
DISTRIBUTED CONTROL

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This code generates scale-free, small-world and random networks; for each network we compute the average size of F_I^* and J^* for different distances between local controller and furthest outputs.

Initialization

```
addpath('Daan') % adding path to Daan's Generative Models
clc
close all
clear all

n = 1000;
GRAPH_TYPES = {'Scale-Free' 'Small-World' 'Random'};

plot_count = 0;

PROB = 0.5; % The probability of choosing a in- or out-edge

for g = 1 : size(GRAPH_TYPES,2)
```

Generating the Directed Network

```
W = generate_network(n, GRAPH_TYPES{g});

deg = sum(W,2); % undirected degrees computation

for i = 1 : n
    for j = i+1 : n
        if deg(i) > deg(j)
            if rand < PROB; W(i,j) = 0; % hubs --> smaller nodes
            else W(j,i) = 0; end
        else
            if rand < PROB; W(j,i) = 0; % hubs <-- smaller nodes
            else W(i,j) = 0; end
        end
    end
end

for i = 1 : n
    if sum(sum(W(i,:))) > 0
```

```

        W(i,:) = W(i,:) / sum(W(i,:));
        W(i,i) = 0;
    end
end

```

Computing the F_I and J^* .

```
[I,J] = estimate_ij_star(W, false);
```

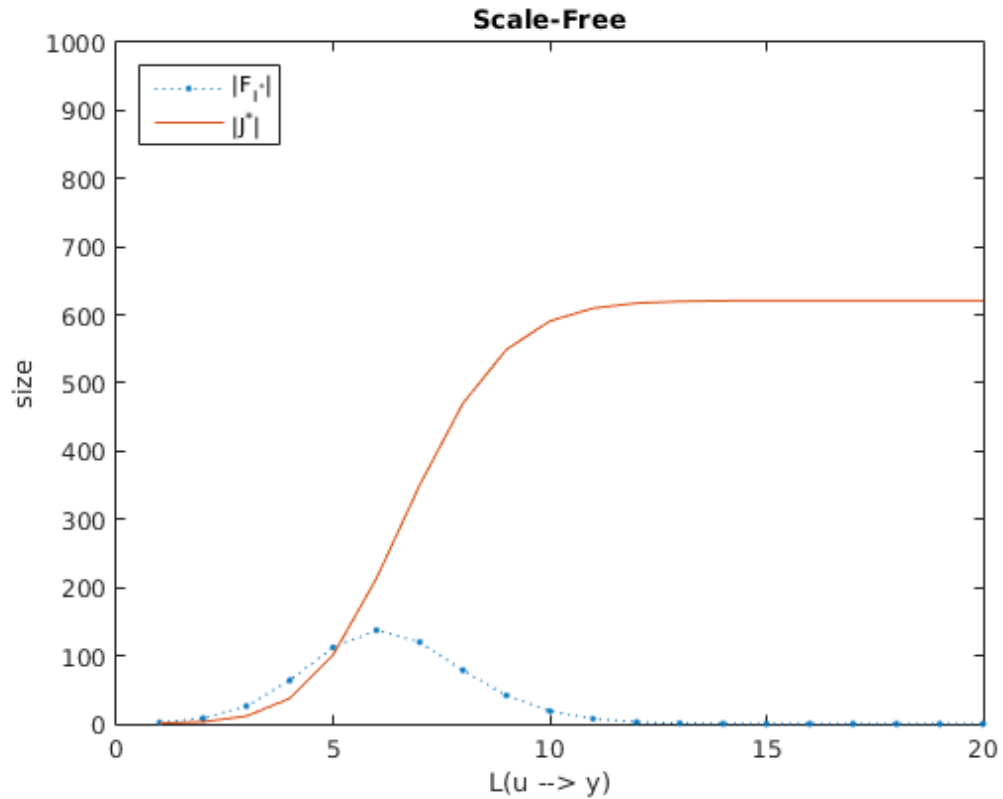
Visualization

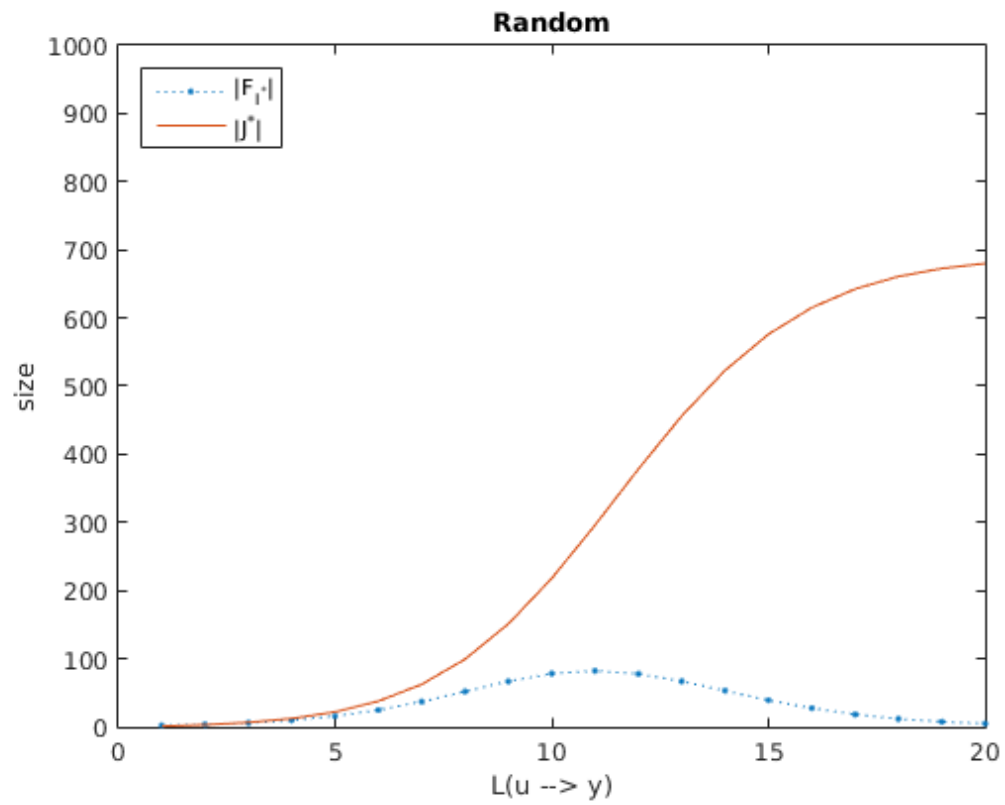
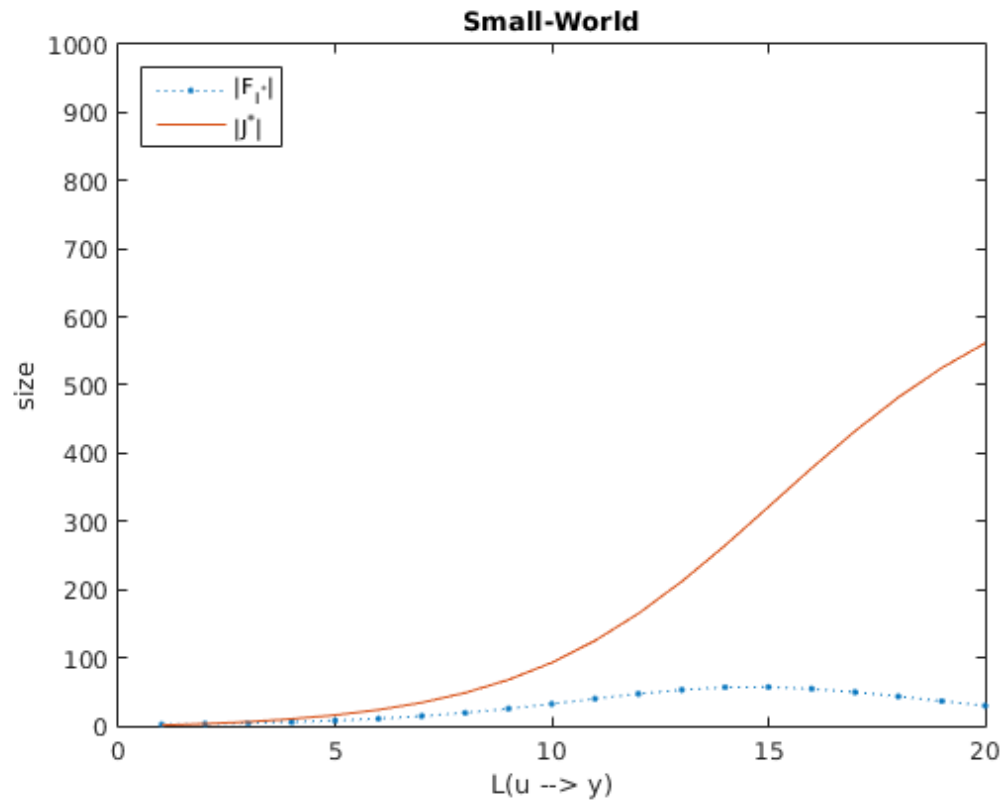
In following figures $|F_I|$ denotes the number of sensors needed and $|J^*|$ denotes the number of nodes which are located within the local network and should be isolated from disturbances.

```

figure
plot(I, 'b.:')
hold on
plot(J)
legend(' |F_I^*| ', ' |J^*| ', 'Location', 'NorthWest')
xlabel('L(u --> y)')
ylabel('size')
ylim([0,n])
title([GRAPH_TYPES{g}])

```





end

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