

Model v2:

Define δ := minimum degree.

Define Δ := maximum degree.

Define n to be the number of vertices.

$$a_{i,j} = a_{j,i} \quad \forall i, j : i \neq j \quad (1)$$

$$a_{i,i} = 0 \quad \forall i \quad (2)$$

$$\sum_{j=1}^n a_{1,j} = \delta \quad (3)$$

$$\sum_{j=1}^n a_{i,j} = \Delta \quad 1 < i \leq \Delta \quad (4)$$

$$\sum_{j=1}^n a_{i,j} = \delta \quad \Delta < i \leq n \quad (5)$$

Constraint 1 ensures that the adjacency matrix is symmetric.

Constraint 2 ensures the trace is 0.

Constraint 3 ensures the top row sums to δ .

Constraint 4 ensures the rows 2 through Δ sums to Δ .

Constraint 5 ensures the rest of the rows sum to δ .

As well as the above constraints the following initial conditions are given by algorithms as they are not simple to write in one line.

The following adds the 0 matrix around the trace where appropriate.

```
for c = 0 < δ
  for i = Δ + 1 + cδ < Δ + δ(c + 1)
    for j = i + 1 ≤ Δ + δ(c + 1)
      ai,j = 0
```

The following adds the identity matrix where appropriate.

```
for i = Δ + 1 ≤ Δ + δ
  for b = 1 < δ
    ai,j+(b-1)δ = 1
```

The following sets the first row.

```
for j = 2 ≤ Δ
  a1,j = 1
```

The following sets the rows 2 through Δ appropriately.

```
for i = 2 ≤ Δ
  for j = 1 ≤ δ
    ai,j+(i-1)δ+1 = 1
```

Notes:

- don't need column sum because of symmetry of the row sum.
- don't need triangle constraints hopefully because of further constraints to be added.
- don't need square constraints hopefully because of further constraints to be added.