In the context of curves, C0, C1, and G1 continuity refer to different levels of smoothness and alignment between curve segments. These concepts are crucial in computer graphics, CAD, and animation to ensure visually pleasing and smooth transitions between curves.

C0 Continuity

- **Definition**: Two curve segments are C0 continuous if they meet at a common endpoint.
- **Implication**: The curves are connected, but the transition at the joint may not be smooth.
- **Example**: A polyline where the endpoints of line segments meet but the angles between them are sharp.

C1 Continuity

- **Definition**: Two curve segments are C1 continuous if they are C0 continuous (share a common endpoint) **and** their first derivatives (slopes or tangents) are equal at the junction.
- **Implication**: The curves meet smoothly without a visible kink. The tangent vectors at the connection point are aligned.
- **Example**: A Bézier curve with C1 continuity at the control points ensures a smooth transition.

G1 Continuity (Geometric Continuity)

- **Definition**: Two curve segments are G1 continuous if they are C0 continuous and their tangents are proportional (have the same direction but not necessarily the same magnitude) at the junction.
- **Implication**: The curves appear smooth at the joint, but the rate of change (speed along the curve) may differ.
- **Difference from C1**: While C1 requires exact equality of tangents, G1 only requires tangents to be collinear (aligned in the same direction).
- **Example**: Two curve segments forming a smooth joint in terms of shape but with potentially different scaling factors for speed.

Visual Summary

- **C0**: Connected, may have sharp corners.
- **C1**: Connected and smooth, no visible kink.
- **G1**: Connected, visually smooth, but possibly different speeds across the joint.

Practical Applications

- C0 is often sufficient for simple paths or connections.
- C1 is used in animation and design where smooth motion or flow is critical.
- G1 is used when visual smoothness is required but strict mathematical equality of derivatives is not necessary, allowing for flexibility in design.