CSC410 Assignment 2 Report

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1 Report

The purpose of the exercise is for you to contrast two different encodings of the same problem against each other, in terms of (i) the ease of encoding, (ii) the size of encoding, and (iii) the performance of the solver at the end. You will submit a pdf file (grouping.pdf) containing a short report to let us know about your conclusions regarding (iiii). Make clear claims, and back them up by solid evidence. But, don't be verbose.

1.1 i

Grouping A applied Boolean theory while grouping B applied equality theory to approach the program. Grouping A constructed one variable for each possible pairing, while Grouping B created one variable for each student instead. The level of encoding is slightly easier in grouping B, since fewer variables are constructed, the constraints enforced on these variables are also less complex. However, from an algorithmic point of view, the complexity in the underlying logic is relatively the same – the solvers ensure that the maximum number of preference is fulfilled, each group has no more than 2 students, and all students are paired unless the total number of students is odd, which in that case one student will be left out.

1.2 ii

Grouping A generates lot more code than that of Grouping B, due to the nature of the variable constructions. The number of variables generated by grouping A are in Big-O of n^2, while the number of variables generated by grouping B are in Big-O of n. Although the formula generated by both A and B are binary, the difference in variable numbers resulted in much more encoding to be generated in A than B especially for large inputs. In a large input which involved 34 students, 146000 lines of code were generated for A while only 1200 lines were generated for B.

1.3 iii

Grouping A is taking more time to compute and is slower than Grouping B when the data set gets larger as shown in the data below.

Small Sample Input - 5 Student:

```
Grouping A - 300 lines
Trial 1: 0.040s
Trial 2: 0.071s
Trial 3: 0.062s
Trial 4: 0.047s
Trial 5: 0.062s

Grouping B - 60 lines
Trial 1: 0.062s
Trial 2: 0.066s
Trial 3: 0.057s
Trial 4: 0.060s
Trial 5: 0.071s
```

Medium Sample Input - 20 Student:

```
Grouping A - 28,000 lines
Trial 1: 0.235s
Trial 2: 0.222s
Trial 3: 0.236s
Trial 4: 0.205s
Trial 5: 0.227s

Grouping B - 500 lines
Trial 1: 0.051s
Trial 2: 0.060s
Trial 3: 0.069s
Trial 4: 0.060s
Trial 5: 0.062s
```

Large Sample Input - 34 Students:

```
Grouping A - 146,000 lines
Trial 1: 1.180s
Trial 2: 1.277s
Trial 3: 1.473s
Trial 4: 1.205s
Trial 5: 1.161s

Grouping B - 1200 lines
Trial 1: 0.165s
Trial 2: 0.152s
Trial 3: 0.160s
Trial 4: 0.158s
Trial 5: 0.168s
```