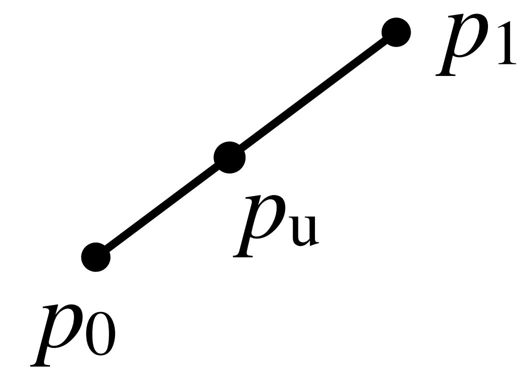
Interpolation

- Linear Interpolation
- Bilinear interpolation
- *Barycentric interpolation*
- Hermite Interpolation
  - Two points + two tangents define curve segment
  - Smoothstep
- Catmull-Rom Interpolation

Bi-linear interpolation

- Remember linear interpolation

$$p_u = (1-u)p_0 + up_1$$

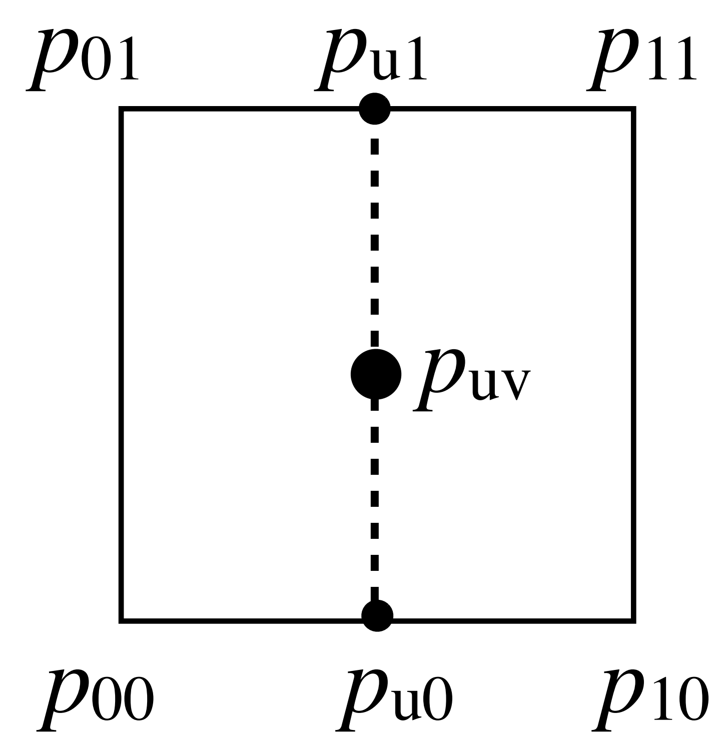


- Bilinear interpolation:

$$p_{u0} = (1-u)p_{00} + up_{10}$$

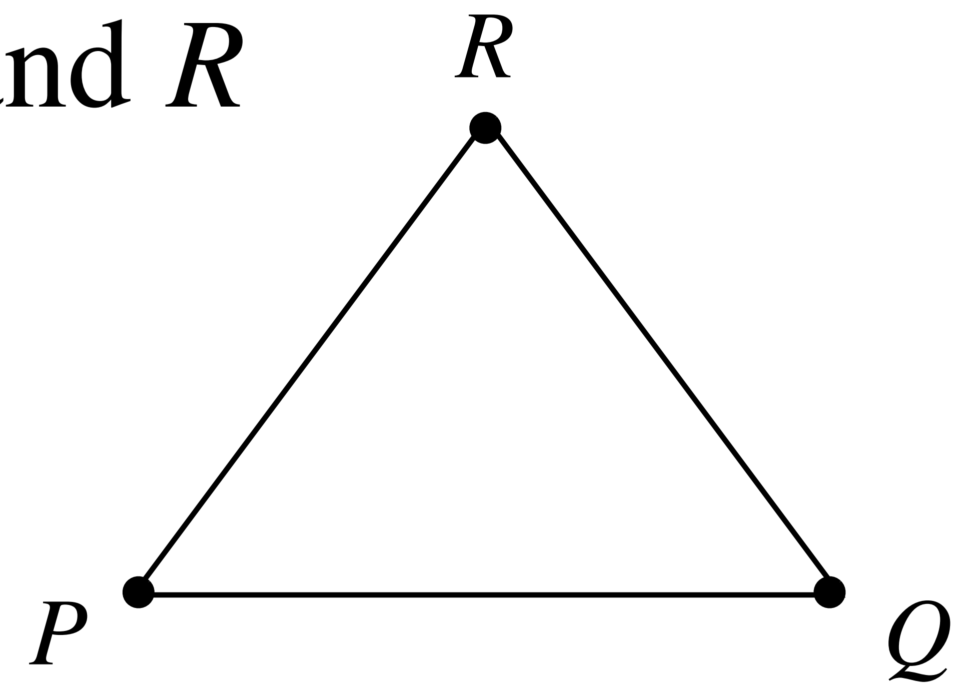
$$p_{u1} = (1-u)p_{01} + up_{11}$$

$$p_{uv} = (1-v)p_{u0} + vp_{u1}$$



Triangle

- Defined by three points P, Q and R



- Points inside triangle:
- u,v,w : barycentric coordinates

$$wP + uQ + vR$$
$$u + v + w = 1$$
$$u, v, w \geq 0$$

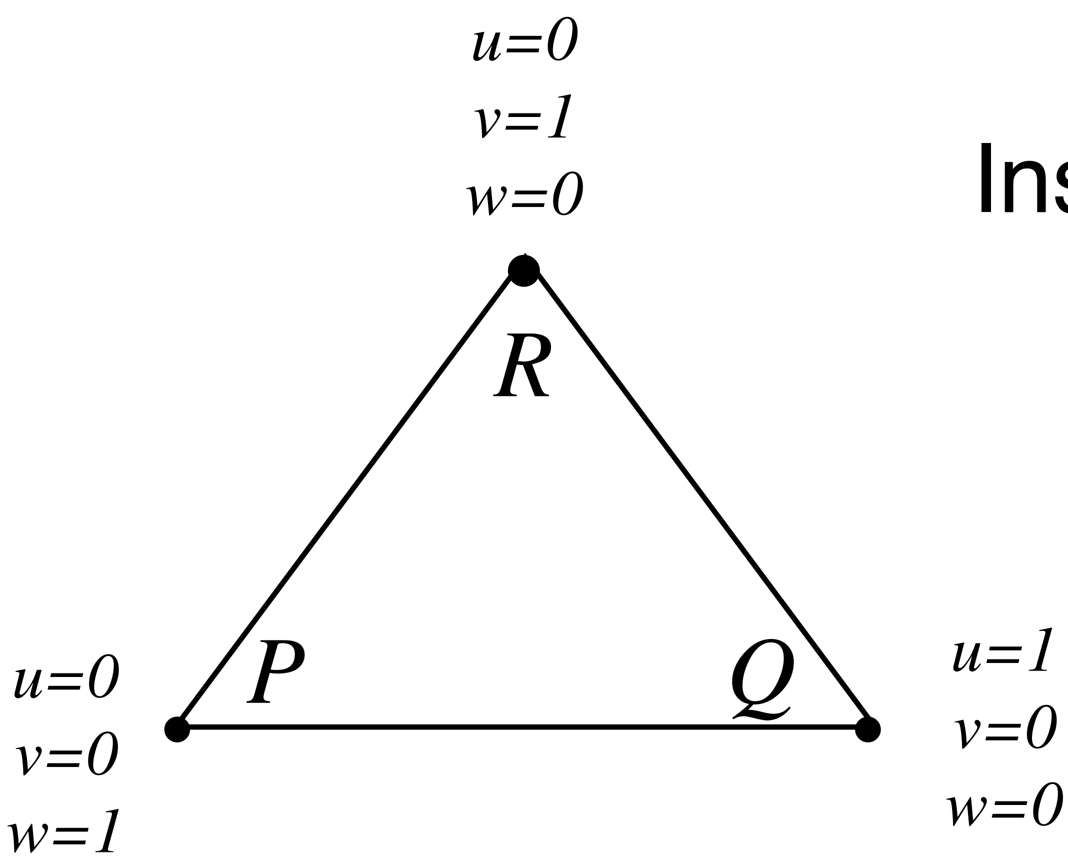
Barycentric Interpolation

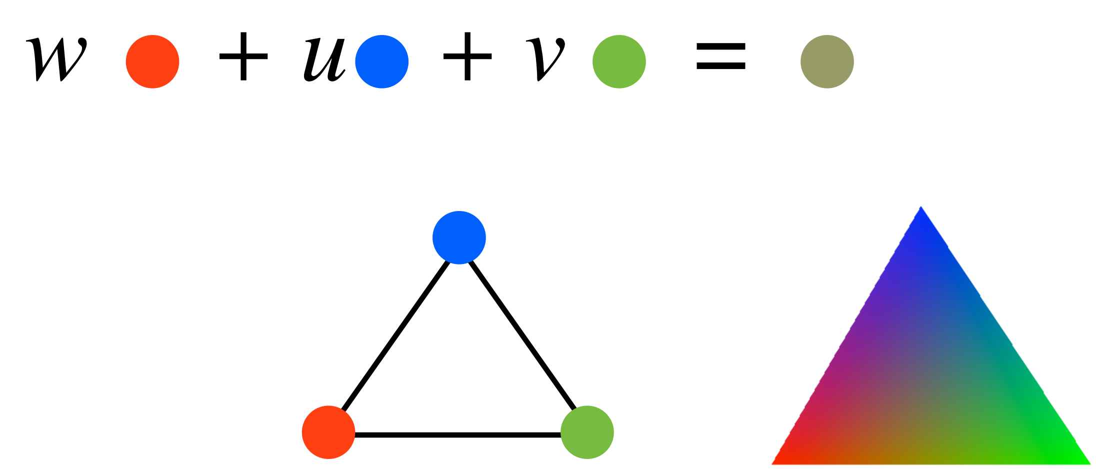
- u,v,w : barycentric coordinates

$$wP + uQ + vR$$

$$u + v + w = 1$$

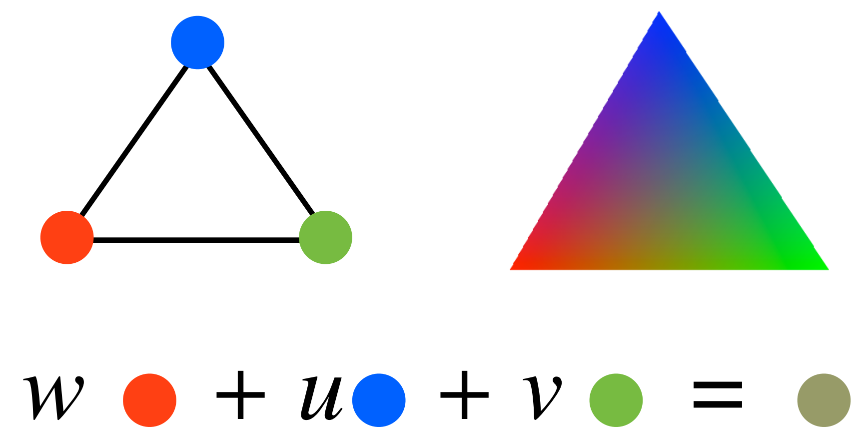
Inside triangle if: $u, v, w \geq 0$

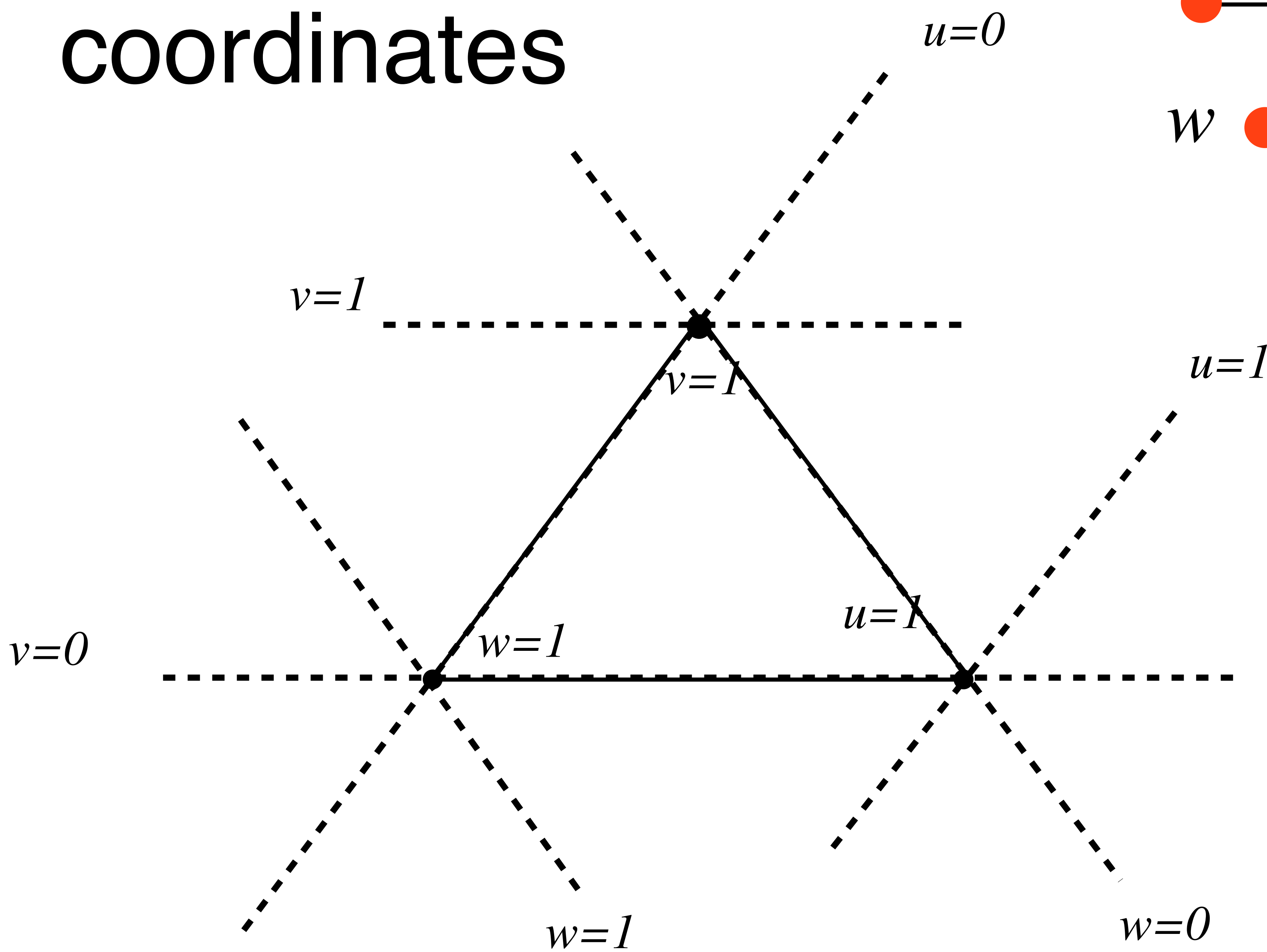




Barycentric Interpolation

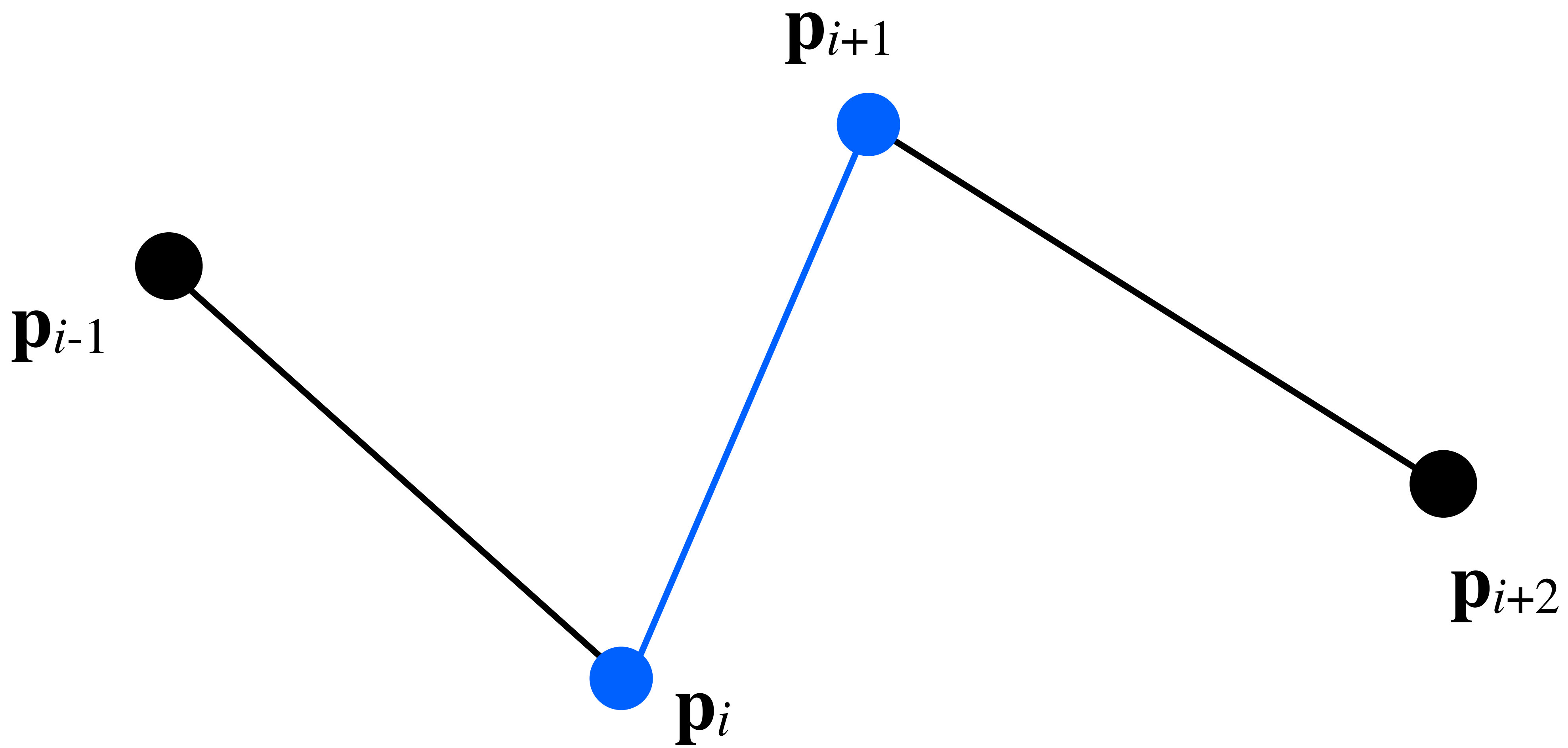
- u,v,w : barycentric coordinates



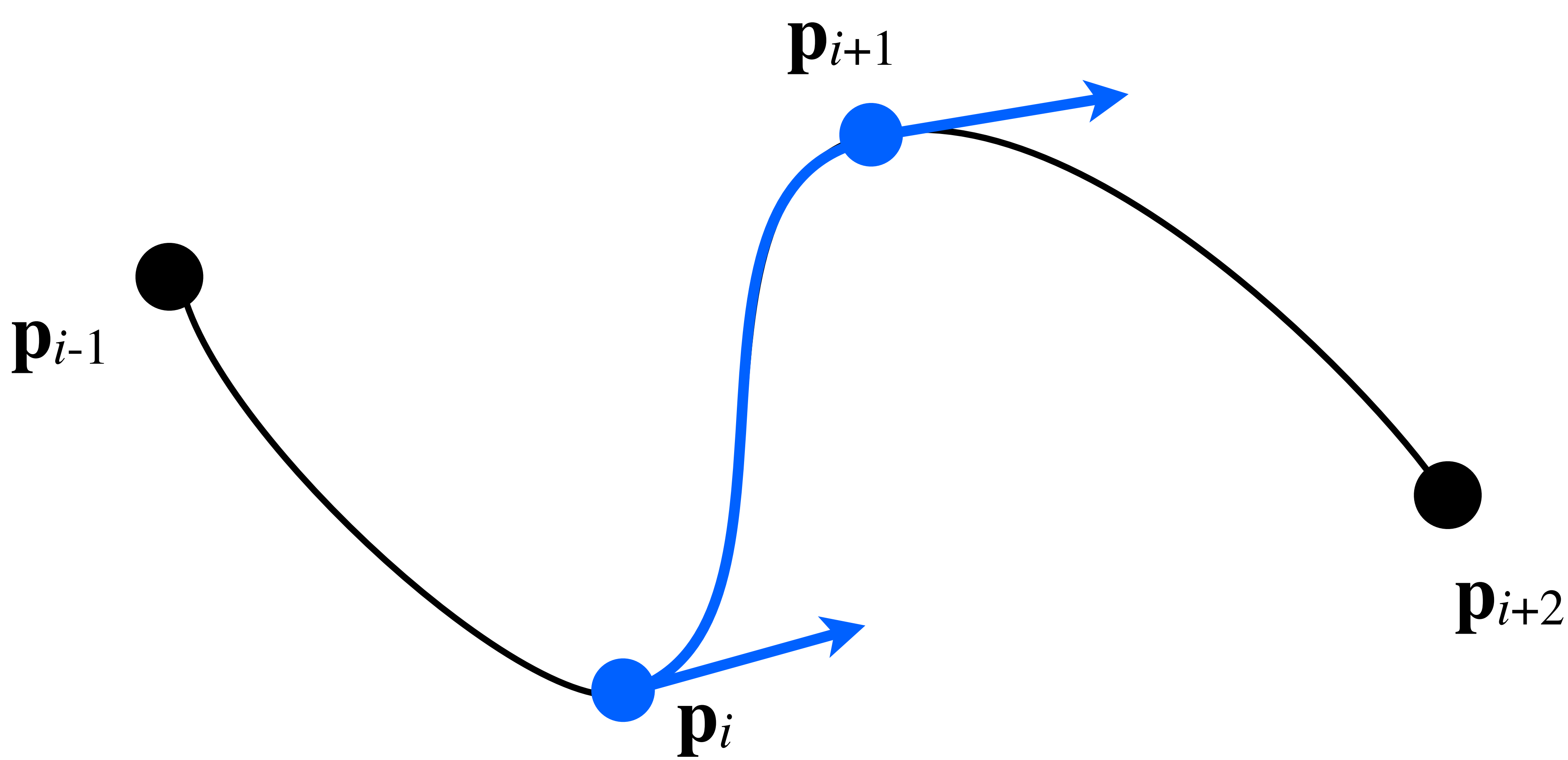


$$u + v + w = 1$$

Linear interpolation

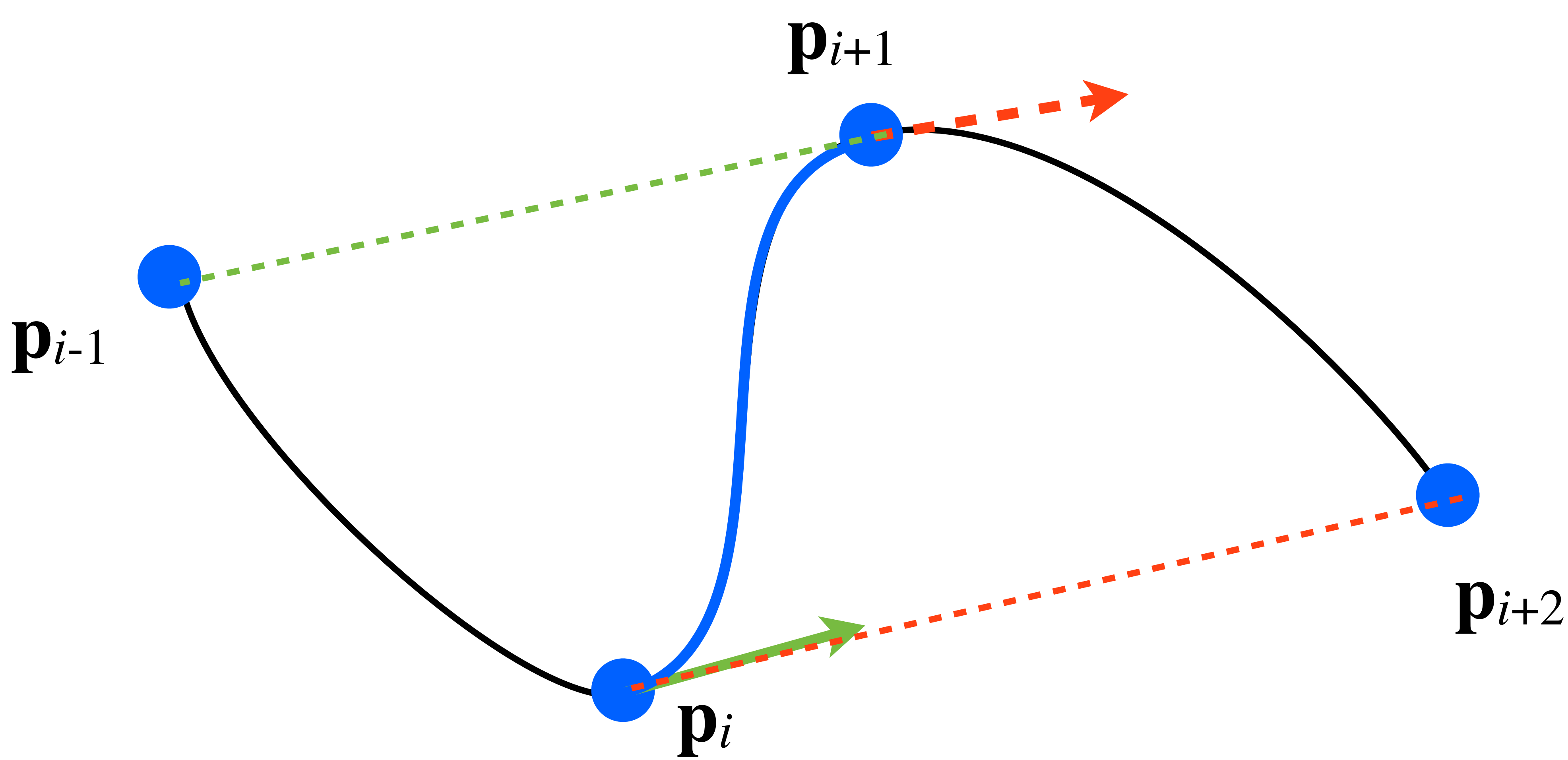


Hermite Interpolation



Use two points and two tangents to specify **cubic** curve segment

Catmull-Rom Interpolation



Use four points to specify cubic curve segment. No need to manually specify tangents. Tangents approximated by: $\mathbf{p}_i' \approx \dfrac{\mathbf{p}_{i+1} - \mathbf{p}_{i-1}}{2}$