Midterm Project

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In the line 215, Yufei Gao told me that I should change number of rows to number of columns. Since my code can only solve the input1 and input3, which is n*n matrix. After changing it, it can solve all the cases for n*m.

Basic Process:

First, using permutation to pick rank number of columns, and put it in a vector C and then pushback it in a vector of vector B. Transpose the vector B, named reduced version of A and solve it used the sample code.

Insert 0 if I did not pick this column and insert the solution if I pick the column into a vector named temp and push back it into solution set and Transpose it again. Check the solution set, if it is linear independent, output it.

Question

How do you reconcile the fact that while equation 1 looks similar,
to the general solution presented in page 7 of lesson 2 of my notes, equation 2 looks different from equation 6 in page 10 of lesson 2

In the case of input1, the “permutation” will take S1 and S2 as the basic solution set, (S1,S2 are the index on the lesson2) since those two are the first permutation that satisfied the condition. So, the program will output these two, which is the same as the lesson 2’s result.

However, In the case of input2, it has 35 choices at first. When we check the linear independent condition, it left 21 choices of permutations. The lecture note pick #2, #21,#23,#31 and pick the solution of these four as the solution set. While the permutation algorithm will take another combination of these 21 choices, which is different from the lecture note.

Input1

```
:\Users\nian yi>cd C:\Users\nian yi\Documents\Visual Studio 2013\Projects\Midterm\Debug

:\Users\nian yi\Documents\Visual Studio 2013\Projects\Midterm\Debug>Midterm.exe input1
olving:
 1.000000   1.000000   1.000000   4.000000
 1.000000  -1.000000  -1.000000   0.000000
 1.000000  -1.000000   1.000000   6.000000
 1.000000   1.000000  -1.000000  -2.000000

 solution =

-4.000000
 6.000000
 0.000000
 2.000000

olution is the affine-combination of these vectors
 1.000000   3.000000
-2.000000  -3.000000
-3.000000   0.000000
 0.000000  -1.000000

erification: (check each column below and y-vector above)
-4.000000  -4.000000
 6.000000   6.000000
 0.000000   0.000000
 2.000000   2.000000
```

Input2

```
C:\Users\nian yi\Documents\Visual Studio 2013\Projects\Midterm\Debug>Midterm.exe inp
Solving:
  1.000000   1.000000   1.000000   1.000000  -2.000000   3.000000   7.000000
  1.000000  -1.000000  -1.000000  -1.000000   8.000000  -3.000000   3.000000
  1.000000   1.000000  -1.000000  -1.000000   8.000000   1.000000   7.000000
  1.000000  -1.000000  -1.000000  -1.000000   8.000000  -3.000000   3.000000
  1.000000   1.000000   1.000000  -1.000000   8.000000   3.000000   7.000000
  1.000000  -1.000000   1.000000   1.000000  -2.000000  -1.000000   3.000000
  1.000000   1.000000  -1.000000   1.000000  -2.000000   1.000000   7.000000
  1.000000  -1.000000  -1.000000  -1.000000   8.000000  -3.000000   3.000000

* solution =

 57.000000
 -1.000000
 27.000000
 -1.000000
 27.000000
 29.000000
 57.000000
 -1.000000

solution is the affine-combination of these vectors
 28.000000  37.000000  28.000000  -7.000000
 14.000000  14.000000   0.000000   0.000000
 -0.000000  -0.000000  -7.000000  -0.000000
 15.000000   0.000000  15.000000  15.000000
  0.000000  -3.000000   0.000000   0.000000
  0.000000   0.000000   7.000000   0.000000
  0.000000   0.000000   0.000000   7.000000

Verification: (check each column below and y-vector above)
 57.000000  57.000000  57.000000  57.000000
 -1.000000  -1.000000  -1.000000  -1.000000
 27.000000  27.000000  27.000000  27.000000
 -1.000000  -1.000000  -1.000000  -1.000000
 27.000000  27.000000  27.000000  27.000000
 29.000000  29.000000  29.000000  29.000000
 57.000000  57.000000  57.000000  57.000000
 -1.000000  -1.000000  -1.000000  -1.000000
```

Input3

```
C:\Users\nian yi\Documents\Visual Studio 2013\Projects\Midterm\Debug>Midterm.exe input3
3
Solving:
  1.000000   1.000000   1.000000   4.000000
  1.000000  -1.000000  -1.000000   0.000000
  1.000000  -1.000000   1.000000   6.000000
  1.000000   1.000000  -1.000000  -2.000000

* vector_x =

  1.000000
  0.000000
  0.000000
  0.000000

There is no solution to this equation
```

Input4

```
C:\Users\nian yi\Documents\Visual Studio 2013\Projects\Midterm\Debug>Midterm.exe input4
Solving:
  1.000000   2.000000   1.000000   0.000000
  4.000000   3.000000   0.000000   1.000000

* solution =

  6.000000
 12.000000

solution is the affine-combination of these vectors
  1.200000   3.000000   6.000000
  2.400000   0.000000   0.000000
  0.000000   3.000000   0.000000
  0.000000   0.000000 -12.000000

Verification: (check each column below and y-vector above)
  6.000000   6.000000   6.000000
 12.000000  12.000000  12.000000
```