EE428/528 VLSI Design Automation – Fall 2015

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KL Partitioning Software – Initial Steps

Your K-L software

1. Programming assignment is Kernighan-Lin algorithm (as presented in their paper (handout). You can use a programming language of your choice but C or $C^{++}$is preferred. You CAN NOT use partitioning software from the internet. Please use only your own code (no subroutines from other sources). The input format is given below. Please start with random partition such as: (1, ..., n) vertices in Partition 1 and (n, ...2n) vertices in Partition 2. If a number of vertices is odd add one dummy vertex. Your output file should include, a value of the cut of the initial partition, and for each iteration step (after groups of vertices to be exchange are chosen), a list of vertices in both partitions, and a value of the cut after each complete pass. At the end it should include lists of vertices in the final partition and the final value of the cut. A list of vertices in each partition should be organized in an increasing order of vertex labels.

STEPs for KL programming project

Step 1. DUE 10/20/2015

Write a program to read an input file that will be used for KL-project and print out a partition in a format that will be used for KL-project.

a. Each input file contains 2n vertices and its format is shown below.
b. For starting partition use the following:
(1, ..., n) vertices in Partition 1 and (n, ...2n) vertices in Partition 2.

Format of a input file

The files are provided in the Chaco input file format. The initial (0th) line of the file contains two integers, representing the number of nodes and the number of edges in the graph. Each following (nth) line contains the list of nodes that share an edge with the nth node, separated by spaces.

The following example represents a complete graph on 6 vertices in this format.

```
6 15
2 3 4 5 6
1 3 4 5 6
1 2 4 5 6
1 2 3 5 6
1 2 3 4 6
1 2 3 4 5
```

Output format:

a. Iteration number (for step1 it will be 1)
b. Partition 1. A List of vertices in an increasing order
c. Partition 2. A List of vertices in an increasing order
d. Cost of the partition (put it as "unknown" for step 1

Step 2. DUE DATE 10/27/2015

Expand the program written for Step 1 to include:

A. Calculate a cost of a partition
B. Cost of a partition is a number of edges with one end in Partition 1 and one in Partition 2

C. Update your Output format to show “cost of the partition”

Step 3. DUE DATE 11/5/2015

Expand the program written for Step 2 to include:

A. Calculate an internal and an external costs for all vertices in both partitions.
B. Calculate D values for each node
C. Calculate Gain values for each possible “Move” (each possible vertex exchange)
D. In addition to a cost of the partition print the largest gain value.

2. **For each KL- project step you need to submit a hard copy (very short) report that includes only the following:**

a. Your name,
b. At least two of your own examples on which you tested your program,
c. Hand calculated results for a smaller of your testing input file,
d. Computer generated results requested for the given KL-project step.

Submitting reports:

1. In class on a due day
2. To an ECE staff person before a deadline (Please ask for a stamp with the date of submission)