Thesis - Report Feb 10 - Heuristic Betweenness Centrality for Weighted Graph

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1 Introduction

1.1 Notation

BBC: the score obtained by Brandes Betweenness Centrality
BBCT: the score obtained by Brandes BC with the inclusion of targets
HBCU: the heuristic way to obtain BC score, for unweighted graph
HBCW: the heuristic way to obtain BC score, for weighted graph

1.2 Dataset

There are 5 datasets in total:

- Unweighted graphs
  - *simple*: this is the graph getting from paper [1]
  - *ninux_unweighted_connected*: all the vertices and edges are the same as *ninux_30_1*, but the costs for all edges are 1. It's
- Weighted graphs
  - *ninux_30_1*
  - *olsr-netjson*
  - *jsoninfo_topo*

1.3 Comparison between BBC, BBCT, HBCU

We have BBC $\sim$ HBCU, there are constant difference between the scores obtained by these 2 methods.

And we have BBCT = HBCU. See 1

1.4 Purpose

This report will

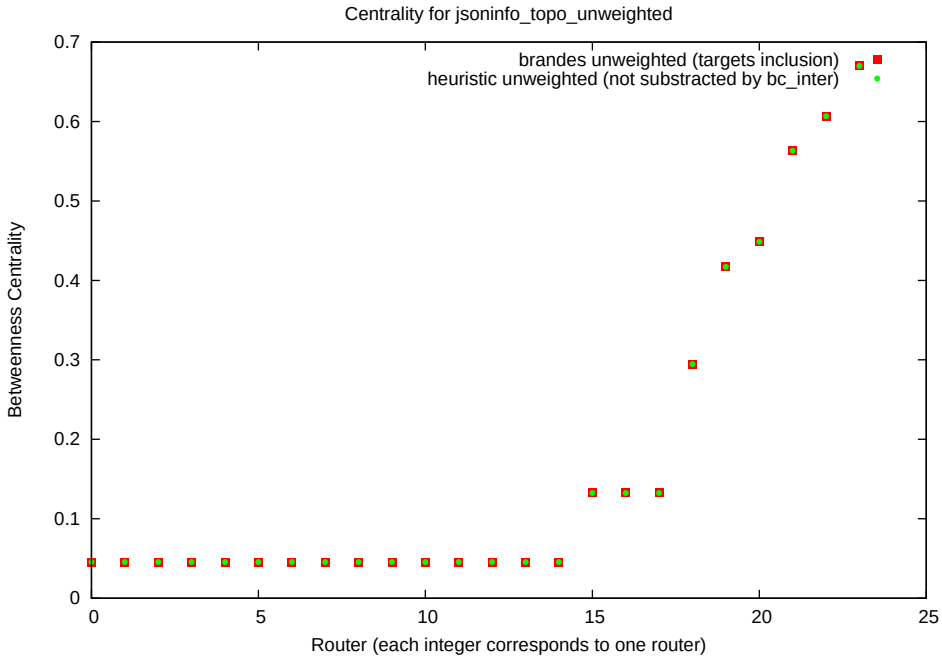
- Show how HBCW is obtained
- Comparing HBCU and HBCW

2 HBC for weighted graph

2.1 Method

When calculating the BC for each bi-connected component, *weight_map* is included. As a result, HBCW will take into account the weight of each edge when calculating the number of shortest paths σ. The σ will affect the final BC score.

Figure 1: BBCT & HBCU for jsoninfo_topo. Their results are the same



3 Result

For **unweighted graph**, BBCT = HBCW.

For **weighted graph**, BBCT = HBCW with these dataset:

- *ninux_30_1*. See 2
- *olsr-netjson*

And BBCT != HBCW in the dataset *jsoninfo_topo*. See 3. Compare to the result obtained by HBCU in 1

Figure 2: BBCT & HBCW for ninux_30_1

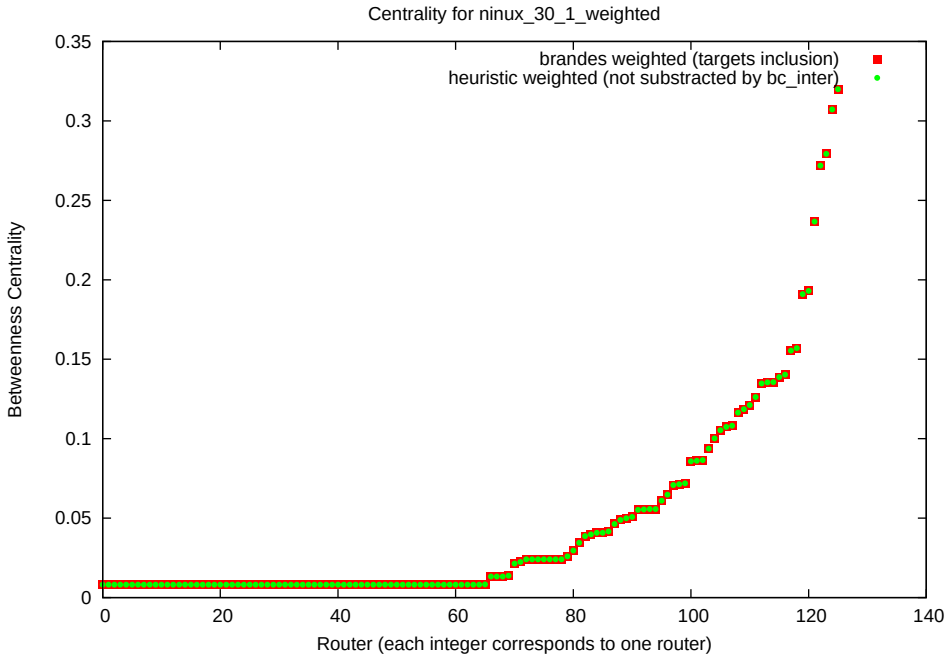
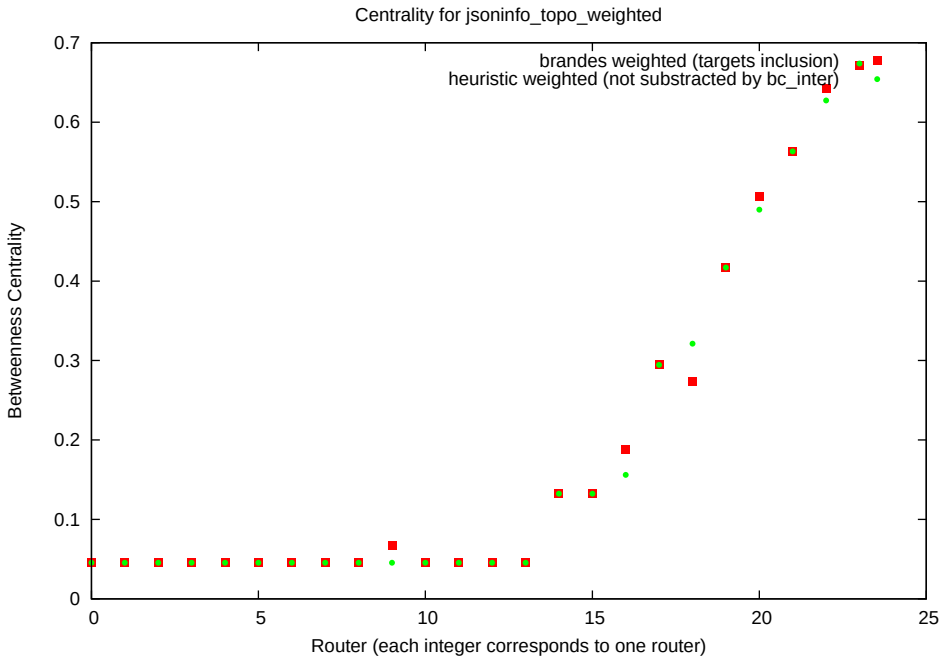


Figure 3: BBCT & HBCW for jsoninfo_topo. Their results are different



References

[1] Rami Puzis, Polina Zilberman, Yuval Elovici, Shlomi Dolev, and Ulrik Brandes. Heuristics for speeding up betweenness centrality computation. In *2012 International Conference on Privacy, Security, Risk and Trust, PASSAT 2012, and 2012 International Confernece on Social Computing, SocialCom 2012, Amsterdam, Netherlands, September 3-5, 2012*, pages 302–311, 2012.