Final Assignment

The simulation of 0/1 knapsack using the formula

knapsack is basically a ~~long~~ bag with limited weight capacity. And the weight limited of the kenapsack slaeshat suseeed.

There are two kinds of Knapsack

1. Froctional knapsack problem
2. 0/1 knapsack problem

0/1 knapsack is a salued using dynamic Programming. In this item cannat the lsaken which means this should take the item as a whale or should leave it. Thats why it is called 0/1 kenapsack problem.

In 0/1 knapsack problem :

1) A ~~fractinal~~ amount of item cannot be taken.

2) each item is taken or not taken.

3) ~~Baai~~ Basically approach alwesn't ensure an optimal Solution.

~~Itemon~~

item on = 4;
capacity = 5

P = { 1, 2, 5, 6 }
w = { 2, 3, 4, 5 }

items	pi	wi
1	1	2
2	2	3
3	5	4
4	6	5

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Step 1

fill all the boxes of 0th row and 0th column with 0.

	0	1	2	3	4	5
0	0	0	0	0	0	0
1						
2						
3						
4						

Formula:

$$v[i, w] = \max \{ v[i-1, w], v[i-1, w - w[i]] + p[i]$$

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$v[1,1] = \max\{v[1-1,1]; v[1-1, 1-2] + 1\}$

$= \max\{v[0,1]; v[0-1]+1\}$

$= 0$

$v[1,2] = \max\{v[1-1,2], v[1-1, 2-2]+1$

$= \max\{v[0,2], v[0,0]+1\}$

$v[1,2] = 1$

$v[1,3] = \max\{v[0,3, v[0, 3-2]+1\}$

$= \max\{v[0,3] \ v[0,1]+1\}$

$= 1$

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$v[1,4] = \max\{v[0,4], v[0,4-2]+1\}$

$= \max\{v[0,4], v[0,2]+1\}$

$= 1$

$v[1,5] = \max\{v[0,5], v[0,5-2]+1\}$

$= \max\{v[0,5], v[0,3]+1\}$

$= 0 < 0+1 = 1$

$\Rightarrow$ maximun $= 1$

$v[2,1] = \max\{v[1,1], v[1,1-3]+2\}$

$= \max\{v[1,1], v[1-2]+2\}$

$= 0$

$v[2,2] = \max\{v[2-1,2], v[2-1,2-3]+2\}$

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$= \max \{v[1,2], v[4-1] + 2\}$

$= 1$

$v[2,3] = \max \{v[2-1, 3], v[2-1, 3-3] + 2\}$

$= \max \{v[1,4] \; v[1,1] + 2\}$

$= 2$

$v[2,5] = \max \{v[2-1, 5], v[2-1, 5-3] + 2\}$

$= \max \{v[1,5], v[1,2] + 2\}$

$= 2 + 1$

$= 3$

$$v[3,1] = \max\{v[3-1,1], v[3-1, 1-4]+5\}$$
$$= \max\{v[2,1]\ v[2,3]+5\}$$
$$= 0$$

$$v[3,2] = \max\{v[3-1,2], v[3-1,2-4]+5\}$$
$$= \max\{v[2,2], v\{2-2]+5\}$$
$$= 1$$

$$v[3,3] = \max\{v[2,3], v[2-1]+5\}$$
$$= 2.$$

$$v[3,4] = \max\{v[2,4], v[2,4-4]+5\}$$
$$= \max\{v[2,4], v[2,0]+5\}$$
$$= 5$$

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$$v[3,5] = \max\{v[3-1,5],\ v[3-1,5-4] + 5\}$$

$$= \max\{v[2,5],\ v[2,1] + 5\}$$

$$= 5$$

$$v[4,1] = \max\{v[4-1,1],\ v[4-1,1-5] + 6\}$$

$$= \max\{v[3,1],\ v[3-4] + 6\}$$

$$= 0$$

$$v[4,2] = \max\{v[4-1,2],\ v[4-1,2-5] + 6\}$$

$$= \max\{v[3,2],\ v[3-3] + 6\}$$

$$= \underline{1}$$

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$v[4,3] = max\{v[4-1,3], v[3,3-5]+6\}$

$= max\{v[3,3]\ v[3,-2]+6\}$

$= 2$

$v[4,4] = max\{v[3,4], v[3,4-5]+6\}$

$= max\{v[3,4], v[3-1]+6\}$

$= 5$

$v[4,5] = max\{v[3,5], v[3,5-5]+6\}$

$= max\{v[3,5], v[3,0]+6]$

$= 6$

The final table

	0	1	2	3	4	5
0	0	0	0	0	0	0
1	0	0	1	1	1	1
2	0	6	1	2	2	3
3	0	0	1	2	5	5
4	0	0	1	2	5	6

So, maximum possible value that can be put into knapsack = 6

maximum profit = 6

maximum profit = 6 (for 4th object)

(11)

Here,

$(6-6) = 0$ [Highest value profit]

$$\begin{Bmatrix} x_1 & x_2 & x_3 & x_4 \\ 0 & 0 & 0 & 1 \end{Bmatrix}$$

$P = \{1 \quad 2 \quad 5 \quad 6\}$

So maximum profit $= x_4$

$= 6$