Data Mining Lab 5: K-way Graph Partitioning Using JaBeJa

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1 Assignment Goals

In this assignment we implement the k-way Graph Partitioning Using JaBeJa [2] algorithm.

2 Solution overview

The program has been implemented using Java and the skeleton provided in canvas. In the second task, we analyze how the performance of the algorithm is affected when different parameters are changed, specially the effect of simulated annealing. The acceptance probability function is defined as the following(adapted from [1]):

$$ap = \exp((new\_energy - old\_energy)/T) \tag{1}$$

. In the extra part we define our own acceptance probability as.

$$ap = \exp((new\_energy - old\_energy)/T) - \exp \tag{2}$$

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The code is available on the following link: `https://github.com/gibchikafa/DataMining_Lab5.git`. **master** branch is the vanilla implementation. **task2** branch is the branch we implement the simulated annealing to enhance performance. **bonus** branch is the implementation of the alternative acceptance probability function.

3 Results

Results are presented in the following plots with the following configuration:

- vanilla implementation: $T = 2, \alpha = 2, \delta = 0.003$

- simulated annealing 1: $T = 1, \alpha = 2, \delta = 0.99$

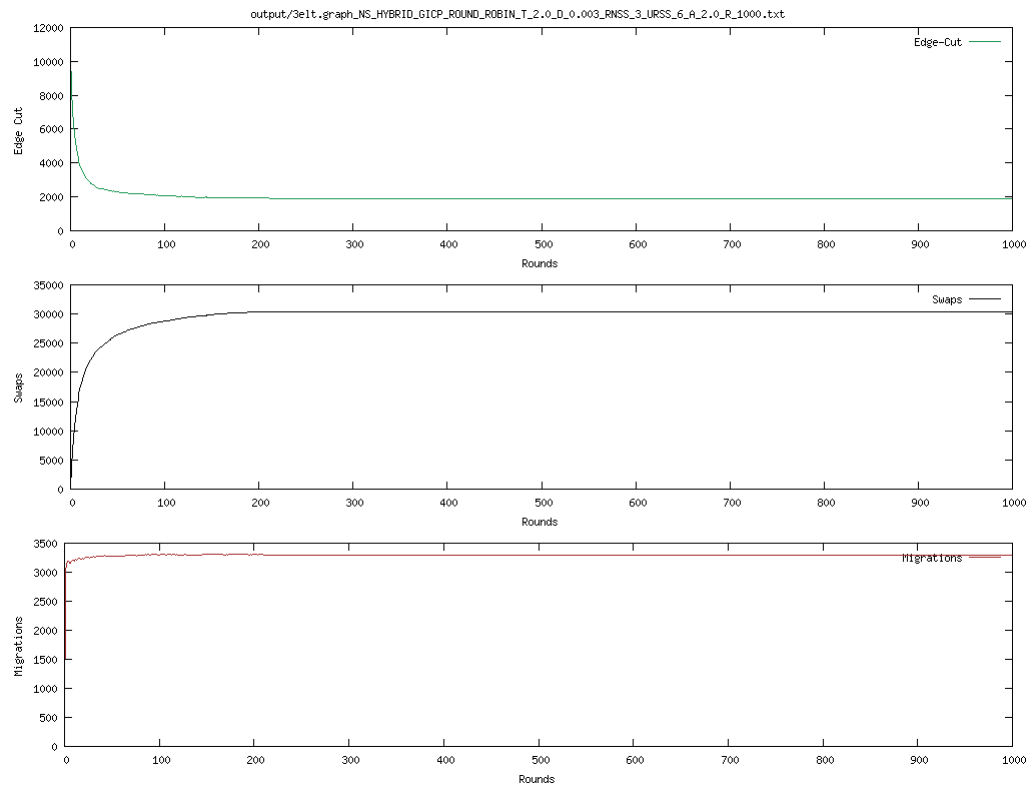- simulated annealing 2: $T = 1, \alpha = 2, \delta = 0.99$
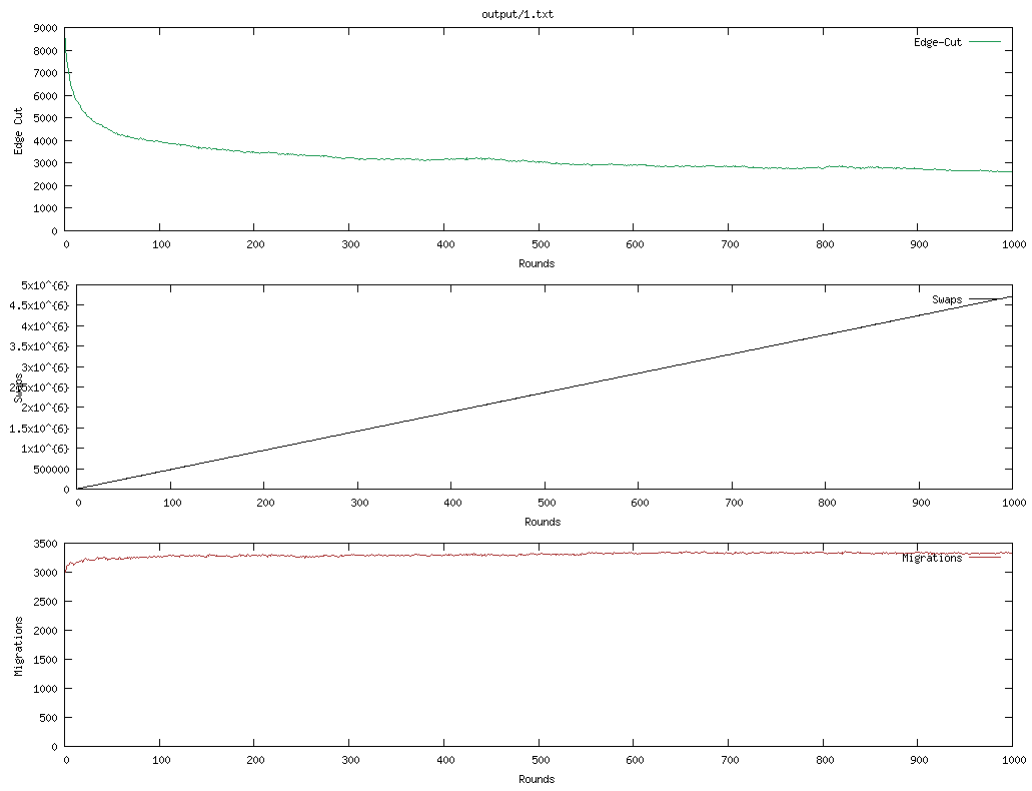
Figure 1: 3elt data using vanilla implementation

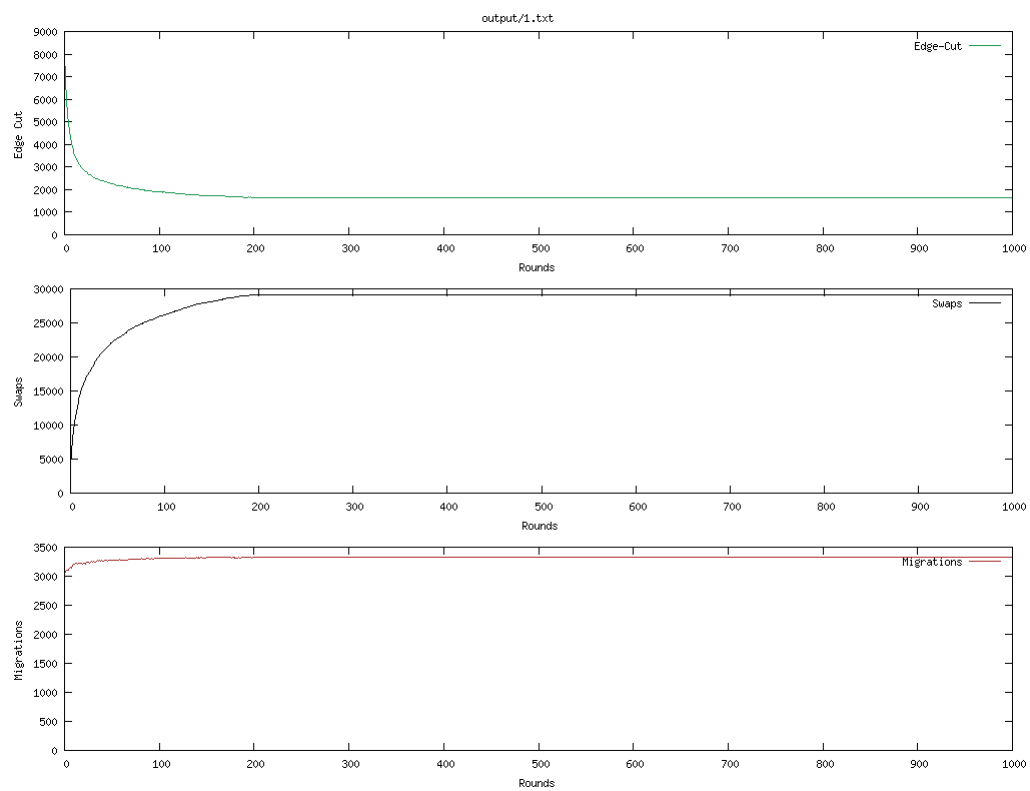Figure 2: 3elt data using simulated annealing with acceptance probability 1

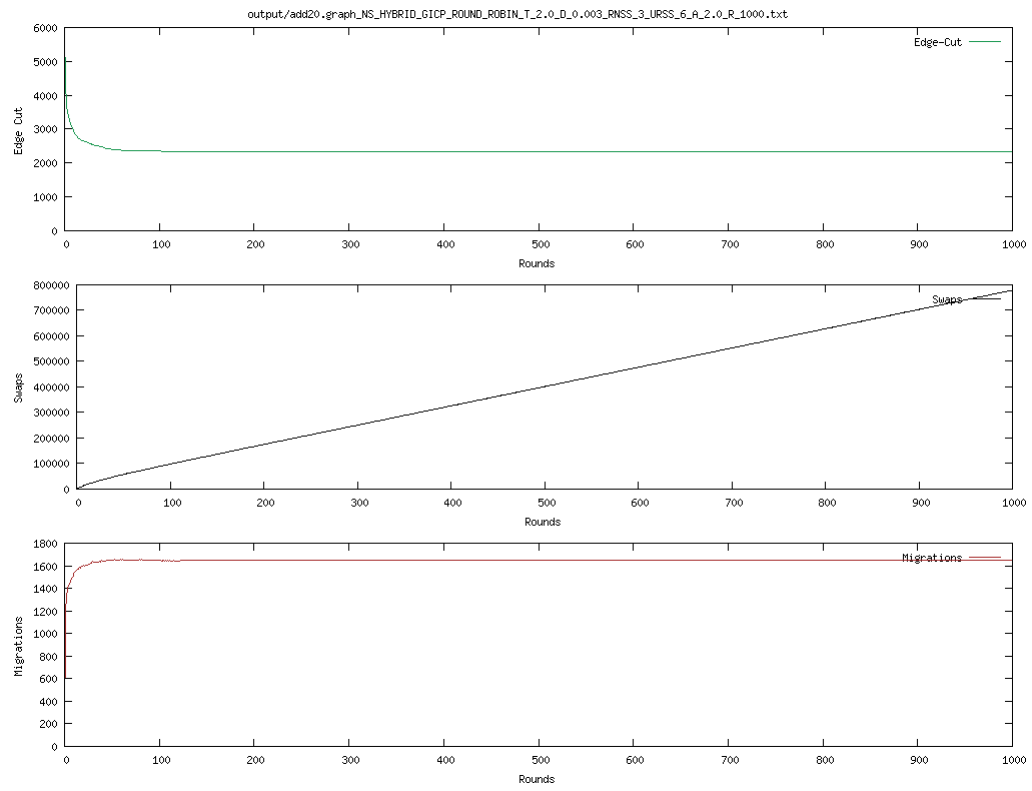Figure 3: 3elt data using simulated annealing with acceptance probability 2

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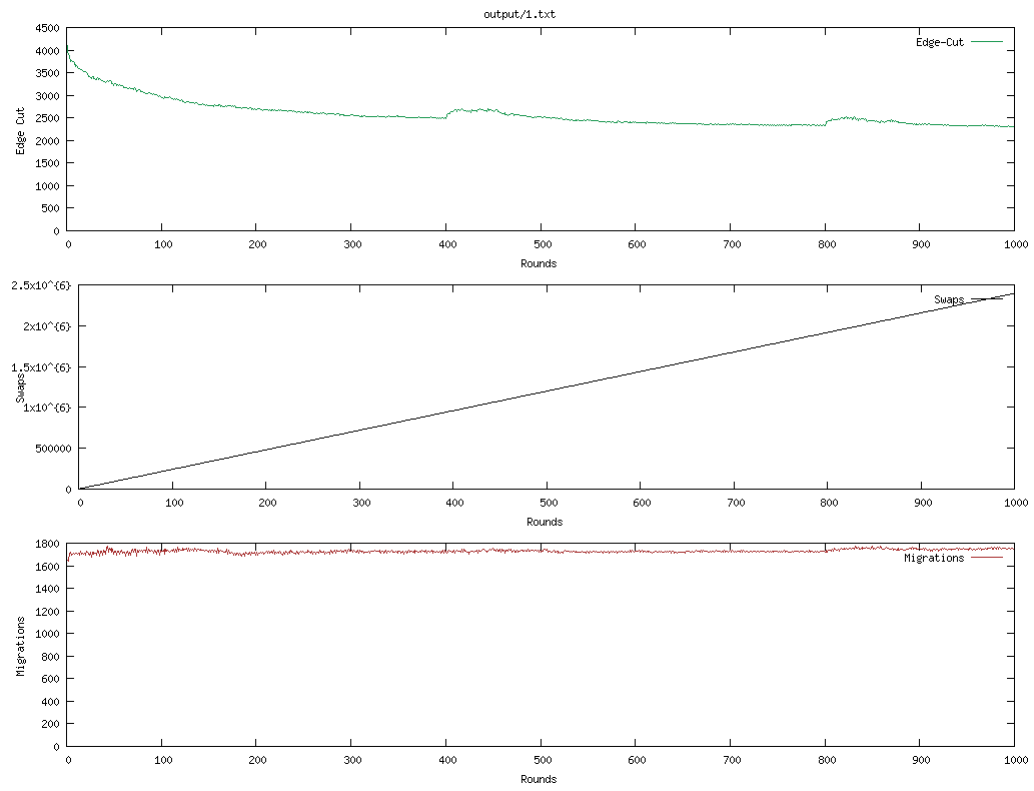Figure 4: add20 data using vanilla implementation

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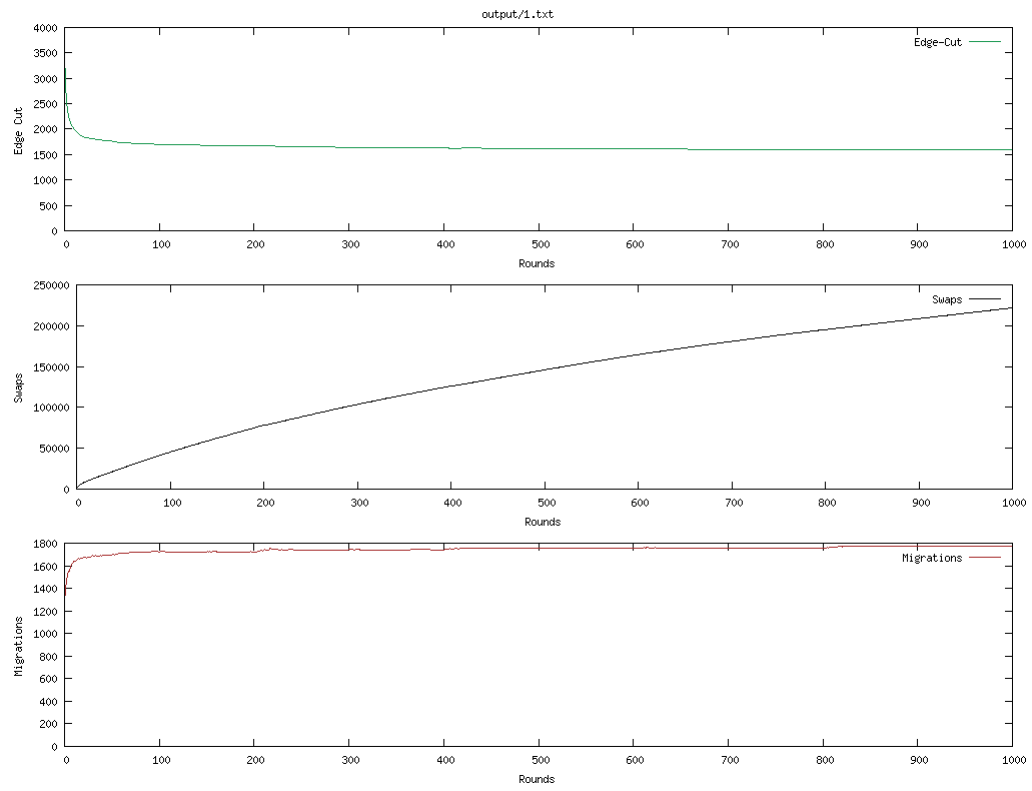Figure 5: add20 data using simulated annealing with acceptance probability 1

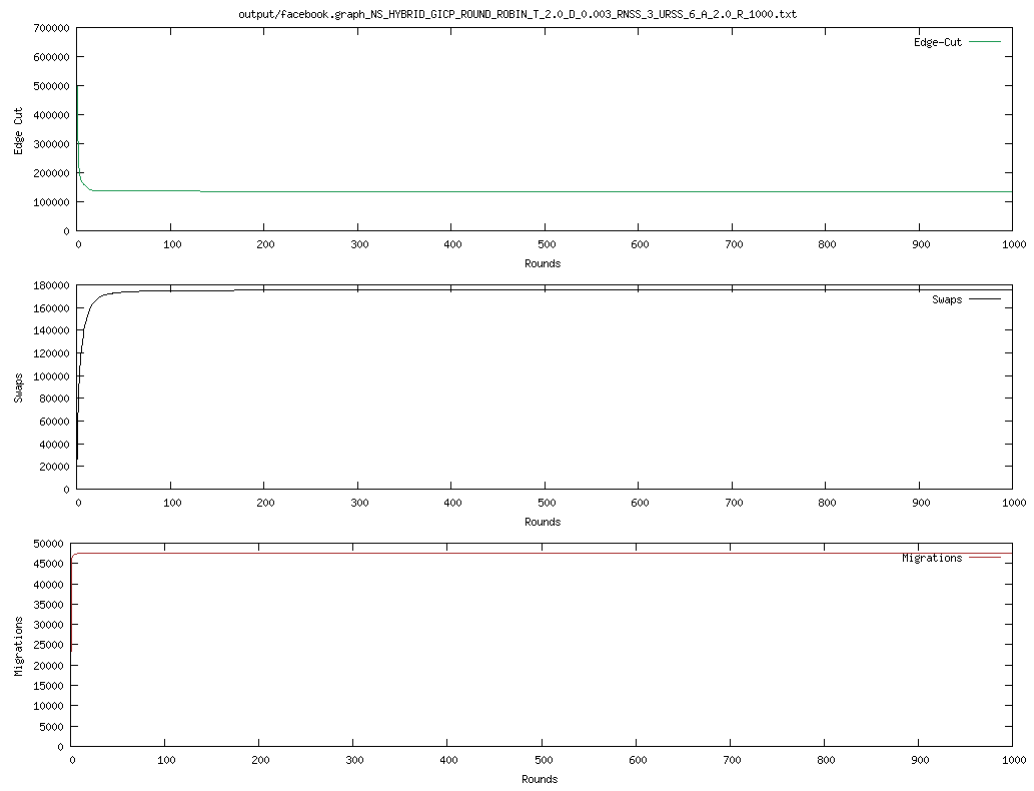Figure 6: add20 data using simulated annealing with acceptance probability 2

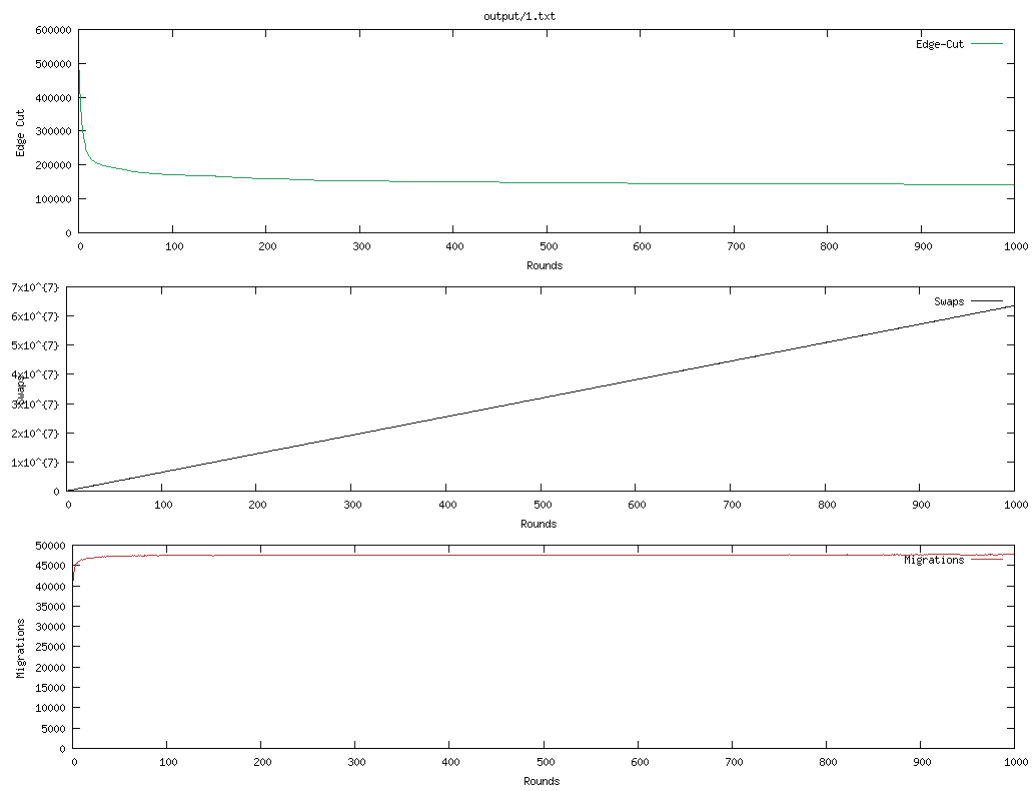Figure 7: facebook data using vanilla implementation

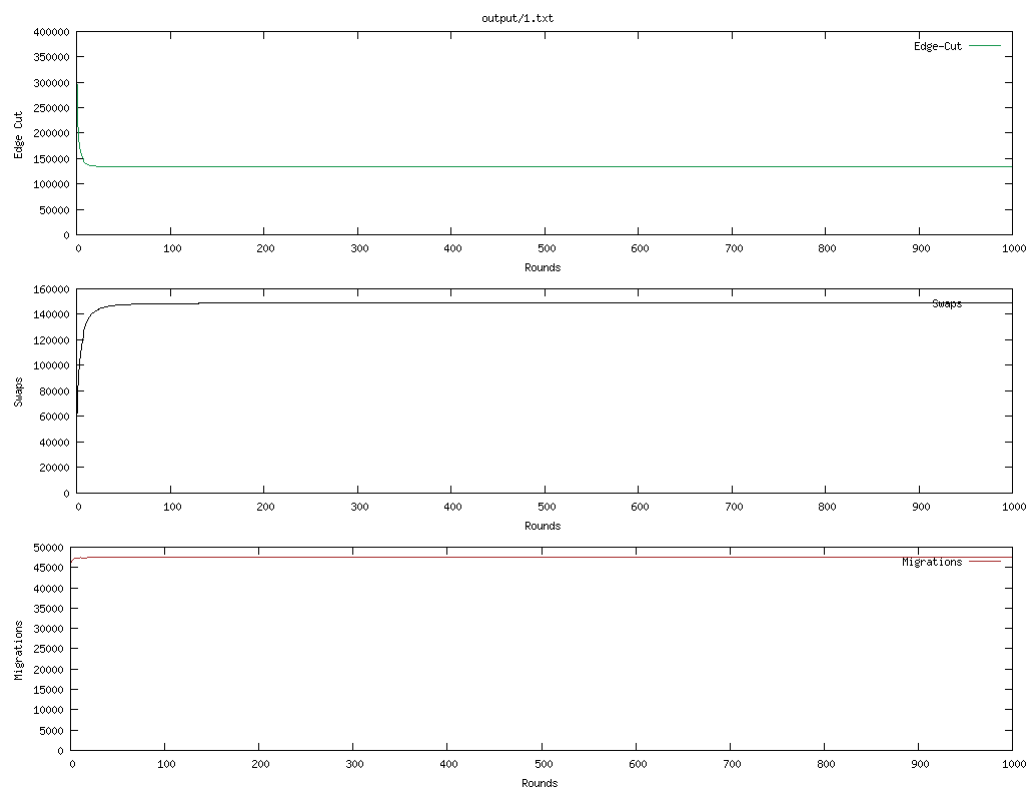Figure 8: facebook data using simulated annealing with acceptance probability 1

Figure 9: facebook data using simulated annealing with acceptance probability 2

References

[1] *The Simulated Annealing Algorithm*, 2020 (accessed Dec 10, 2020). `http://katrinaeg.com/simulated-annealing.html`.

[2] F. Rahimian, A. H. Payberah, S. Girdzijauskas, M. Jelasity, and S. Haridi. Ja-be-ja: A distributed algorithm for balanced graph partitioning. In *2013 IEEE 7th International Conference on Self-Adaptive and Self-Organizing Systems*, pages 51–60, 2013.