

Elitism Test

In this report I compared the effects of using different kinds of elitism and different strategies to group the neurons into networks. For the grouping the first option is completely random, the second is making sure that every node gets picked as often as any other node.

The elitism options are elitism based on the best network, the best nodes, both or none.

As can be seen in the plots below network elitism performs significantly worse on the task if two pole balancing than node elitism or no elitism at all.

```
clear;
addpath('simulator');
p(1).topology = [6 2 1];
evaluationFunction = 'twoPoleEvaluation';
p(1).permutationOption = 1;
p(1).elitismOption = 1;
p(1).targetFitness = 1000;
p(1).maximumGenerations = 500;

p(2) = p(1);
p(2).permutationOption = 1;
p(2).elitismOption = 2;

p(3) = p(1);
p(3).permutationOption = 1;
p(3).elitismOption = 3;

p(4) = p(1);
p(4).permutationOption = 1;
p(4).elitismOption = 4;

p(5) = p(1);
p(5).permutationOption = 2;
p(5).elitismOption = 1;

p(6) = p(1);
p(6).permutationOption = 2;
p(6).elitismOption = 2;

p(7) = p(1);
p(7).permutationOption = 2;
p(7).elitismOption = 3;

p(8) = p(1);
p(8).permutationOption = 2;
p(8).elitismOption = 4;

nRuns = 100;

for experiment=1:8
    clearvars medianNodes bestNet medianNet r;
    medianNodes = ones(nRuns,p(experiment).maximumGenerations) * p(experiment).targetFitness;
    bestNet = ones(nRuns,p(experiment).maximumGenerations) * p(experiment).targetFitness;
    medianNet = ones(nRuns,p(experiment).maximumGenerations) * p(experiment).targetFitness;
    for run=1:nRuns
        r(run) = doEsp(evaluationFunction, p(experiment));
        medianNodes(run,1:size(r(run).medianNodeFitness,2)) = mean(r(run).medianNodeFitness,1);
        bestNet(run,1:size(r(run).bestNetFitness,2)) = r(run).bestNetFitness;
```

```

medianNet(run,1:size(r(run).medianNetFitness,2)) = r(run).medianNetFitness;

end
meanMedianNodes(experiment,:) = mean(medianNodes,1);
meanBestNet(experiment,:) = mean(bestNet,1);
meanMedianNet(experiment,:) = mean(medianNet,1);
end

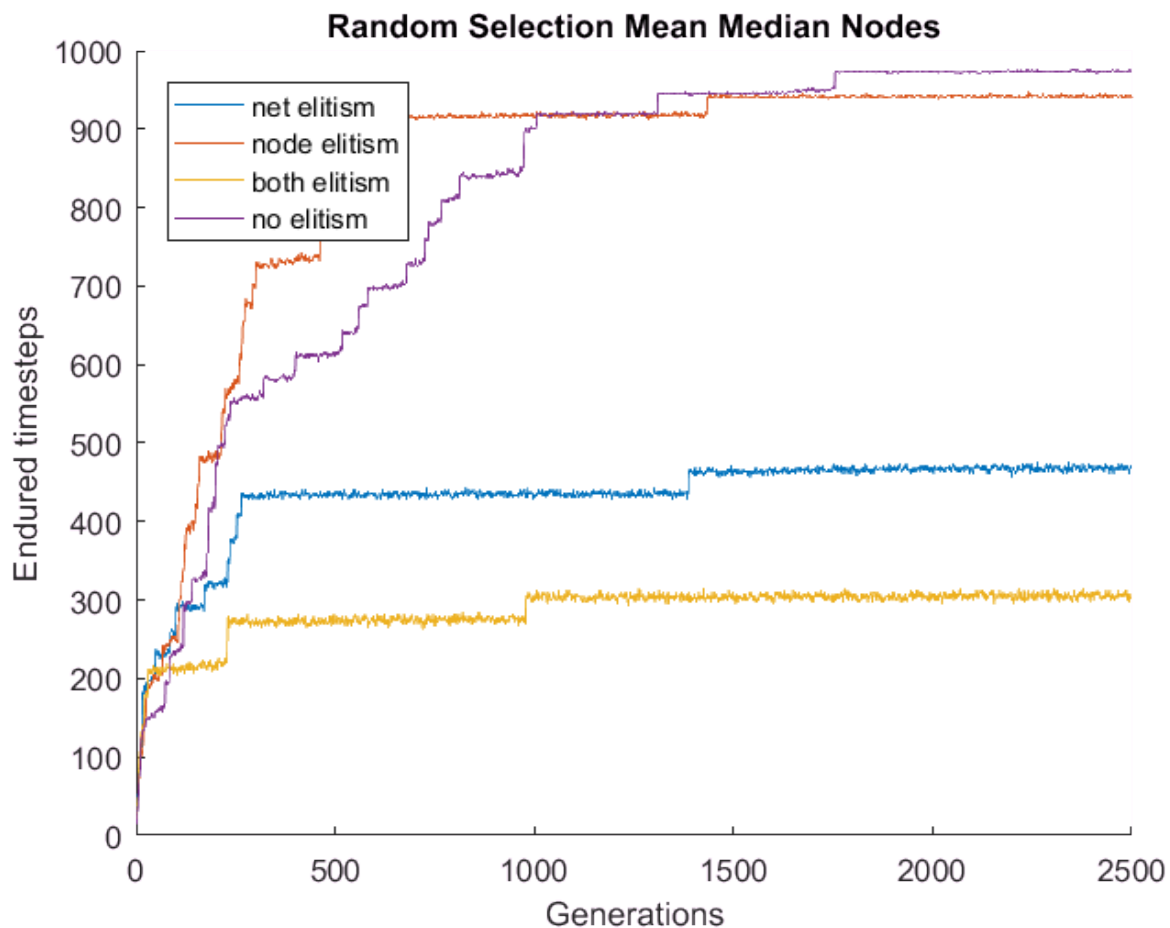
```

Starting parallel pool (parpool) using the 'local' profile ...
connected to 4 workers.

```

figure(1); clf; hold on;
for i=1:4
    plot(meanMedianNodes(i,:));
end
legend('net elitism','node elitism',...
    'both elitism','no elitism',...
    'Location','northwest');
title('Random Selection Mean Median Nodes');
ylabel('Endured timesteps');
xlabel('Generations');

```



```

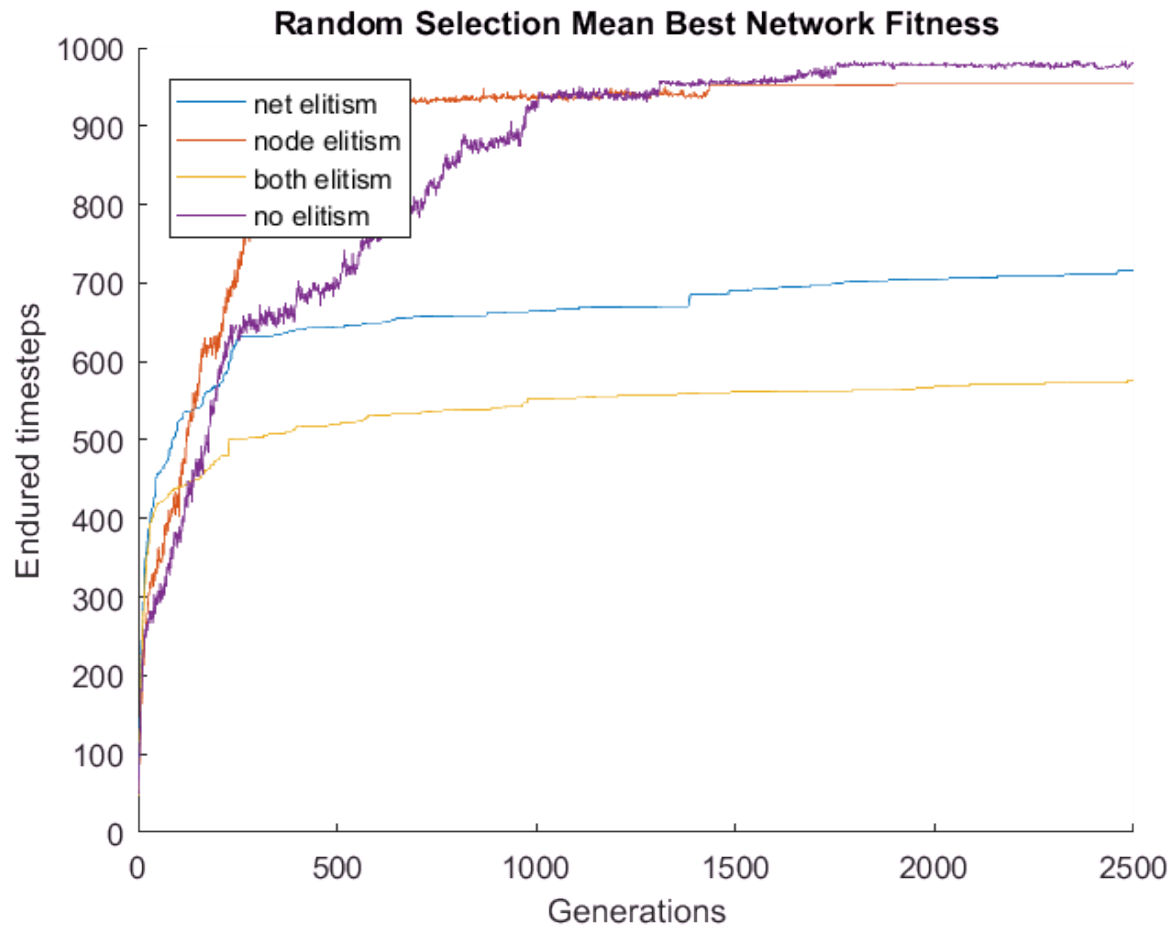
figure(2); clf; hold on;
for i=1:4
    plot(meanBestNet(i,:));
end

```

```

legend('net elitism','node elitism',...
      'both elitism', 'no elitism',...
      'Location','northwest');
title('Random Selection Mean Best Network Fitness');
ylabel('Endured timesteps');
xlabel('Generations');

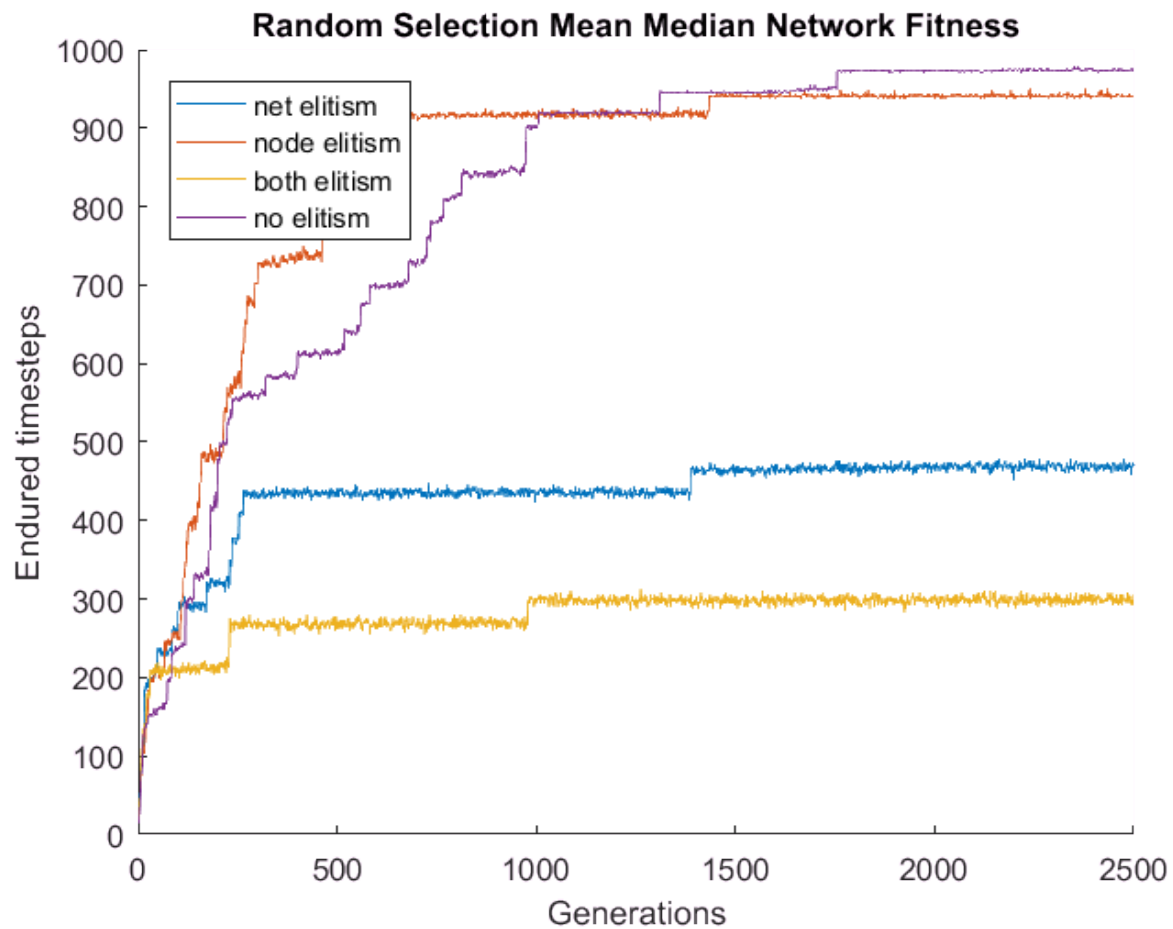
```



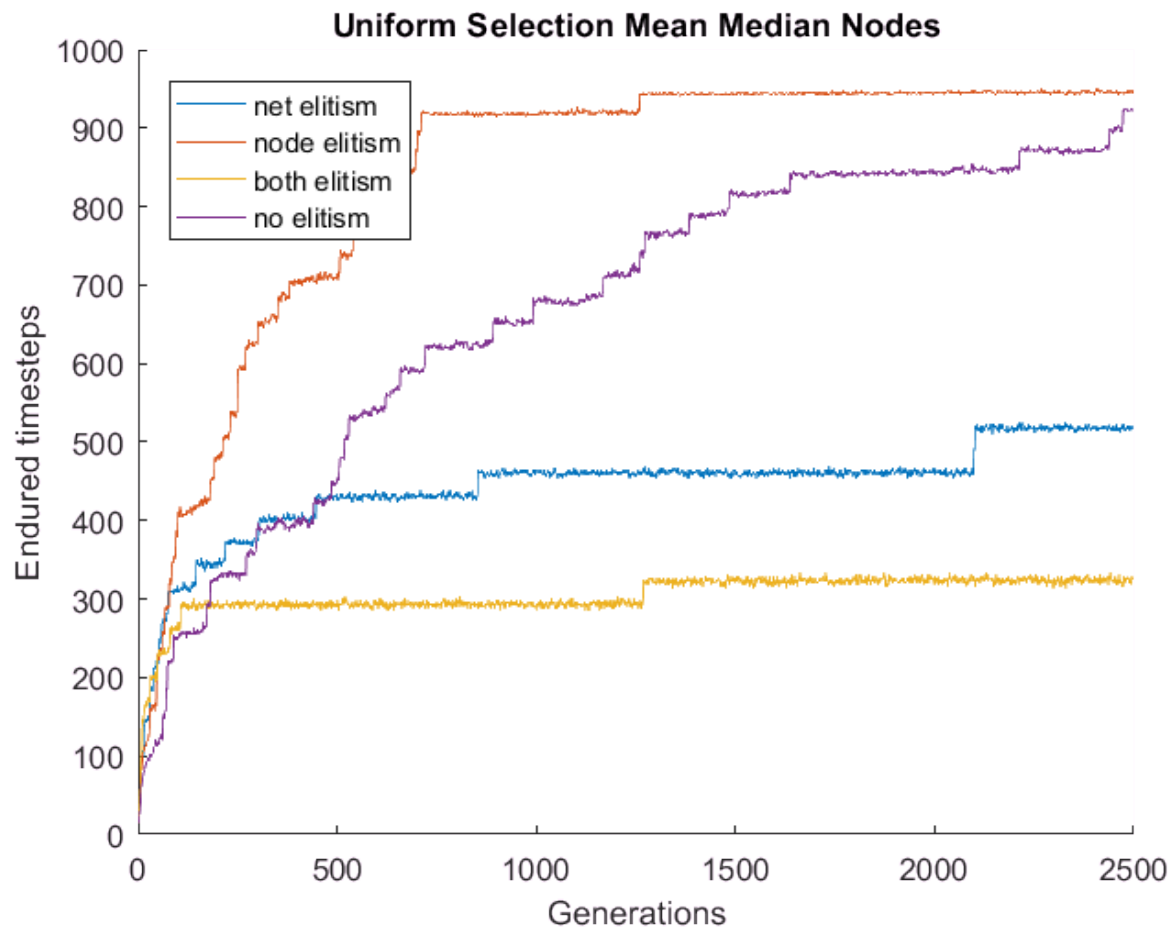
```

figure(3); clf; hold on;
for i=1:4
    plot(meanMedianNet(i,:));
end
legend('net elitism','node elitism',...
      'both elitism', 'no elitism',...
      'Location','northwest');
title('Random Selection Mean Median Network Fitness');
ylabel('Endured timesteps');
xlabel('Generations');

```



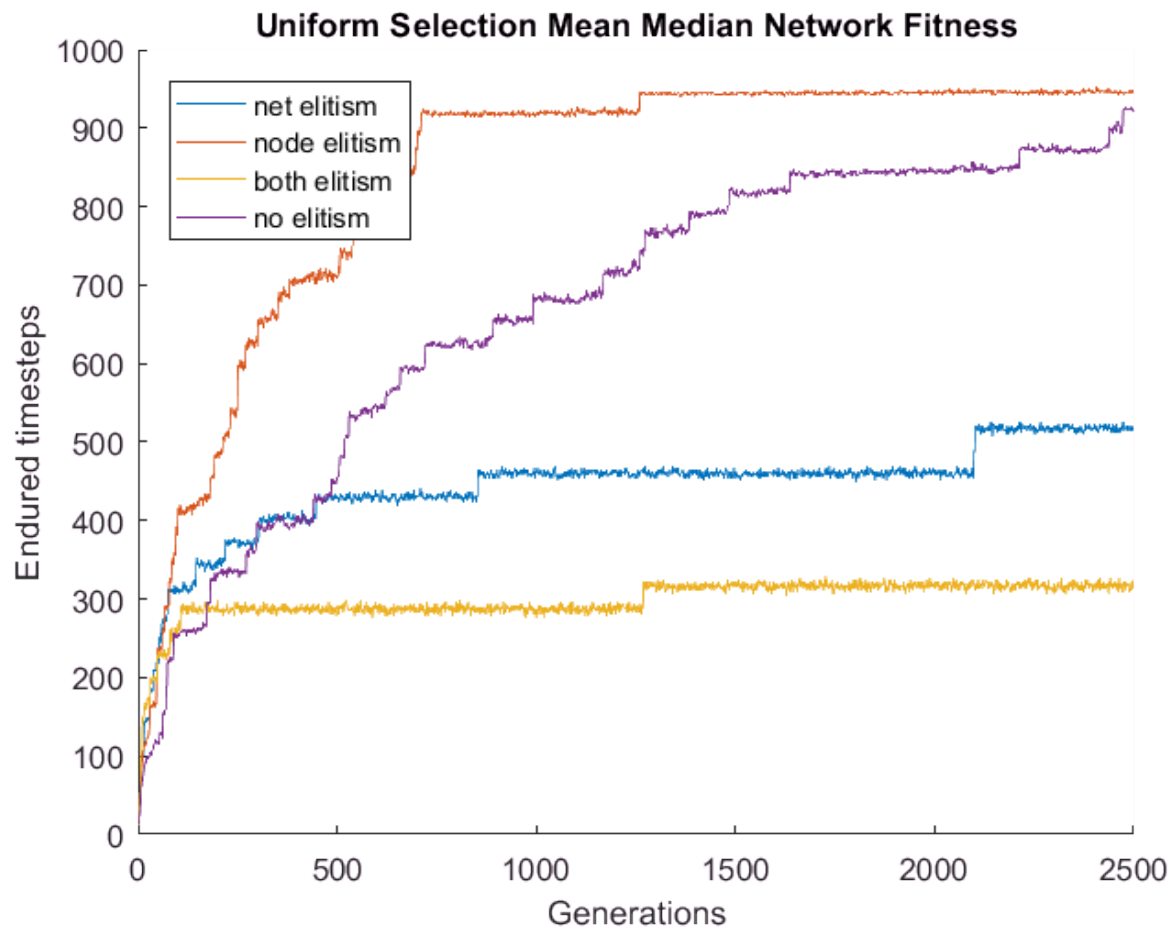
```
figure(4); clf; hold on;
for i=5:8
    plot(meanMedianNodes(i,:));
end
legend('net elitism','node elitism',...
    'both elitism', 'no elitism',...
    'Location','northwest');
title('Uniform Selection Mean Median Nodes');
ylabel('Endured timesteps');
xlabel('Generations');
```



```
figure(5); clf; hold on;
for i=5:8
    plot(meanBestNet(i,:));
end
legend('net elitism','node elitism',...
    'both elitism','no elitism',...
    'Location','northwest');
title('Uniform Selection Mean Best Network Fitness');
ylabel('Endured timesteps');
xlabel('Generations');
```



```
figure(6); clf; hold on;
for i=5:8
    plot(meanMedianNet(i,:));
end
legend('net elitism','node elitism',...
    'both elitism','no elitism',...
    'Location','northwest');
title('Uniform Selection Mean Median Network Fitness');
ylabel('Endured timesteps');
xlabel('Generations');
```



```
figure(7); clf; hold on;
plot(meanMedianNet(1,:));
plot(meanMedianNet(2,:));
plot(meanMedianNet(5,:));
plot(meanMedianNet(6,:));
legend('random net','random node',...
       'uniform net','uniform node',...
       'Location','northwest');
title('Mean Median Network Fitness');
ylabel('Endured timesteps');
xlabel('Generations');
```

