I guess some 7 years ago I made this same function in Structured Text which I have re-written again this weekend. I have lost all my previous PLC codes from my previous job. But this was again a refreshing experience as making even simple things in Siemens TIA portal is not so simple. Last time I made this code in Twincat 2 and it was pretty straight forward. We need to think which part f code we should use as FC, which part as FB, which part as Global DB. So the main purpose are two:  
# To make a modular function which can be easily re-usable with minimum or almost no changes in the main logic part of the program.   
# Easy to read.   
Aim is to make a X,Y,Z pattern for palletizing. Different PLC programmers do it different ways. Mostly they use “IF-ELSE loop” , “FOR loop” to achieve this goal. This approach is also fine, problem is it’s not re-usable, difficult to change and update and also to troubleshoot. This makes it a poor approach to program. Below is example of typical pallet with X,Y,Z pattern box palletized.   
A close up of a box

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The first step was to create a function “DIVMOD” which gives both quotient & remainder of given inputs. This DIVMOD has been used 3 times inside the function block “XYZ\_Pattern”.   
Let’s assume we have a palletizing operation where we need the following amount of parts in following XYZ axis directions X=3, Y=2, Z=2. I will try to explain the different parts of the program below.   
A screenshot of a cell phone

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Part-1:   
\*Here the total size of pattern is calculated. In case of XYZ pattern of X=3, Y=2, Z=2 the total size of pattern is (3X2X2=12).  
\*First DIVMOD function is called. The outputs variables are called [CloneIndex] & [patternIndex]. In case of X=3, Y=2, Z=2 for one complete cycle of palletizing the values of variable [patternIndex] are 0,1,2,3,4,5,6,7,8,9,10,11

Part-2:  
\* Second DIVMOD function is called. The outputs variables are called [k] & [ij]. In case of X=3, Y=2, Z=2 for one complete cycle of palletizing the values of variable [k] & [ij] are  
0 0  
0 1  
0 2  
0 3  
0 4   
0 5  
1 0  
1 1  
1 2  
1 3  
1 4  
1 5  
So basically this [k] value stores the Z axis increment

Part-3:  
\* Third DIVMOD function is called. The outputs variables are called [i] & [j]. In case of X=3, Y=2, Z=2 for one complete cycle of palletizing the values of variable [k] & [ij] are  
0 0  
0 1  
1 0  
1 1  
2 0  
2 1  
0 0  
0 1  
1 0  
1 1  
2 0  
2 1  
So basically this [i] value indicated the X axis increment and the [j] value indicates the Y axis increment.

Part-4:  
Finally the palletizing position for each element are created here. If the programmer needs as offset for the first part he needs to set the offset here.   
  
What value the programmer needs to change?  
  
patternX : Int; > How many boxes you want in X axis

patternY : Int; > How many boxes you want in Y axis

patternZ : Int; > How many boxes you want in Z axis

patternX\_step : Int; > distance between boxes in X axis

patternY\_step : Int; > distance between boxes in Y axis

patternZ\_step : Int; > distance between boxes in Z axis  
  
A screenshot of a cell phone

Description automatically generated