Interpolation tri-linearly at location \( x = \left( \begin{array}{c} 0.2 \\ 0.4 \end{array} \right) \)
interpolate inside a triangle at location \( x = (0.2, 0.3) \). The triangle has vertices \( t_1 = (0), t_2 = (2), t_3 = (6) \) and scalar values \( u_1 = 1 \), \( u_2 = 2 \), \( u_3 = 2 \).

\[ \text{(3) ?} \]

\[ 1 \quad (1) \quad (2) \quad 3 \]

**Solution:** Compute the barycentric coordinates

\[ b_1 + b_2 + b_3 = 1 \]
\[ 4b_1 + 4b_2 + 4b_3 = x \]

\[ \begin{cases} b_1 + b_2 + b_3 = 1 \\ 4b_1 + 4b_2 + 4b_3 = x \end{cases} \Rightarrow \begin{cases} b_1 + 1.2b_2 + 2b_3 = 1.2 \\ 1.5b_1 + 2.5b_2 + 0.5b_3 = 0.2 \end{cases} \]

1. \( b_1 + b_2 + b_3 = 1 \)
2. \( b_1 + 2b_2 = 0.2 \)
3. \( b_2 = 0.2 \)
4. \( b_3 = 0.3 \)
5. \( b_1 = 0.5 \Rightarrow b_2 = 0.3 \)
\[
\begin{align*}
\begin{array}{c}
5_1 + b_2 + 5_2 = 1.2 \\
\frac{5_1}{3} + 2b_2 = 0.3 \\
\end{array}
\end{align*}
\]
\[
D \times x = d, \quad x = \begin{pmatrix}
5.1 \\
5.2 \\
5.3 \\
\end{pmatrix}, \quad D = \begin{pmatrix}
0.5 & 0.2 & 0.3 \\
1.1 & 0.2 & 0.4 \\
0 & 1.1 & 0.7 \\
\end{pmatrix}
\]
\[
\det (D) = |D| = \det \left( \begin{array}{cc}
1 & 0.5 \\
1.1 & 0.2 \\
0 & 1.1
\end{array} \right) + \det \left( \begin{array}{cc}
1 & 1 \\
0 & 1.1
\end{array} \right)
\]
\[
= 1.0 - 2.2 + 1.2 - 1.1 = -3
\]
\[
D_1 = \begin{pmatrix}
0.5 & 0.2 & 0.3 \\
1.1 & 0.2 & 0.4 \\
0 & 1.1 & 0.7 \\
\end{pmatrix}, \quad D_2 = \begin{pmatrix}
1 & 1 & 1 \\
0 & 1 & 2 \\
1 & 0 & 0
\end{pmatrix}, \quad D_3 = \begin{pmatrix}
1 & 1 & 1 \\
0 & 1 & 2 \\
1 & 0 & 0.7
\end{pmatrix}
\]
\[
\det D_1 = \det \left( \begin{array}{cc}
1.2 & 1 \\
0.2 & 2
\end{array} \right) - 2 \det \left( \begin{array}{cc}
0.7 & 1 \\
0 & 2
\end{array} \right)
\]
\[
= 2.4 - 0.7 - 2 \left( 2 - 0.7 \right)
\]
\[
= 1.7 - 2.6 = -0.9
\]
\[ D_2 = \begin{pmatrix} 1 & 1 & 1 \\ 1 & 2 & 0 \\ 0.7 & 0 \end{pmatrix} \]

\[ d_{11}(D_2) = d_{11}(1.2, 0) + d_{11}(1.2, 2) = -1.4 + 2 - 1.2 = -0.6 \]

\[ D_3 = \begin{pmatrix} 0 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 2 & 0.2 \end{pmatrix} \]

\[ d_{11}(D_3) = d_{11}(1, 1, 1.2) + d_{11}(1, 1.2) = 0.7 - 2.4 + 1.2 - 1 = -1.5 \]

\[ b_1 = \frac{d_{11}(D_1)}{d_{11}(D)} = \frac{-0.9}{-3} = 0.3 \]

\[ b_2 = \frac{d_{11}(D_2)}{d_{11}(D)} = \frac{-0.6}{-3} = 0.2 \]

\[ b_3 = \frac{d_{11}(D_3)}{d_{11}(D)} = \frac{-1.5}{-3} = 0.5 \]
\[ u = b_1 v_1 + b_2 v_2 + b_3 v_3 \]

\[ = 0.3 \cdot 1 + 0.2 \cdot 2 + 0.5 \cdot 2 \]

\[ = 1.9 \]

What are the strengths of the pipeline concept in visualization software packages?
- Modularity: it can apply algorithms at different stages
- Less redundancy
- Universality: freedom in applicability of applications
- Flexibility: pipeline can be set up based on needs
How can we solve ambiguities in the marching cubes algorithm?

Use of alternate cases based on neighboring cells.

What is the advantage of the radial layout for graphs?

Area increases with every level.

What concepts did we discuss for maintaining context when visualizing graphs/trees?

Hyperbolic layout, fish eye lens view.
What is preattentive processing and why is it important for visualization?
- can be picked up in less than 200 ms
- important for highlighting or drawing attention/focus