

CS 404 — Homework 4

Prolog Genealogy System

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Q1 - What are your newly added Turkish relationship predicates (there are 10 total)?

Ten new Turkish relationship predicates were added to the genealogy system. These predicates and their meanings are listed below:

- `hala/2` – sister of father
- `teyze/2` – sister of mother
- `dayi/2` – brother of mother
- `amca/2` – brother of father
- `anneanne/2` – mother of mother
- `babaanne/2` – mother of father
- `gelin/2` – daughter-in-law
- `damat/2` – son-in-law
- `torun/2` – grandchild
- `dunur/2` – parents whose children are married

Example queries and outputs:

```
?- hala(oya, esra).  
true.
```

```
?- dayi(X, esra).  
X = murat.
```

```
?- anneanne(X, esra).
```

```
X = rukiyе.
```

```
?- babaanne(X, esra).
```

```
X = ayse.
```

```
?- gelin(mualla, ayse).
```

```
true.
```

```
?- torun(elif, ali).
```

```
true.
```

```
?- dunur(X,Y).
```

```
X = ayse,
```

```
Y = rukiyе.
```

Q2 - Write a predicate list-spouse-pairs to list all spouses just once and without hitting next

Using the spouse/2 predicate directly lists each married couple twice and requires pressing next. To avoid this and to list each married couple only once without user interaction, the predicate list-spouse-pairs was implemented using an ordering comparison.

Query and output:

```
?- list-spouse-pairs./ list-all-married-couples
remzi - rukiye
ali - ayse
mualla - osman
murat - oya
true
```

Each married couple is listed exactly once and the user does not need to press next.

Q3 - Is there someone who has at least two children, who are married (i.e., non-single)?

The following query checks whether there exists a person who has at least two children and both children are married.

```
?- person(P), P \= unknown,
parent(P,C1), parent(P,C2),
C1 @< C2,
person(C1), person(C2),
spouse(C1,_), spouse(C2,_).
```

```
C1 = mualla,
C2 = murat,
P = remzi ;
```

```
C1 = mualla,
C2 = murat,
P = rukiye ;
```

```
C1 = osman,
C2 = oya,
```

```
P = ali ;  
  
C1 = osman,  
C2 = oya,  
P = ayse ;  
  
false.
```

This shows that Remzi, Rukiye, Ali, and Ayse each have at least two children who are married.

Q4 - Is the order of the clauses of the add_person predicate matter?

YES — Prolog evaluates clauses from top to bottom and the cut operator (!) can stop further execution, so changing the order of the clauses changes the behavior of the predicate.

Q5 - What is done in mother_check?

The `mother_check` predicate first checks whether the given mother exists as a person in the database. If this cannot be proven (`\+(person(Mother))`), the predicate succeeds immediately and stops due to the cut. If the mother is a known person, it then checks whether the mother is male; if so, it fails. If this also does not fail, it finally checks whether the person being added is male and already used as someone's mother; if so, it fails. If none of these conditions fail, `mother_check` succeeds.