CS4310 - Design & Analysis of Algorithms
Kruskal Investigation
Spring 2017
Due: Sunday, April 23, 2017

Jason Eric Johnson

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1 Introduction

The purpose of this assignment is to utilize the scientific method to demonstrate that claims about algorithms
are either likely true or likely false.

2 The Assignment

You will run experiments on Kruskal's algorithm. Your first step will be to implement the algorithm using
the pseudocode on page 428 of your book.
The claim about this algorithm is as follows:

Kruskal's Algorithm runs in $O(m \log(n))$ time where n is the number of vertices and m is the number of
edges.

You must provide all the data and explain how it was gathered and analysed. Then use all of that to draw a
conclusion, which you must explain with a convincing argument that your conclusion is correct.
Assume that I am operating on the assumption that your conclusion is wrong. Your experiments, analysis,
and argument should leave me with no choice but to agree with your conclusion.

Here are some hints and things to think about:

- Pay attention to the analysis in your book (pages 431 and 432). This gives you the assumptions about data structures and so on that lead to the hypothesis above. Make sure you use data structures consistent with the analysis in your implementation OR you may use others, but you will have to put your own analysis with a modified hypothesis into your report.

- Simply graphing your data along with an m log(n) curve and doing a visual comparison will not be acceptable. You must do a mathematical analysis.

- The mathematical analysis should be robust. Consider tools like Maple, R, etc. There are many mathematical tools available in the computer labs.

- Once you've done the analysis you must explain it. Your data and analysis constitute the evidence that you will use to make your case about whether the hypothesis bears out.

- Do you have enough data points?

- Do you cover enough of a range of input sizes to see the shape of the growth?

3   Evaluation

This assignment will be worth 150 points.

4   Handin Instructions

Submit this assignment using Elearning. Your submission should be a single `.zip` file containing your Ruby program, any data and/or image files, and the final report in PDF format. Please use the following naming convention for your archive file:

CS4310-YourName-Kruskal.zip

Follow these Handin Instructions EXACTLY. There will be significant point penalties for not following the naming convention above or submitting a different format of archive file. Make sure it is a `.zip` and NOT another format (no .rar, .tar, .tar.gz, etc).