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P3 README

Design

I chose to write this program in Java. I felt using an object oriented language would be useful in the design of the project. I started this project by doing some basic design sketches with an expo marker on my sliding glass door. I mapped out the bag and item classes and well as possible constraint classes and variables. The design is rather basic. There are classes for each model and for each search type. There is a class for the file parser and a generic Program to help move all information from the parser back into the main method.

After some work on the project the Constraint class is only really used in the parser and then used to help put the information in the ListItem object, the ListItem is the responsible for knowing what it can and cannot go in the same bag with. The Bag uses this information to have a master set of what it can and cannot hold.

To help with using MRV and LCV I used some specially made comparators and priority queues to help hold items and bags in such a way that they would be chosen using those ideologies.

Testing

My main idea for testing was to use sample lists that had particular characteristics. There were a number of edge cases that I knew needed to pass and thus made lists that would satisfy those cases. These included things like:

- One item larger than bag capacity
- Combined item sizes larger than combined bag capacity
- All + constraints
- All - constraints

Once I was able to get these basic concepts in a working state I knew that I would need to increase the difficulty of the problems to be solved. I started with some of the problems given to us on piazza.

A major difficulty in testing this program was that I either had to write the test cases myself or hope that my project was working correctly when it gave me answers

from the random generated test cases. I know we were given a solver that does work, but I have not been able to get it to work on my computer and have not had a chance to try to make it work on onyx. I think this would have helped my stress during the testing process. I felt left in the dark during most of the testing process and I should have tried to take more time to make this work.

Efficiency

I have not spent a lot of time determining the efficiency of my program nor have I been able to take the time to really make it more efficient than it is right now. I struggle a bit with some of the more basic implementations that the efficiency aspect was left undone.

General Thoughts and Discussion

This was an interesting project to work on, I found it surprisingly challenging. I am finding in this class that I understand conceptually what needs to be done for these searches and what they should ultimately do. However, coding them has been difficult. In this project I started with what I thought was the simplest of the searches. I started with the non-arc consistent search. I did this without the use of the MRV or LCV heuristics. It took a while to get implemented so that it would work as desired. I ran into several complications and perhaps should have reconsidered my approach. However, I did get it to work and solve problems. Once I had it searching appropriately I added in the MRV and LCV heuristics. Luckily this helped me spot a few places where the search was not perfect and I was able to fix it some more.

With no-arc-consistency working I began adding in the arc consistency aspect. I am not convinced I have done this correctly, but it does work in my cases that I have tested. This also took a bit of work to debug through and determine how to get to where it needed to be going.

Local search has been giving my the most trouble. I am pretty sure I understand the concept involved here. The basic process is to put all items into bags randomly and then one by one go through items that are in conflict and move it around to a place where it is either not in conflict or has the least amount of conflict. Keep going it gets

into a stuck state or a solution. This has proven to be the most difficult one for me to implement. It is at this time not completed, I will be working on it some more over the next few days and if I get it finished I will re-submit.