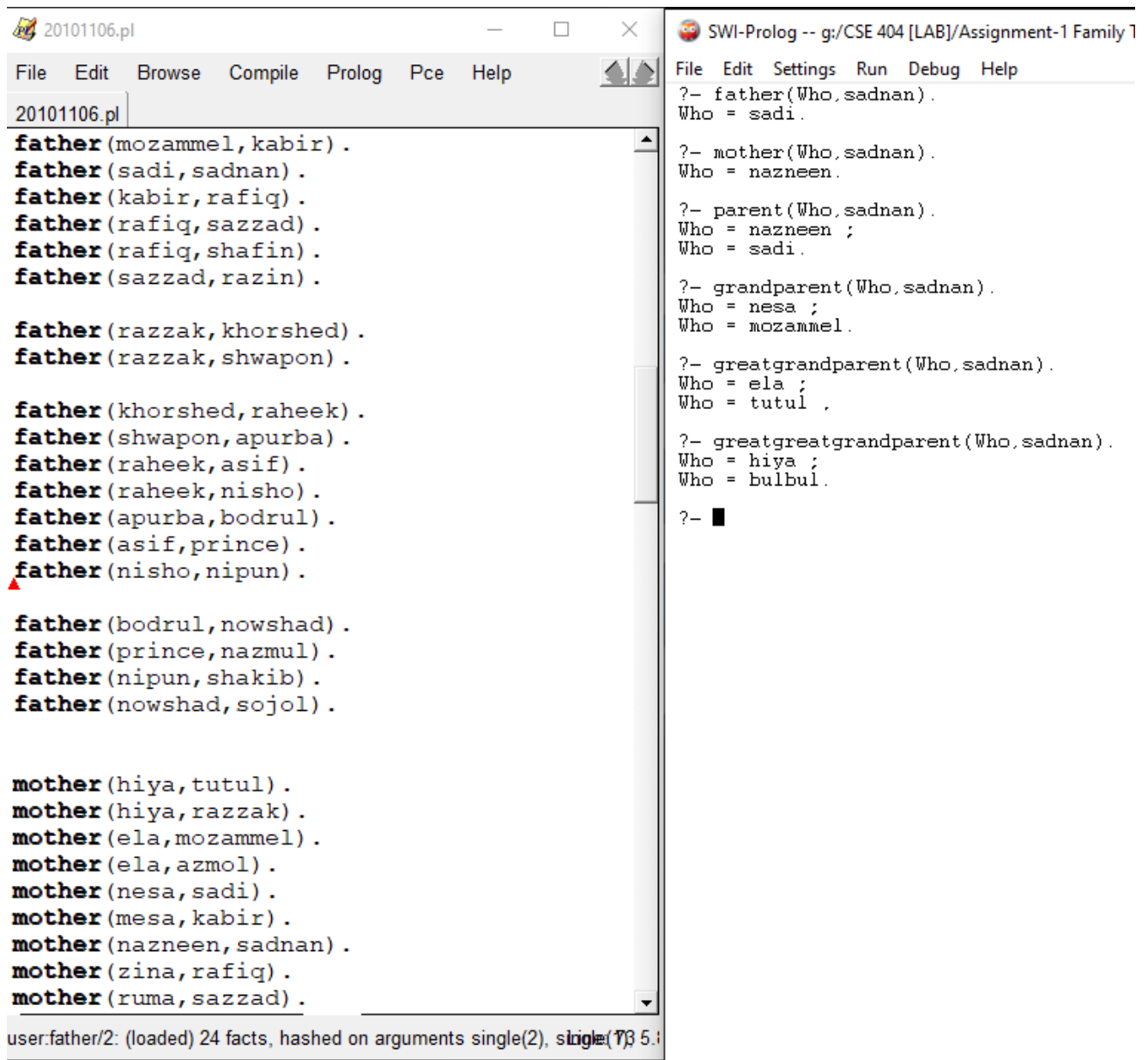
Diagram/Figure:



The above diagram is my family relationship tree structure. Here, green labeled names are male and blue labeled names are female.

Sample Input/Output:

Below screenshot, here is sample output for father, mother, parent, grandparent, great-grandparent and great-great grand parent for myself. The fact has been already prescribed in prolog-



The screenshot displays a Prolog IDE with two windows. The left window, titled '20101106.pl', contains a Prolog database with facts for 'father' and 'mother'. The right window, titled 'SWI-Prolog -- g:/CSE 404 [LAB]/Assignment-1 Family 1', shows the results of several queries.

```
20101106.pl
File Edit Browse Compile Prolog Pce Help
20101106.pl
father(mozammel,kabir).
father(sadi,sadnan).
father(kabir,rafiq).
father(rafiq,sazzad).
father(rafiq,shafin).
father(sazzad,razin).

father(razzak,khorshed).
father(razzak,shwapon).

father(khorshed,raheek).
father(shwapon,apurba).
father(raheek,asif).
father(raheek,nisho).
father(apurba,bodrul).
father(asif,prince).
father(nisho,nipun).

father(bodrul,nowshad).
father(prince,nazmul).
father(nipun,shakib).
father(nowshad,sojol).

mother(hiya,tutul).
mother(hiya,razzak).
mother(ela,mozammel).
mother(ela,azmol).
mother(nesa,sadi).
mother(mesa,kabir).
mother(nazneen,sadnan).
mother(zina,rafiq).
mother(ruma,sazzad).

user:father/2: (loaded) 24 facts, hashed on arguments single(2), single(7) 5.1
```

```
SWI-Prolog -- g:/CSE 404 [LAB]/Assignment-1 Family 1
File Edit Settings Run Debug Help
?- father(Who,sadnan).
Who = sadi.

?- mother(Who,sadnan).
Who = nazneen.

?- parent(Who,sadnan).
Who = nazneen ;
Who = sadi.

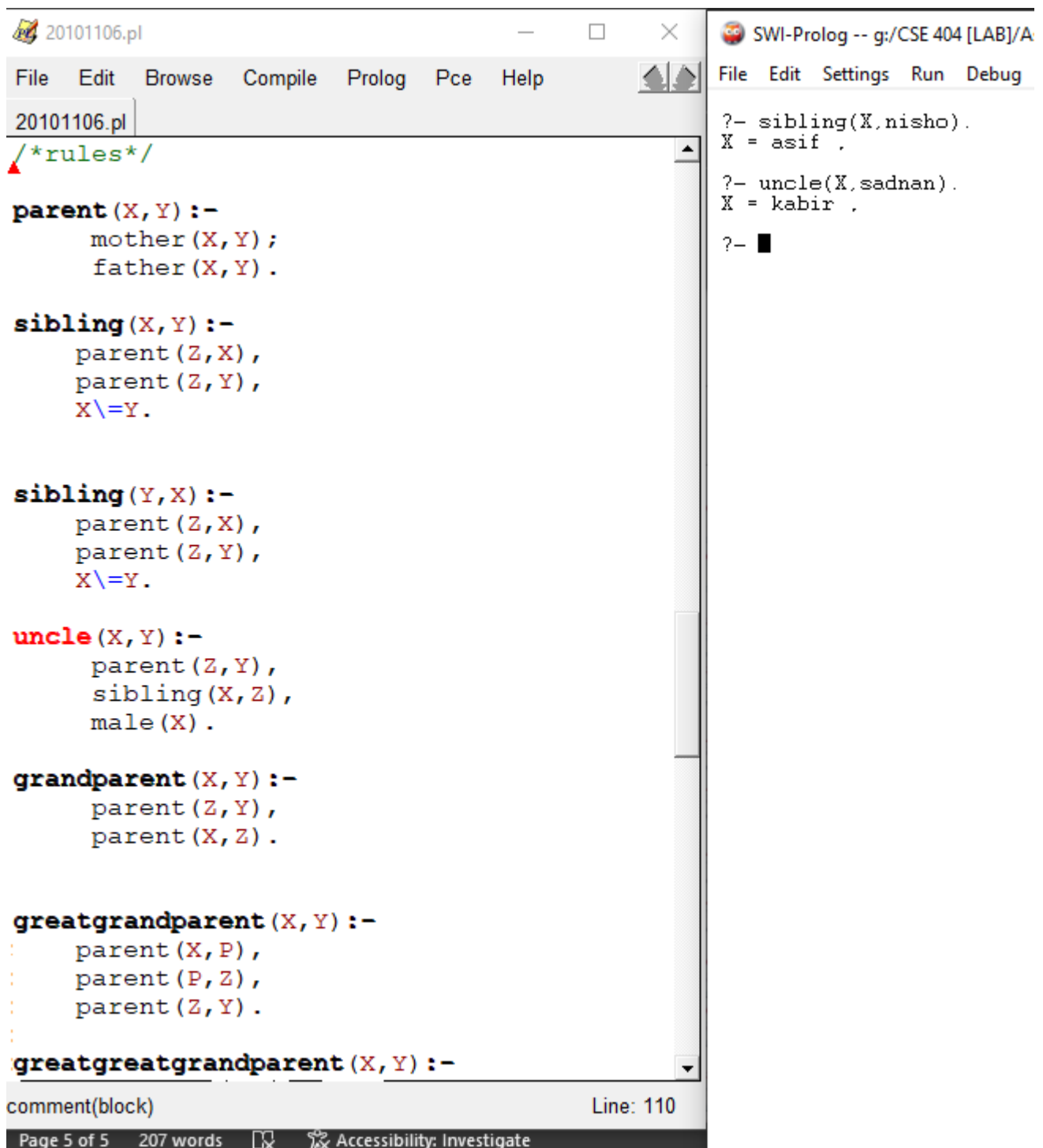
?- grandparent(Who,sadnan).
Who = nesa ;
Who = mozammel.

?- greatgrandparent(Who,sadnan).
Who = ela ;
Who = tutul.

?- greatgreatgrandparent(Who,sadnan).
Who = hiya ;
Who = bulbul.

?-
```

Sibling and uncle relationships example:



```
20101106.pl
File Edit Browse Compile Prolog Pce Help
20101106.pl
/*rules*/

parent(X,Y):-
    mother(X,Y);
    father(X,Y).

sibling(X,Y):-
    parent(Z,X),
    parent(Z,Y),
    X\=Y.

sibling(Y,X):-
    parent(Z,X),
    parent(Z,Y),
    X\=Y.

uncle(X,Y):-
    parent(Z,Y),
    sibling(X,Z),
    male(X).

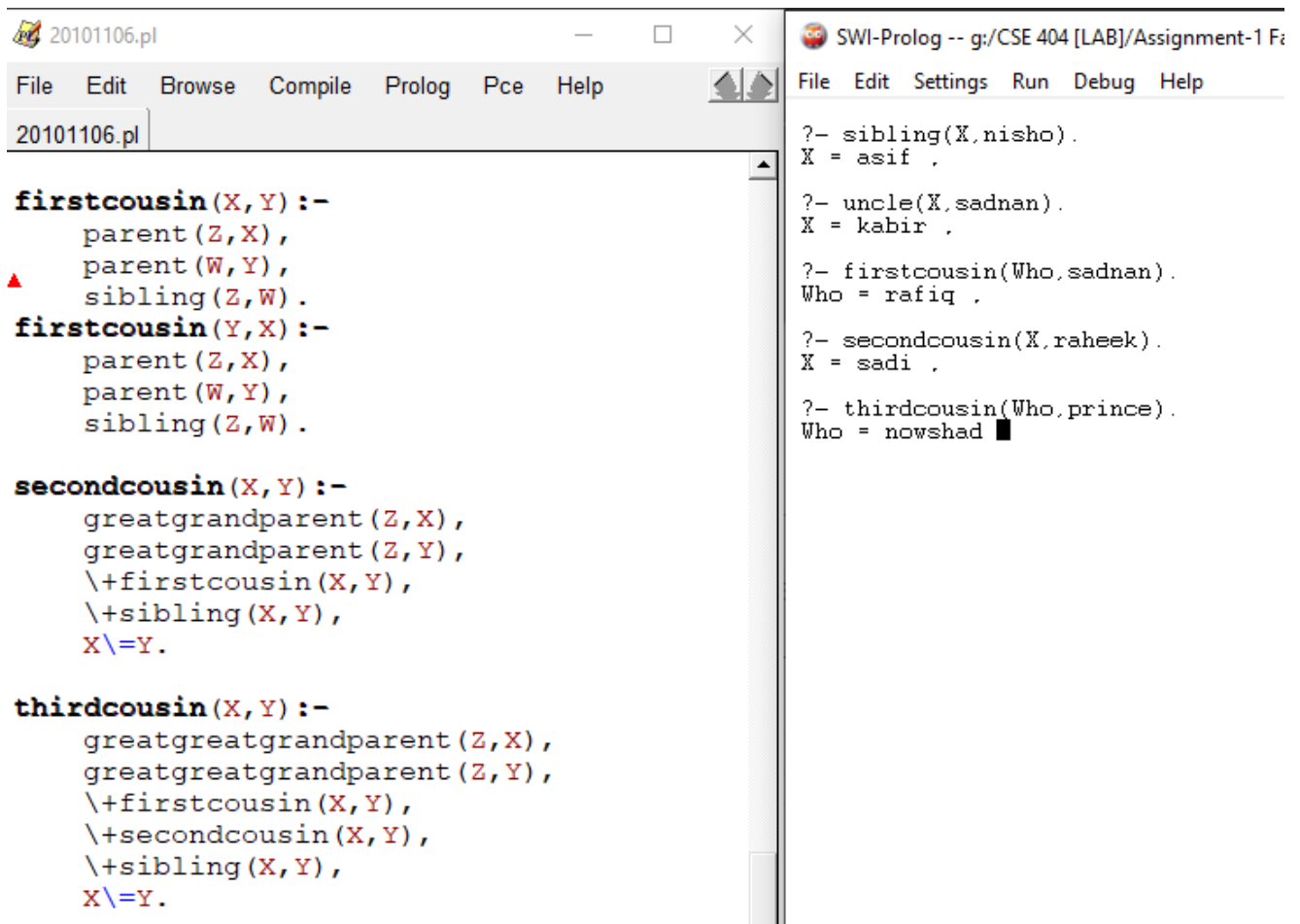
grandparent(X,Y):-
    parent(Z,Y),
    parent(X,Z).

greatgrandparent(X,Y):-
    parent(X,P),
    parent(P,Z),
    parent(Z,Y).

greatgreatgrandparent(X,Y):-
comment(block) Line: 110
Page 5 of 5 207 words Accessibility: Investigate
```

```
SWI-Prolog -- g:/CSE 404 [LAB]/A
File Edit Settings Run Debug
?- sibling(X,nisho).
X = asif ,
?- uncle(X,sadnan).
X = kabir ,
?-
```

First cousin, second cousin and third cousin relationship example:



```
20101106.pl
File Edit Browse Compile Prolog Pce Help
20101106.pl

firstcousin(X,Y):-
    parent(Z,X),
    parent(W,Y),
    sibling(Z,W).
firstcousin(Y,X):-
    parent(Z,X),
    parent(W,Y),
    sibling(Z,W).

secondcousin(X,Y):-
    greatgrandparent(Z,X),
    greatgrandparent(Z,Y),
    \+firstcousin(X,Y),
    \+sibling(X,Y),
    X\=Y.

thirdcousin(X,Y):-
    greatgreatgrandparent(Z,X),
    greatgreatgrandparent(Z,Y),
    \+firstcousin(X,Y),
    \+secondcousin(X,Y),
    \+sibling(X,Y),
    X\=Y.

SWI-Prolog -- g:/CSE 404 [LAB]/Assignment-1 F
File Edit Settings Run Debug Help

?- sibling(X,nisho).
X = asif ,

?- uncle(X,sadnan).
X = kabir ,

?- firstcousin(Who,sadnan).
Who = rafiq ,

?- secondcousin(X,raheek).
X = sadi ,

?- thirdcousin(Who,prince).
Who = nowshad
```

First cousin once and twice removed example:

The screenshot shows the SWI-Prolog IDE with two windows. The left window, titled '20101106.pl', contains the following Prolog code:

```

firstcousin_onceremoved(X,Y):-
    parent(Z,Y),
    firstcousin(X,Z).
firstcousin_onceremoved(X,Y):-
    parent(Z,X),
    firstcousin(Z,Y).

firstcousin_twicereMOVED(X,Y):-
    firstcousin(X,Z),
    grandparent(Z,Y).
firstcousin_twicereMOVED(X,Y):-
    firstcousin(Z,Y),
    grandparent(Z,X).

```

The right window, titled 'SWI-Prolog -- g:/CSE 404 [LAB]/Assignment-1', shows the results of queries:

```

?- firstcousin_onceremoved(X,Y).
X = khorshed,
Y = sadi .

?- firstcousin_twicereMOVED(X,Y).
X = mozammel,
Y = asif ;
X = mozammel,
Y = nisho ;
X = mozammel,
Y = asif .

```

Second cousin once and twice removed example:

The screenshot shows the SWI-Prolog IDE with two windows. The left window, titled '20101106.pl', contains the following Prolog code:

```

firstcousin(Z,Y),
grandparent(Z,X).

secondcousin_onceremoved(X,Y):-
    parent(Z,Y),
    secondcousin(X,Z).
secondcousin_onceremoved(X,Y):-
    parent(Z,X),
    secondcousin(Z,Y).

secondcousin_twicereMOVED(X,Y):-
    grandparent(Z,Y),
    secondcousin(X,Z).
secondcousin_twicereMOVED(X,Y):-
    grandparent(Z,X),
    secondcousin(Z,Y).

thirdcousin_onceremoved(X,Y):-

```

The right window, titled 'SWI-Prolog -- g:/CSE 404 [LAB]/Assignment-1 Family Tree', shows the results of queries:

```

?- firstcousin_onceremoved(X,Y).
X = khorshed,
Y = sadi .

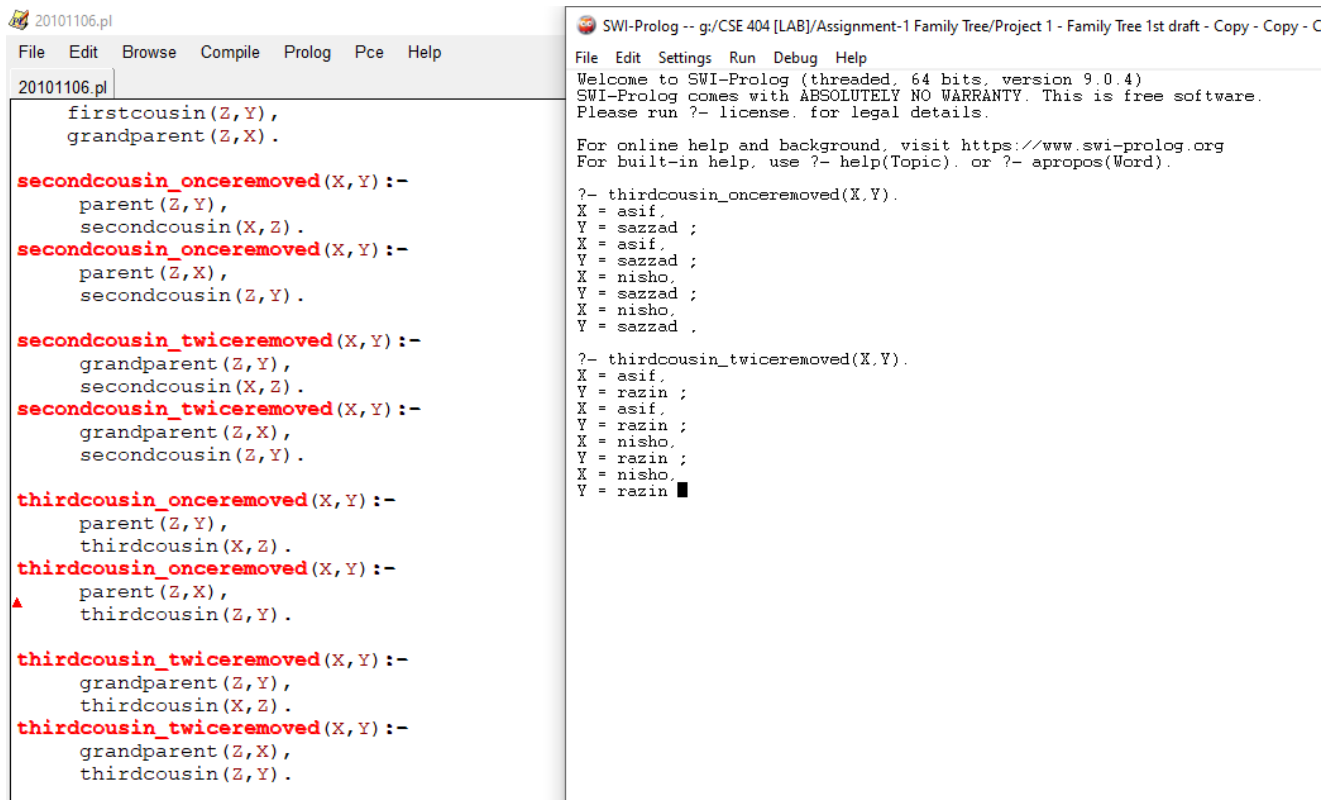
?- firstcousin_twicereMOVED(X,Y).
X = mozammel,
Y = asif ;
X = mozammel,
Y = nisho ;
X = mozammel,
Y = asif .

?- secondcousin_onceremoved(X,Y).
X = raheek,
Y = sadnan ;
X = apurba,
Y = sadnan ;
X = raheek,
Y = sadnan .

?- secondcousin_twicereMOVED(X,Y).
X = raheek,
Y = sazzad ;
X = apurba,
Y = sazzad ;
X = raheek,
Y = sazzad .

```

Third cousin once and twice removed example:



The screenshot displays the SWI-Prolog environment. The left pane shows the file `20101106.pl` with the following Prolog code:

```
firstcousin(Z,Y),
grandparent(Z,X).

secondcousin_onceremoved(X,Y):-
    parent(Z,Y),
    secondcousin(X,Z).
secondcousin_onceremoved(X,Y):-
    parent(Z,X),
    secondcousin(Z,Y).

secondcousin_twiceremoved(X,Y):-
    grandparent(Z,Y),
    secondcousin(X,Z).
secondcousin_twiceremoved(X,Y):-
    grandparent(Z,X),
    secondcousin(Z,Y).

thirdcousin_onceremoved(X,Y):-
    parent(Z,Y),
    thirdcousin(X,Z).
thirdcousin_onceremoved(X,Y):-
    parent(Z,X),
    thirdcousin(Z,Y).

thirdcousin_twiceremoved(X,Y):-
    grandparent(Z,Y),
    thirdcousin(X,Z).
thirdcousin_twiceremoved(X,Y):-
    grandparent(Z,X),
    thirdcousin(Z,Y).
```

The right pane shows the SWI-Prolog console output:

```
SWI-Prolog -- g:/CSE 404 [LAB]/Assignment-1 Family Tree/Project 1 - Family Tree 1st draft - Copy - Copy - C
File Edit Settings Run Debug Help
Welcome to SWI-Prolog (threaded, 64 bits, version 9.0.4)
SWI-Prolog comes with ABSOLUTELY NO WARRANTY. This is free software.
Please run ?- license. for legal details.

For online help and background, visit https://www.swi-prolog.org
For built-in help, use ?- help(Topic). or ?- apropos(Word).

?- thirdcousin_onceremoved(X,Y).
X = asif,
Y = sazzad ;
X = asif,
Y = sazzad ;
X = nisho,
Y = sazzad ;
X = nisho,
Y = sazzad .

?- thirdcousin_twiceremoved(X,Y).
X = asif,
Y = razin ;
X = asif,
Y = razin ;
X = nisho,
Y = razin ;
X = nisho,
Y = razin .
```

Conclusion and Challenges:

I've faced some lite issues during completing this assignment. SWI-Prolog was showing some errors, especially when implementing complicated cousin removed relationships. But after some debugging and troubleshooting I was able to fix all the errors of SWI-Prolog. Although it was an appropriate task for me to explore the field of prolog, it was enjoyable doing the assignment.