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Experiment No. 7

Aim – To implement Backtracking algorithm

Details – We are given n distinct positive numbers and find all combinations of these numbers whose sum are m.

Sum of subsets Problem – Suppose we are given n distinct positive numbers and we desire to find all combinations of these numbers whose sum are m. This is called the sums of subsets problem. We considering a backtracking solution using the fixed tuple size strategy. In this case the element x_i of the solution vector is either on or zero depending on whether the weights w_i is included or not. The children of any node in the following are easily generated. For a node at level *i* the left child corresponds to x_i = 1 and the right to $x_i = 0$. A simple choice for the bounding functions is $B_k(x_1,\dots,x_k)$ true iff

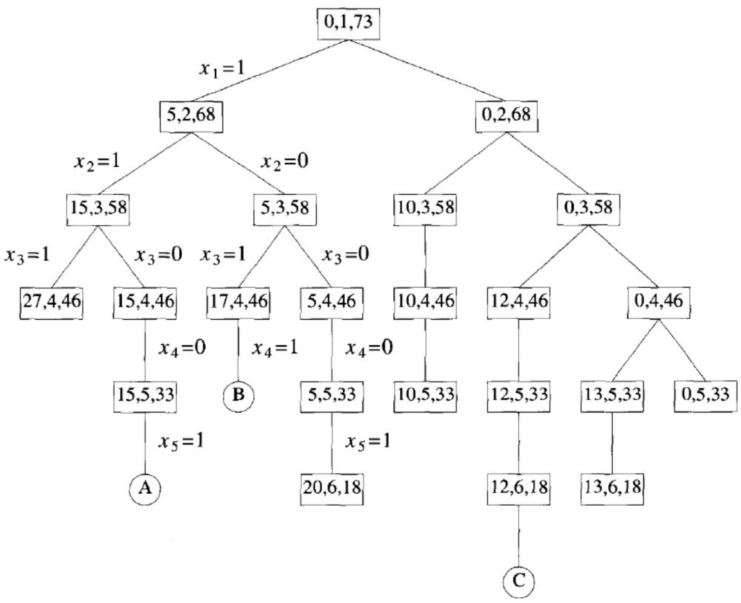
$$\sum_{i=1}^{k} w_i x_i + \sum_{i=k+1}^{n} w_i \geq m$$

$$\sum_{i=1}^{k} w_i x_i + w_{k+1} > m$$

Since our algorithms will not make use of Bn we need not be concerned by the appearance of wn+1 in this function. Although we have now specified all that is needed to directly use either of the backtracking schemas, a simpler algorithm results if we tailor either of these schemas to the problem at hand. This simplification results from the realization that if $x_k = 1$ then follows:

$$\sum_{i=1}^{k} w_i x_i + \sum_{i=k+1}^{n} w_i > m$$

For W={5,10,12,13,15,18} and m=30. Following recursion tree shows the working of Sum of subsets:



Important Links:
1) YouTube Video: Sum of subsets 2) Reading Resource: Sum of subset 3) Section 7.3 of Chapter 7 of Ref 2 Book

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Input – Enter the weights of n number of elements and the integer m
Output – Print all possible subsets so that the sum is m.
Submission –

1) C/C++ source code of implementation
2) Verified output for the written source code with multiple inputs 3) One page report of Exp. 7