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Aggregation in hierarchical structures

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AGGREGATION IN HIERARCHICAL STRUCTURES WITHIN A SPREADSHEET PROGRAM

Technical task:

The task of the technical innovation is to be able to structure a spreadsheet function hierarchically.

Initial situation:

A spreadsheet program (e.g., Microsoft Excel) works with two-dimensional tables that have rows and columns. The representation of hierarchical structures, called in the graph theory of computer science „tree“, can be represented graphically in a two-dimensional table according to different patterns (representation pattern 1-3). Each of the representation patterns of a hierarchy has its specific advantages. In practice, aggregations in hierarchical structures are needed. For example, if there is a numeric number on each „leaf“ (a leaf is the last element or end element of a branch) in aggregation, then the aggregation takes place on a nodal plane from the respective underlying elements (Fig).

The spreadsheet program „Excel“ uses the sum formula „Sum“ with the specification of the cell addresses to summate the specified cells. The registered formulas for forming the aggregation in the hierarchical structure shown are shown in Figure 4 on the right.

As a result, the formula results are displayed on the worksheet, see Figure 5.

The creation of the sum formulas along the hierarchical structure must be done manually and is correspondingly complicated in the case of complex data structures.

Solution:

An additional functionality for the spreadsheet program automatically generates the totals formulas for a hierarchy selected on the worksheet, replacing a complex manual input.

The representation of the hierarchy can be done in the variants described above:

1. Hierarchy in columns
2. Hierarchy in columns with complete path specification for positioning in the graph
3. Hierarchy in a column with cell entries

The cell areas for which an automatic entry of the sum formulas can be selected by the user specifically. For example, it is necessary to specify a column in order to only enter the sum formulas of the node elements here. In the example shown, this is column D.

But also complex cell areas are possible. For example, one could specify that only in cells D4 and D10 formulas are to be entered.

In addition, the same functionality is possible with a horizontal hierarchical structure representation. Compared to the vertical structure shown here, the „ramification“ of the hierarchical structure is not shown down but to the right.

Advantages:

- Significant cost savings.
- Exclusion of error risks associated with manual entries.

Possible application:

- Applicable in spreadsheet programs.

Stand der Technik

Darstellungsmuster 1: Hierarchie in Spalten

	A	B	C	D	E
1					
2					
3		Wurzel			
4			Knoten-1		
5				Blatt-1-1	
6				Blatt-1-2	
7			Knoten-2		
8				Blatt-2-1	
9			Knoten-3		
10				Knoten-3-1	
11					Blatt-3-1-1
12					Blatt-3-1-2
13			Blatt-4		
14					

Darstellungsmuster 2: Hierarchie in Spalten mit vollständiger Pfadangabe zur Verortung im Graph

	A	B	C	D	E
1					
2					
3		Wurzel			
4		Wurzel	Knoten-1		
5		Wurzel	Knoten-1	Blatt-1-1	
6		Wurzel	Knoten-1	Blatt-1-2	
7		Wurzel	Knoten-2		
8		Wurzel	Knoten-2	Blatt-2-1	
9		Wurzel	Knoten-3		
10		Wurzel	Knoten-3	Knoten-3-1	
11		Wurzel	Knoten-3	Knoten-3-1	Blatt-3-1-1
12		Wurzel	Knoten-3	Knoten-3-1	Blatt-3-1-2
13		Wurzel	Blatt-4		
14					

Darstellungsmuster 3: Hierarchie in einer Spalte mit Zelleinzüge

	A	B	C
1			
2			
3		Wurzel	
4		Knoten-1	
5		Blatt-1-1	
6		Blatt-1-2	
7		Knoten-2	
8		Blatt-2-1	
9		Knoten-3	
10		Knoten-3-1	
11		Blatt-3-1-1	
12		Blatt-3-1-2	
13		Blatt-4	
14			

	A	B	C	D
1				
2				
3		Wurzel		
4		Knoten-1		
5		Blatt-1-1	10	
6		Blatt-1-2	20	
7		Knoten-2		
8		Blatt-2-1	5	
9		Knoten-3		
10		Knoten-3-1		
11		Blatt-3-1-1	5	
12		Blatt-3-1-2	1	
13		Blatt-4	7	
14				

	A	B	C	D
1				
2				
3		Wurzel		=SUMME(D4; D7; D9; D13)
4		Knoten-1		=SUMME(D5; D6)
5		Blatt-1-1	10	
6		Blatt-1-2	20	
7		Knoten-2		=SUMME(D8)
8		Blatt-2-1	5	
9		Knoten-3		=SUMME(D10)
10		Knoten-3-1		=SUMME(D11; D12)
11		Blatt-3-1-1	5	
12		Blatt-3-1-2	1	
13		Blatt-4	7	
14				

Abb. 4

Stand der Technik/ Technische Neuerung

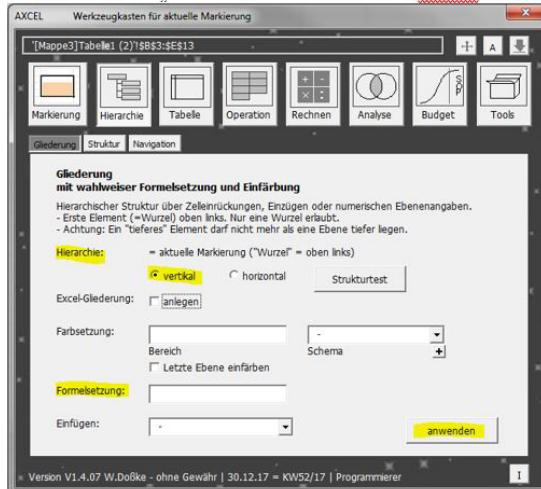
	A	B	C	D
1				
2				
3		Wurzel		48
4		Knoten-1		30
5		Blatt-1-1		10
6		Blatt-1-2		20
7		Knoten-2		5
8		Blatt-2-1		5
9		Knoten-3		6
10		Knoten-3-1		6
11		Blatt-3-1-1		5
12		Blatt-3-1-2		1
13		Blatt-4		7
14				

Abb. 5

Beispielablauf:

a) Markierung der hierarchischen Struktur auf einem Tabellenblatt

b) Aufruf innerhalb Tool „AXCEL“ mit der Tastenkombination STRG+d:



Die hierarchische Struktur wird erkannt. Mit einem Mausklick in den Bereich „Formelsetzung“ wird der Bereich, für den die Summenformeln eingetragen werden sollen, über einen Dialog abgefragt (s.u.).

Technische Neuerung

c) Ergebnisdarstellung mit den summierten Beträgen als Formelergbnis und in der Ansicht der als Formeldarstellung

Alternativ können auch für eine horizontale hierarchische Struktur Formeln erzeugt werden: