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## Insertion of information in hierarchical

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## COLORING HIERARCHICAL STRUCTURES WITHIN A SPREADSHEET PROGRAM

### Technical task:

The task of the technical innovation is to be able to color hierarchical structures in spreadsheet programs.

### 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 reporting practice, different colors are chosen for the different levels of hierarchy for the sake of clarity. Fig. 4 shows the option where the last elements in the sub-branches (leaf elements) of the hierarchy are not colored.

The spreadsheet program „Excel“ has no functionality for a corresponding automatic coloring from a hierarchical structure. The coloring should be done manually.

### Solution:

An additional functionality for the spreadsheet program creates an automatic coloring for a hierarchy selected on the worksheet, replacing a complex manual coloring.

The representation of the hierarchy can have 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 user is optionally offered to make no coloring of the line of the last element in the respective branch. In graph theory these are the „leaves“.

The user is offered different color patterns for coloring. These can be specified by the program and individually designed by the user and supplemented by further patterns.

The cell areas that are automatically colored can be specifically selected by the user. For example, it is necessary to specify several columns in order to make the colorings in these areas. In the example in

Figure 4 is the columns B-G.

The technical implementation of an automatic generation of colorings with respect to a hierarchical structure is exemplified using the tool AXCEL.

In addition, you can specify whether the lines of the last elements in the respective branch of the hierarchy should also be colored. In this example, this option is disabled.

The hierarchical structure is recognized. With a mouse-click in the area „Farbsetzung“, the area for which the colorings are to be made is queried via a dialog, see Figure 6.

### Advantages:

- Significant cost savings.
- Realizability even with extensive structures.

### 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 |   |             |   |

Stand der Technik/ Technische Neuerung

|    | A | B        | C          | D           | E | F | G |
|----|---|----------|------------|-------------|---|---|---|
| 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 |   |          |            |             |   |   |   |

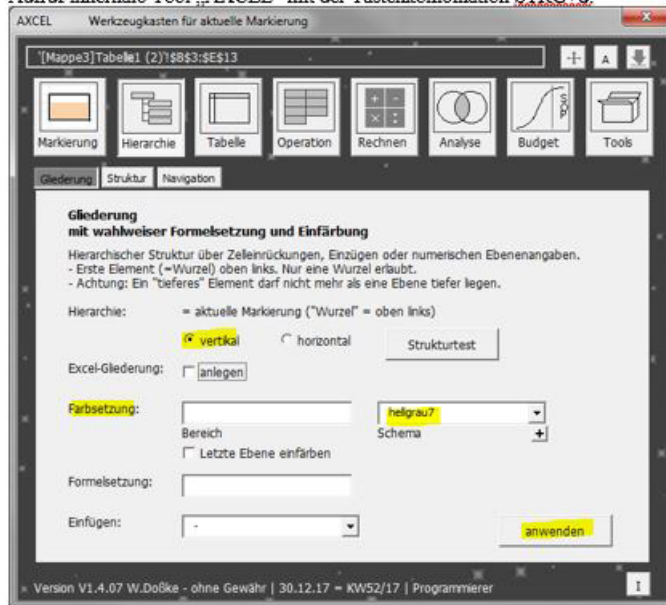
Abb. 4

Beispielablauf:

a) Markierung der hierarchischen Struktur auf einem Tabellenblatt

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

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



Technische Neuerung

Im Feld „Schema“ wird hier in diesem Beispiel das Farbschema „hellgrau7“ ausgewählt.

Im Tool „AXCEL“ sind beispielhaft folgende Schemen implementiert und können aber vom Nutzer spezifische geändert werden:

|    | A         | B         | C         | D         | E         | F         | G         | H         | I           |
|----|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-------------|
| 1  | beenden   |           |           |           |           |           |           |           |             |
| 2  | graue9    | grau4     | hellgrau7 | RotGrau9  | rot6      | rot4      | blau6     | blau4     | gelbbraun7g |
| 3  | 1. Ebene  | 1. Ebene  | 1. Ebene  | 1. Ebene  | 1. Ebene  | 1. Ebene  | 1. Ebene  | 1. Ebene  | 1. Ebene    |
| 4  | 2. Ebene  | 2. Ebene  | 2. Ebene  | 2. Ebene  | 2. Ebene  | 2. Ebene  | 2. Ebene  | 2. Ebene  | 2. Ebene    |
| 5  | 3. Ebene  | 3. Ebene  | 3. Ebene  | 3. Ebene  | 3. Ebene  | 3. Ebene  | 3. Ebene  | 3. Ebene  | 3. Ebene    |
| 6  | 4. Ebene  | 4. Ebene  | 4. Ebene  | 4. Ebene  | 4. Ebene  | 4. Ebene  | 4. Ebene  | 4. Ebene  | 4. Ebene    |
| 7  | 5. Ebene  | 5. Ebene  | 5. Ebene  | 5. Ebene  | 5. Ebene  | 5. Ebene  | 5. Ebene  | 5. Ebene  | 5. Ebene    |
| 8  | 6. Ebene  | 6. Ebene  | 6. Ebene  | 6. Ebene  | 6. Ebene  | 6. Ebene  | 6. Ebene  | 6. Ebene  | 6. Ebene    |
| 9  | 7. Ebene  | 7. Ebene  | 7. Ebene  | 7. Ebene  | 7. Ebene  | 7. Ebene  | 7. Ebene  | 7. Ebene  | 7. Ebene    |
| 10 | 8. Ebene  | 8. Ebene  | 8. Ebene  | 8. Ebene  | 8. Ebene  | 8. Ebene  | 8. Ebene  | 8. Ebene  | 8. Ebene    |
| 11 | 9. Ebene  | 9. Ebene  | 9. Ebene  | 9. Ebene  | 9. Ebene  | 9. Ebene  | 9. Ebene  | 9. Ebene  | 9. Ebene    |
| 12 | 10. Ebene | 10. Ebene | 10. Ebene | 10. Ebene | 10. Ebene | 10. Ebene | 10. Ebene | 10. Ebene | 10. Ebene   |

Abb. 5

Darüber hinaus lässt sich noch angeben, ob die im jeweiligen Teil-Ast der Hierarchie die Zeilen der letzten Elemente markiert werden sollen. In diesem Beispiel ist diese Option deaktiviert.

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

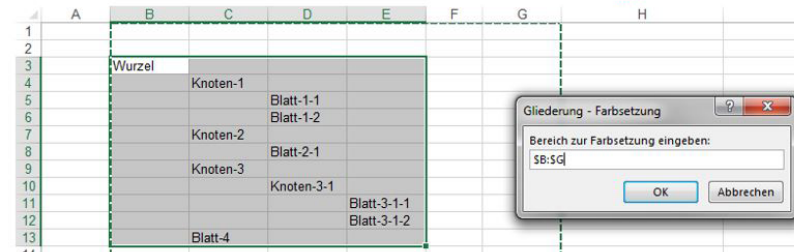


Abb. 6

c) Ergebnisdarstellung Einfärbung im gewählten Bereich

|    | A | B        | C          | D           | E | F | G |
|----|---|----------|------------|-------------|---|---|---|
| 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 |   |          |            |             |   |   |   |

Abb. 7