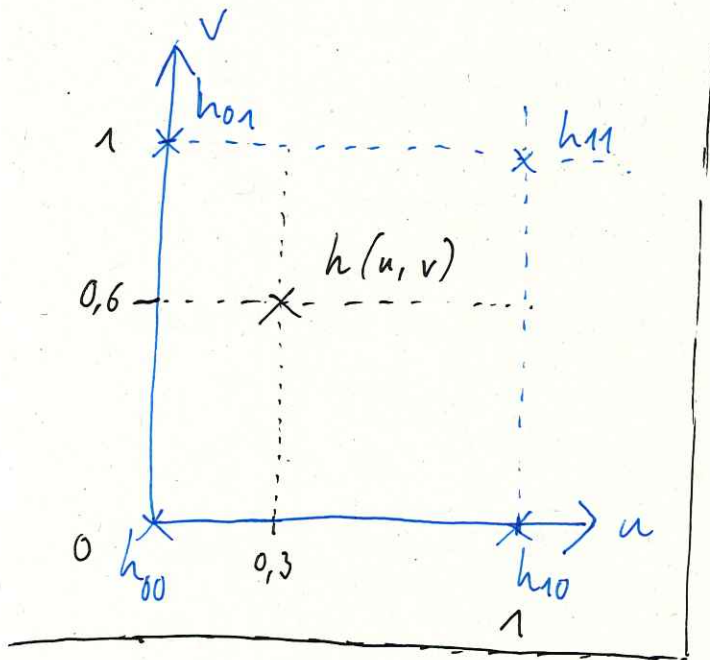


Beispielrechnung: Bilineare Interpolation

$$h(u, v) = (1-v) [(1-u) \cdot h_{00} + u \cdot h_{10}] \\ + v [(1-u) \cdot h_{01} + u \cdot h_{11}]$$



Beispiel:

$$u = 0,3 = \frac{3}{10}$$

$$v = 0,6 = \frac{6}{10}$$

Es sind folgende Werte gegeben bei den Koord. $(0,0)$, $(1,0)$, etc.

$$h_{00} = 0,2 = \frac{2}{10}$$

$$h_{10} = 0,7 = \frac{7}{10}$$

$$h_{01} = 0,4 = \frac{4}{10}$$

$$h_{11} = 0,1 = \frac{1}{10}$$

$$h(0,3, 0,6) = (1-0,6) [(1-0,3) \cdot 0,2 + 0,3 \cdot 0,7] \\ + 0,6 [(1-0,3) \cdot 0,4 + 0,3 \cdot 0,1]$$

$$\Leftrightarrow h\left(\frac{3}{10}, \frac{6}{10}\right) = \left(1 - \frac{6}{10}\right) \left[\left(1 - \frac{3}{10}\right) \frac{2}{10} + \frac{3}{10} \cdot \frac{7}{10}\right] \\ + \frac{6}{10} \left[\left(1 - \frac{3}{10}\right) \frac{4}{10} + \frac{3}{10} \cdot \frac{1}{10}\right]$$

$$= \frac{4}{10} \left[\frac{7}{10} \cdot \frac{2}{10} + \frac{21}{100}\right] + \frac{6}{10} \left[\frac{7}{10} \cdot \frac{4}{10} + \frac{3}{100}\right]$$

$$= \frac{4}{10} \left[\frac{14}{100} + \frac{21}{100}\right] + \frac{6}{10} \left[\frac{28}{100} + \frac{3}{100}\right] = \frac{4}{10} \cdot \frac{35}{100} + \frac{6}{10} \cdot \frac{31}{100}$$

$$= \frac{140}{1000} + \frac{186}{1000} = \frac{326}{1000} = \underline{\underline{0,326}}$$

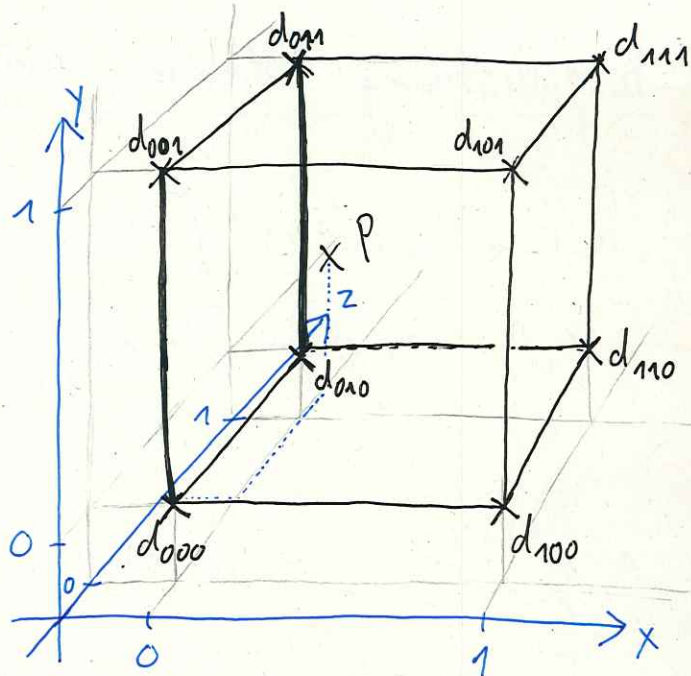
Beispielrechnung: Trilineare Interpolation

$$d_{abc} \in [0, 1]$$

$$a, b, c \in \{0, 1\}$$

$$P = \begin{pmatrix} x \\ y \\ z \end{pmatrix}, \quad x, y, z \in [0, 1]$$

gesucht: d_{xyz}



Gegeben seien:

$$P = \begin{pmatrix} 0,2 \\ 0,5 \\ 0,7 \end{pmatrix} \text{ und die}$$

zu interpolierenden Werte:

$$d_{000} = 0,3 = \frac{3}{10}$$

$$d_{001} = 0,2 = \frac{2}{10}$$

$$d_{010} = 0,4 = \frac{4}{10}$$

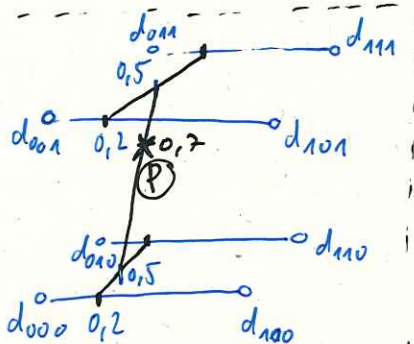
$$d_{011} = 0,8 = \frac{8}{10}$$

$$d_{100} = 0,1 = \frac{1}{10}$$

$$d_{101} = 0,5 = \frac{5}{10}$$

$$d_{110} = 0,2 = \frac{2}{10}$$

$$d_{111} = 0,9 = \frac{9}{10}$$



1. Interpolation entlang der x-Achse

$$\begin{aligned} \text{1) } d_{x00} &= (1-0,2) \cdot d_{000} + 0,2 \cdot d_{100} \\ &= \frac{8}{10} \cdot \frac{3}{10} + \frac{2}{10} \cdot \frac{1}{10} = \frac{24}{100} + \frac{2}{100} \\ &= \frac{26}{100} \end{aligned}$$

$$\begin{aligned} \text{2) } d_{x01} &= (1-\frac{2}{10}) d_{001} + \frac{2}{10} \cdot d_{101} = \frac{8}{10} \cdot \frac{2}{10} + \frac{2}{10} \cdot \frac{5}{10} \\ &= \frac{16}{100} + \frac{10}{100} = \frac{26}{100} \end{aligned}$$

$$\text{3) } d_{x10} = \frac{8}{10} \cdot \frac{4}{10} + \frac{2}{10} \cdot \frac{2}{10} = \frac{32}{100} + \frac{4}{100} = \frac{36}{100}$$

$$\text{4) } d_{x11} = \frac{8}{10} \cdot \frac{8}{10} + \frac{2}{10} \cdot \frac{9}{10} = \frac{64}{100} + \frac{18}{100} = \frac{82}{100}$$

2. Interpolation entlang der y-Achse

$$\begin{aligned} \text{1) } d_{xy0} &= (1-y) \cdot d_{x00} + y \cdot d_{x10} \\ &= (1-\frac{5}{10}) \cdot \frac{26}{100} + \frac{5}{100} \cdot \frac{36}{100} = \frac{130}{1000} + \frac{180}{1000} = \frac{310}{1000} = \frac{31}{100} \end{aligned}$$

$$\begin{aligned} \text{2) } d_{xy1} &= (1-y) \cdot d_{x01} + y \cdot d_{x11} \\ &= \frac{5}{10} \cdot \frac{26}{100} + \frac{5}{10} \cdot \frac{82}{100} = \frac{130}{1000} + \frac{410}{1000} = \frac{540}{1000} = \frac{54}{100} \end{aligned}$$

3. Interpolation entlang der z-Achse

$$\begin{aligned} \text{1) } d_{xyz} &= (1-z) d_{xy0} + z \cdot d_{xy1} \\ &= (1-\frac{7}{10}) \cdot \frac{31}{100} + \frac{7}{10} \cdot \frac{54}{100} = \frac{3 \cdot 31}{10 \cdot 100} + \frac{7 \cdot 54}{10 \cdot 100} \\ &= \frac{93}{1000} + \frac{378}{1000} = \frac{471}{1000} = \underline{\underline{0,471}} \end{aligned}$$