Testing Document

This program takes a single Netdraw .VNA file as an command line argument.  It parses the information from the file line by line and creates a graph with the collected vertex and arc data specified by the .VNA file.  The program then collects and outputs basic statistics on the graph.  Finally it follows the depth-first search algorithm to find the Strongly Connected Components of the graph and outputs the Strongly Connected Components and its members in non-increasing order.

Sample .vna files included

[SCC-Test.vna](file:///D:\Dropbox\ICS311_Projects\Graph\SCC-Test.vna)

[celegansneural.vna](file:///D:\Dropbox\ICS311_Projects\Graph\celegansneural.vna)

Testing Results:

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Graph SCC-Test.vna

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|V| = 41

|A| = 67

Density = 0.04085365853658537

Degree distribution:     minimum         average           maximum

            inDegree(v)     0          1.634   4

            outDegree(v)   0          1.634   4

Number of Strongly Connected Components: 12

Number of Members in Largest Strongly Connected Component: 8

Percent Vertices in Largest Strongly Connected Component: 19.51219512195122

SCC:

ID        Root    Size     Members

1.         13        8          13, 17, 16, 19, 11, 10, 18, 14

2.         39        7          36, 39, 30, 31, 32, 37, 34

3.         47        6          47, 43, 41, 48, 40, 46

4.         29        6          21, 29, 28, 24, 27, 22

5.         50        5          52, 54, 56, 50, 58

6.         3          3          3, 5, 4

7.         6          1          6

8.         2          1          2

9.         7          1          7

10.       8          1          8

11.       1          1          1

12.       9          1          9

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Graph celegansneural.vna

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|V| = 297

|A| = 2345

Density = 0.026674401674401674

Degree distribution:     minimum         average           maximum

            inDegree(v)     0          7.896   134

            outDegree(v)   0          7.896   39

Number of Strongly Connected Components: 57

Number of Members in Largest Strongly Connected Component: 239

Percent Vertices in Largest Strongly Connected Component: 80.47138047138047

SCC:

ID        Root    Size     Members

1.         0          239      12, 2, 172, 125, 118, 4, 3, 84, 86, 117, 137, 6, 142, 13, 59, 119, 114, 130, 1, 204, 98, 191, 207, 63, 90, 226, 132, 42, 187, 195, 14, 123, 48, 31, 47, 102, 71, 58, 93, 111, 177, 67, 202, 213, 145, 198, 199, 193, 245, 201, 103, 8, 113, 87, 218, 74, 21, 203, 105, 108, 205, 73, 27, 7, 16, 115, 95, 219, 189, 43, 18, 121, 122, 109, 148, 233, 75, 20, 149, 52, 35, 97, 133, 200, 72, 129, 224, 9, 101, 197, 77, 50, 15, 10, 185, 166, 276, 168, 209, 5, 116, 41, 106, 22, 225, 206, 169, 163, 162, 178, 160, 151, 124, 135, 85, 66, 33, 171, 170, 167, 275, 192, 179, 161, 34, 214, 216, 150, 69, 30, 19, 64, 107, 139, 228, 157, 184, 155, 138, 131, 141, 91, 32, 62, 11, 65, 277, 256, 176, 182, 159, 238, 153, 253, 232, 173, 89, 215, 53, 0, 194, 110, 99, 257, 164, 152, 220, 181, 180, 217, 211, 210, 244, 104, 112, 29, 17, 70, 100, 40, 36, 255, 221, 165, 127, 156, 154, 212, 120, 239, 83, 68, 229, 158, 196, 237, 241, 283, 82, 136, 61, 38, 60, 55, 56, 175, 246, 188, 76, 208, 45, 240, 147, 96, 24, 236, 140, 26, 28, 254, 183, 282, 128, 146, 250, 267, 272, 265, 126, 263, 92, 235, 266, 264, 279, 262, 144, 223, 222

2.         23        2          23, 46

3.         247      2          247, 248

4.         44        1          44

5.         190      1          190

6.         284      1          284

7.         231      1          231

8.         49        1          49

9.         269      1          269

10.       227      1          227

11.       234      1          234

12.       271      1          271

13.       273      1          273

14.       39        1          39

15.       51        1          51

16.       57        1          57

17.       268      1          268

18.       278      1          278

19.       230      1          230

20.       134      1          134

21.       54        1          54

22.       249      1          249

23.       259      1          259

24.       186      1          186

25.       78        1          78

26.       261      1          261

27.       258      1          258

28.       88        1          88

29.       252      1          252

30.       174      1          174

31.       37        1          37

32.       25        1          25

33.       143      1          143

34.       79        1          79

35.       274      1          274

36.       94        1          94

37.       270      1          270

38.       280      1          280

39.       81        1          81

40.       281      1          281

41.       251      1          251

42.       80        1          80

43.       296      1          296

44.       295      1          295

45.       294      1          294

46.       293      1          293

47.       292      1          292

48.       291      1          291

49.       290      1          290

50.       289      1          289

51.       288      1          288

52.       287      1          287

53.       286      1          286

54.       285      1          285

55.       260      1          260

56.       243      1          243

57.       242      1          242

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Graph political-blogs.vna

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|V| = 1490

|A| = 19025

Density = 0.0085751889696702

Degree distribution:     minimum         average           maximum

            inDegree(v)     0          12.768 337

            outDegree(v)   0          12.768 256

Number of Strongly Connected Components: 688

Number of Members in Largest Strongly Connected Component: 793

Percent Vertices in Largest Strongly Connected Component: 53.22147651006711

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Graph wiki-Vote.vna

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|V| = 7115

|A| = 103689

Density = 0.0020485375110809584

Degree distribution:     minimum         average           maximum

            inDegree(v)     0          14.573 457

            outDegree(v)   0          14.573 893

Number of Strongly Connected Components: 5816

Number of Members in Largest Strongly Connected Component: 1300

Percent Vertices in Largest Strongly Connected Component: 18.271257905832748

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Graph p2p-Gnutella31.vna

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|V| = 62586

|A| = 147892

Density = -3.9122540451204797E-4

Degree distribution:     minimum         average           maximum

            inDegree(v)     0          2.363   68

            outDegree(v)   0          2.363   78

Number of Strongly Connected Components: 48438

Number of Members in Largest Strongly Connected Component: 14149

Percent Vertices in Largest Strongly Connected Component: 22.60729236570479

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Graph ti-full.vna

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|V| = 38804

|A| = 197082

Density = 1.3088960623623057E-4

Degree distribution:     minimum         average           maximum

            inDegree(v)     0          5.079   889

            outDegree(v)   0          5.079   944

Number of Strongly Connected Components: 7061

Number of Members in Largest Strongly Connected Component: 27287

Percent Vertices in Largest Strongly Connected Component: 70.3200700958664

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Graph email-Enron.vna

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|V| = 36692

|A| = 367662

Density = 2.7309755503535E-4

Degree distribution:     minimum         average           maximum

            inDegree(v)     0          10.02   1383

            outDegree(v)   0          10.02   1383

Number of Strongly Connected Components: 1065

Number of Members in Largest Strongly Connected Component: 33696

Percent Vertices in Largest Strongly Connected Component: 91.83473236672845

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Graph cit-HepTh.vna

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|V| = 27770

|A| = 352807

Density = 4.575105077821084E-4

Degree distribution:     minimum         average           maximum

            inDegree(v)     0          12.705 2414

            outDegree(v)   0          12.705 562

Number of Strongly Connected Components: 20086

Number of Members in Largest Strongly Connected Component: 7464

Percent Vertices in Largest Strongly Connected Component: 26.877925819229386

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Graph soc-Epinions1.vna

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|V| = 75879

|A| = 508837

Density = 3.4790383143530336E-4

Degree distribution:     minimum         average           maximum

            inDegree(v)     0          6.706   3035

            outDegree(v)   0          6.706   1801

Number of Strongly Connected Components: 42176

Number of Members in Largest Strongly Connected Component: 32223

Percent Vertices in Largest Strongly Connected Component: 42.466295022338194

\* Computer could not run file listed below:

soc-Slashdot0902.vna

web-google.vna

The only discrepancies’ of the test results collected were with graphs:

celegansneural.vna

email-Enron.vna

|V| and |A| for C. Elegans were higher than stated under graph analysis

|A| for Enron email network as well.

I iterated through both graph’s |V| and |A| data, the results corresponded with test results gathered.

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