The Subset Sum Problem – An attempt at a solution

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For any set S, construct a table of S+S. For each diagonal of S in one direction is 2n-1 calculation (entries). To complete a table, two sets of diagonals must be computed, another 2n-1 totaling in 4n-2.

For diagonal 2n-1 entries, the subset sums must be found. The diagonal of n or less elements combined is n2 ????operations and is a simple pairing, tripleting, etc. Matching a list of numbers to find combinations that produce 0. The largest any pair can be is n. Then for each diagonal, ????2n2 – 2 must be calculated.

To find all the subsets, the set S+S+S must be calculated as well, where all the individual elements of S are added in the same cells of the table. This is continued on to the next table until k tables have been formed where k is the number of elements of the set being examined. We know calculations for one table is 2n2-2 so for k tables the algorithm finishes with k(2n2-2) = O (2n3)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | -1 | 1 | 2 | -2 | 3 | -3 |
| -1 | -2 | 0 | 1 | -3 | 2 | -4 |
| 1 | 0 | 2 | 3 | -1 | 4 | -2 |
| 2 | 1 | 2 | 3 | 0 | 5 | -1 |
| -2 | -3 | -1 | 0 | -4 | 1 | -5 |
| 3 | -4 | 4 | 5 | 1 | 6 | 0 |
| -3 | -4 | -2 | -1 | -5 | 0 | -6 |

Above is the summation table (first iteration) for the set {-1,1,2,-2,3,-3}

Taking the diagonals we get:

1,-1

5,-5

-6,6

-4,4

so we are missing 2,-2 and 3, -3

they might show up in the second iteration

However, all the above pairs are valid answers.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | -1 | 1 | 2 | -2 | 3 | -3 |
| -1 | -4 | 0 | 2 | -6 | 4 | -8 |
| 1 | 0 | 4 | 6 | -2 | 8 | -4 |
| 2 | 2 | 4 | 6 | 0 | 10 | -2 |
| -2 | -6 | -2 | 0 | -8 | 2 | -10 |
| 3 | -8 | 8 | 10 | 2 | 12 | 0 |
| -3 | -8 | -4 | -2 | -10 | 0 | -12 |

-6,-2,8 – not possible

10, -10 – not possible

-4, 4 valid

-2, 2 valid

-8, 8 – not possible

It might be worthwhile to use multiple diagonals and horizontal and vertical scans? Something worth looking into.