CSE537: Artificial Intelligence, Fall 2018

Assignment 3

(Due: 31 October 2018)

Submission Details			
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Answer 1) List of Authorized Roles for a given user

Approach:

We are calculating direct roles and descendant roles for the given user. Then we are creating a new list from appending the above 2 lists and finally put the elements of the resultant list into a set to remove duplicate elements. To calculate the direct roles we are checking predicates of the form ur(User, X) and to calculate descendant roles we are checking for all paths (X, Y).

Input:

users(3).
roles(5).
perms(5).
ur(1,1).
ur(1,2).
ur(2,3).
ur(2,4).
ur(3,5).
rp(1,1).
rp(1,2).
rp(2,3).
rp(2,4).
rp(5,3).
rp(5,4).
rh(3,4).
rh(4,5).
rh(4,3).
rh(5,4).

authorizedroles(2,ListRoles)

Output:

So for user 2, direct roles are [3,4].
Descendant roles for role 3 is [4], for role 4 is [5]. So appending direct and descendant roles, we get:

ListRoles = [3,4,5]

Answer 2) List of Authorized Permissions for a given user

Approach:

Since we already got the roles for each user in part (1), so to calculate the permissions we checked the predicates of the form rp(X,Y) for each role calculated for the given user and finally doing the setof to remove the duplicates from the permissions list.

Input:

users(3).
roles(5).
perms(5).
ur(1,1).
ur(1,2).
ur(2,3).
ur(2,4).
ur(3,5).
rp(1,1).
rp(1,2).
rp(2,3).
rp(2,4).
rp(5,3).
rp(5,4).
rh(3,4).
rh(4,5).
rh(4,3).
rh(5,4).

authorizedpermissions(1, ListPermissions)

Output:

So for user 1, we have roles = [1, 2].
Permissions for role 1 is [1,2] and for role 2 is [3,4].

ListPermissions = [1,2,3,4]

Answer 3) Minimum number of roles to cover all users

Approach:

Since we have the permissions for each user, we will check the unique number of sets for each user and that will be the minumum number of roles required to cover all users.

Input:

users(3).
roles(5).
perms(5).
ur(1,1).
ur(1,2).
ur(2,3).
ur(2,4).
ur(3,5).
rp(1,1).
rp(1,2).
rp(2,3).
rp(2,4).
rp(5,3).
rp(5,4).
rh(3,4).
rh(4,5).
rh(4,3).
rh(5,4).

minRoles(S)

Output:

for user 1, permission set is [1,2,3,4].
for user 2, permission set is [3,4].
for user 3, permission set is [3,4].
Thus we have 2 unique sets, so the minimum number of roles required are:

S = 2