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% DYNAQPLUS_MAZE_SCRIPT - Implements the DynaQ Algorithm on the simple maze example found
in Chapter 9
%
% Written by:
% --
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%
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% Please send comments and especially bug reports to the
% above email address.
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%-----

close all;
clc;

% sample_discrete.m
addpath( genpath( '../.../FullBNT-1.0.4/KPMstats/' ) );

% the learning rate:
alpha = 1e-1;

% the probability of a random action (non-greedy):
epsilon = 0.1;

% the discount factor:
gamma = 0.95;
%gamma = 1.0;

% get our initial maze (the blocking maze):
MZ = mk_ex_9_2_mz(0); [sideII,sideJJ] = size(MZ);

% the beginning and terminal states (in matrix notation):
s_start = [ 6, 4 ];
s_end    = [ 1, 9 ];

MAX_N_STEPS=30;
%MAX_N_STEPS=1e3;
MAX_N_STEPS=1e4;
MAX_N_STEPS=1e5;
%MAX_N_STEPS=1e6;
%MAX_N_STEPS=10e6;

% the number of steps to do in planning:
%nPlanningSteps = 0;
nPlanningSteps = 5;
%nPlanningSteps = 50;
nPSV = [ 0, 5, 50 ];

% a factor relating how important revisiting old states is, relative to
% the past recieved reward coming from these states/action pairs ...
%kappa = 0.02;
kappa = 2/sqrt(MAX_N_STEPS);

allCR = zeros(2*length(nPSV),MAX_N_STEPS);
for npsi=1:length(nPSV),
    nPlanningSteps = nPSV(npsi);
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[Q,ets,cr] =
dynaQplus_maze(alpha,epsilon,gamma,kappa,nPlanningSteps,@mk_ex_9_2_mz,s_start,s_end,MAX_N
_STEPS);
    allCR(npsi,:) = cr(2:end);
    fh1{npsi} = sprintf('dynaQplus: %d planning steps',nPlanningSteps);

    [Q,ets,dum1,dum2,dum3,cr] =
dynaQ_maze(alpha,epsilon,gamma,nPlanningSteps,@mk_ex_9_2_mz,s_start,s_end,MAX_N_STEPS);
    allCR(length(nPSV)+npsi,:) = cr(2:end);
    fh1{length(nPSV)+npsi} = sprintf('dynaQ: %d planning steps',nPlanningSteps);
end

figure; fhs=plot( (1:3000), allCR(:,2:3001), '-' );
title( 'cumulative reward' ); grid on;
xlabel('timestep index'); ylabel('cum. reward'); drawnow;
legend( fhs, fh1, 'Location', 'NorthWest' );
fn = sprintf('blocking_dynaQplus_vs_dyanQ_cum_reward'); saveas( gcf, fn, 'png' );

clear functions;
%close all;
return;
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