# Computer-aided simulations lab
# Lab L6 report: Dynamic processes on graphs

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## 1 Variables chosen

The number of nodes decided to be used in the voter model analysis was 1000, so the probability of an edge between two nodes, $p_g$, was equal to $\frac{10}{n} = 0.01$.

## 2 Consensus analysis

To calculate a good approximation of the probability and time needed for reaching a +1 consensus, for each value of initial probability $p_1$, 1000 G(n=1000,p=0.01) graphs were randomly generated. Then, these graphs were simulated until they reached a consensus (not mattering if it was a +1 consensus or not). By the law of large numbers, the samples probability of reaching a +1 consensus and the mean time for it are good approximations for the real values. The table below summarizes the results obtained for the different values of $p_1$.

| $p_1$ value | +1 consensus probability estimation | consensus time estimation |
|---|---|---|
| 0.51 | 50.8% | 0.71s |
| 0.55 | 54.8% | 0.62s |
| 0.6 | 58.3% | 0.55s |
| 0.7 | 69.8% | 0.49s |

The results are consistent to theoretical predictions, according to [1], since the consensus probability increases and consensus time decreases as the initial node states gets more homogeneous to +1.

**References**

[1] Y. Hatano and M. Mesbahi, "Agreement over random networks," IEEE Trans. Autom. Control, vol. 50, no. 11, pp. 1867-1872, 2005.