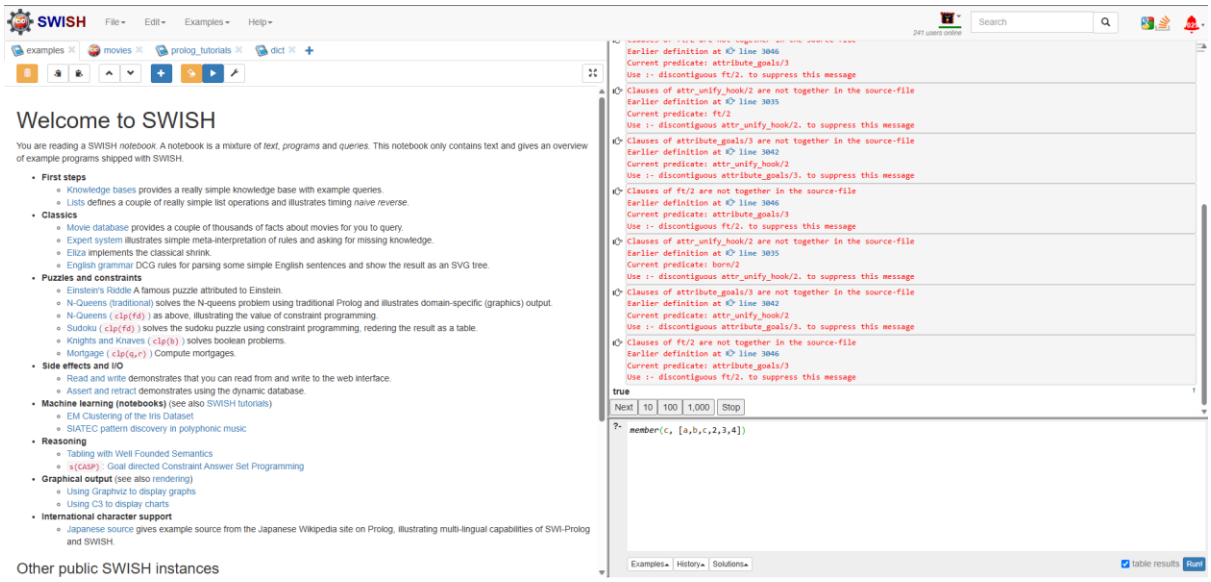
Unit 4 Seminar exercises

1. *Prolog can be used to test the questions included in Unit 2. For example, to test exercise 1 carry out the following steps.*
    - *Surf to https://swi-prolog.org*
    - *Click on "try swi-prolog online".*
    - *On the SWISH page click on notebook.*
    - *Click on Query.*
    - *In the 'query' box enter "member(c, [a,b,c,2,3,4])".*
    - *Click the go (>) button – it should give the answer 'true' (I.e., c is a member of the set).*
    - *How many of the questions in exercise 1 can you check in this way?*

Answer:



Negation: ~P

not_p(P) :- \+ P.

Conjunction: P ∧ Q

and_p_q(P, Q) :- P, Q.

Disjunction: P ∨ Q

or_p_q(P, Q) :- P; Q.

Implication: P → Q

implies_p_q(P, Q) :- \+ P; Q.

Biconditional: P ↔ Q

biconditional_p_q(P, Q) :- implies_p_q(P, Q), implies_p_q(Q, P).

Complex: P → (~ Q)

implies_p_not_q(P, Q) :- \+ P; \+ Q.

Negation of Implication: (~ Q) -> (~ P)

neg_implies_q_p(Q, P) :- Q, \+ P.

Exclusive OR: P XOR Q

xor_p_q(P, Q) :- (P, \+ Q); (\+ P, Q).

Negation of Conjunction: ~(P ∧ Q)

neg_and_p_q(P, Q) :- \+ (P, Q).

Disjunction with Conjunction: P ∨ (Q ∧ R)

or_p_and_q_r(P, Q, R) :- P; (Q, R).

Nested Disjunction: P ∨ (Q ∨ R)

or_p_or_q_r(P, Q, R) :- P; Q; R.

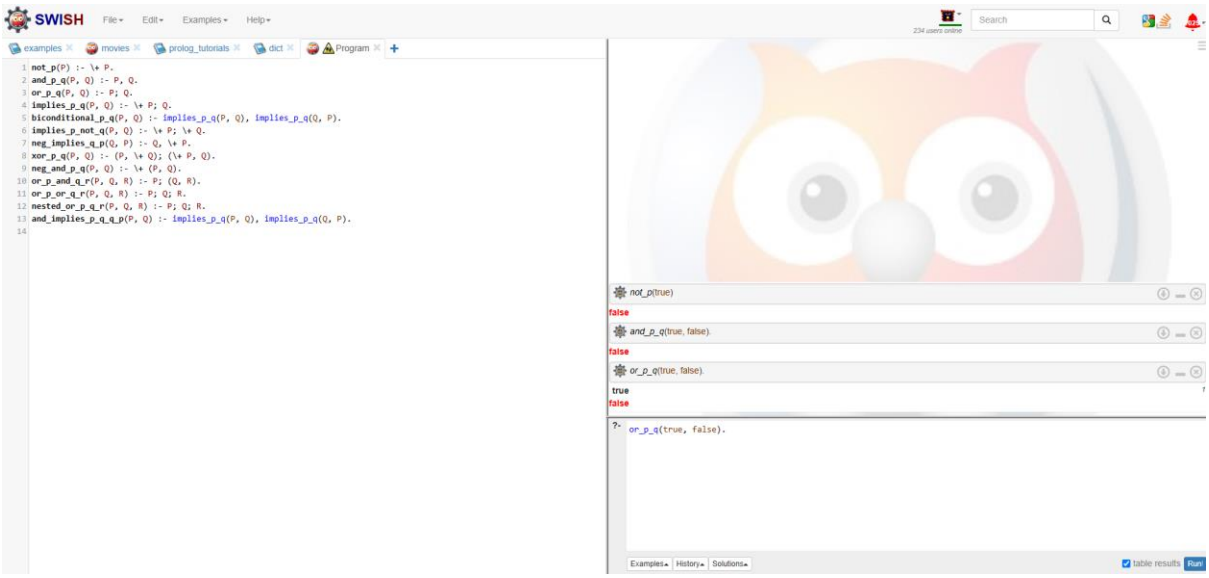
Comparison of Disjunctions: (P ∨Q) ∨ R

nested_or_p_q_r(P, Q, R) :- P; Q; R.

Biconditional: (P → Q) ∧ (Q → P)

and_implies_p_q_q_p(P, Q) :- implies_p_q(P, Q), implies_p_q(Q, P).

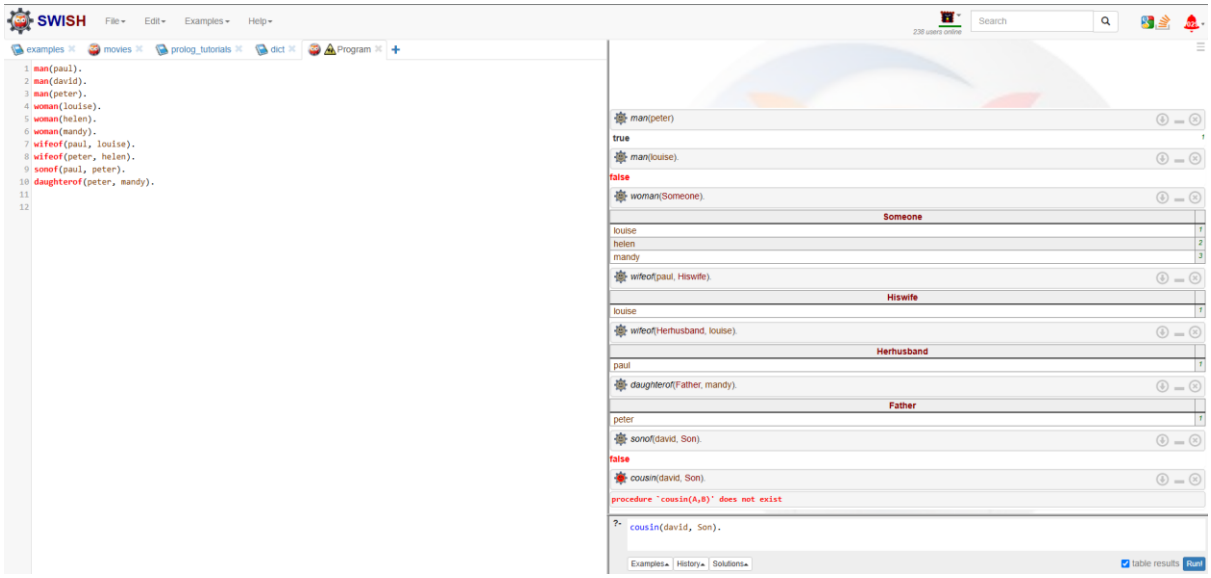
Testing:

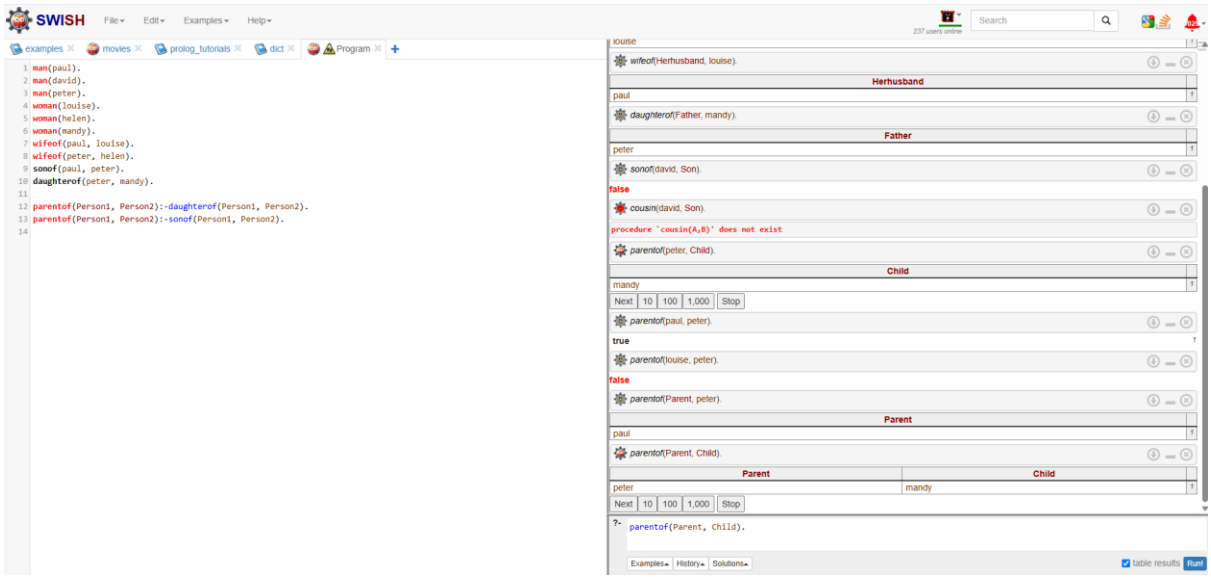


2. *Read Ritchie (2002) section 8.2 (starting on pg 12). Input the facts into the SWI-SWISH page and run the queries. To do this:*

   - *Click the + sign next to the word notebook.*
   - *Choose program.*
   - *Enter the facts (printed in the Ritchie book) into the large window.*
   - *On the right hand side of the screen you will see a smaller window, with a "?- " at the top corner – this is the query box.*
   - *Enter your queries into the box then click the run button.*
   - *Try all the queries presented in sections 8.2 and 8.3 of the Ritchie book.*

Answer:





3. *Enter the Prolog version of the "crossing problem" into the SWISH program window and run it. What is the result?*

Unable to answer as the Prolog answer is not provided in the learning materials