Homework 4

# Problem

This is a special case of the classical knapsack problem.

Here, the spaceship is the knapsack and the capacity is .

The items we want to stuff into the knapsack are the chunks of the cristaline.

The value of each chunk is defined to be its own weight.

We want to put as many (in terms of value=weight) chunks into the spaceship as possible.

Assume we have chunks. Each chunk has weight .

Define optimality equation to be the maximum total value possible when considering chunks with the constraint that the spaceship can carry as much as pounds.

Now, there are two cases:

1. OPT does not select chunk
   1. In this case OPT selects best of with weight limit .
2. OPT does select chunk
   1. In this case OPT select best of with weight limit .

Similar to the lecture slides, we can fill up a table. Here, we just replace each with since weights are considered values. See slide excerpt below.



The algorithm is correct by construction. The time complexity is pseudo polynomial . The space complexity is the same.

Final touch here. The algorithm above gives a total weight only. To find out the exact chunks that are picked, one can record, for each whether case 1 or case 2 were chosen. With this, one can trace back from to the beginning to decide which exact chunks to put into spaceship!