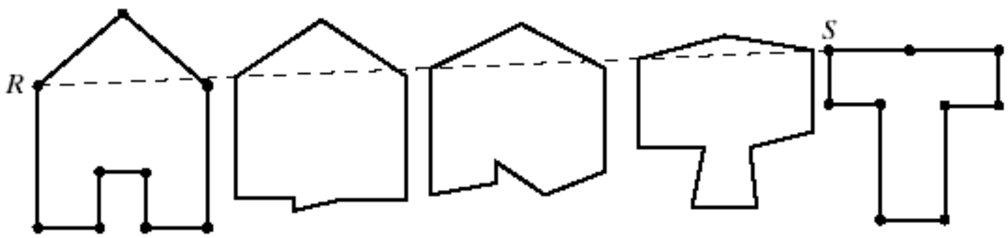
Tweening

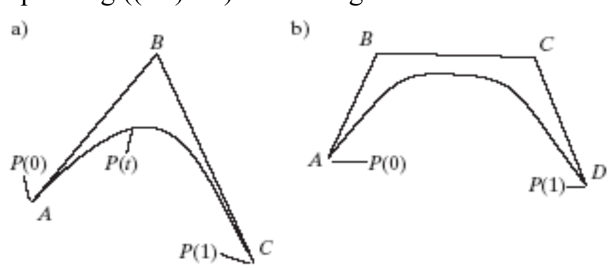
- In films, artists draw only the key frames of an animation sequence (usually the first and last).
- Tweening is used to generate the in-between frames

How is it done?

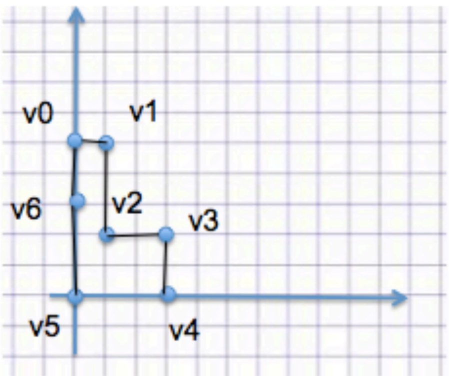
- P = (1-t)A + tB is a linear interpolation (lerp or tween) of 2 points.
- Tweening takes 2 polylines and interpolates between them (using lerp) to make one turn into another (or vice versa).
  - P(t) that is a fraction t of the way along the straight line (not to be drawn) from point A to point B.
  - $P_i(t) = (1\text{-}t)A_i + tB_i$, for t = 0.0, 0.1, …, 1.0 (or any other set of t in [0, 1]), and draw the polyline for P_i.



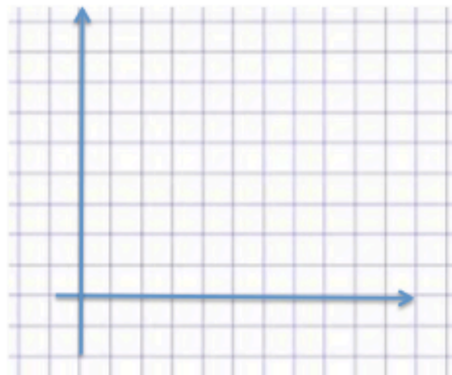
- Practice Question:
  - What is the effect of tweening when all of the points A_i in polyline A are the same? How is polyline B distorted in its appearance in each tween?
  - Polyline A is a square with vertices (1, 1), (-1, 1), (-1, -1), (1, -1) and polyline B is a wedge with vertices (4, 3), (5, -2), (4, 0), (3, -2). Sketch the shape P(t) for t=-1, -0.5, 0.5, and 1.5.
- Other uses of tweening:
  - Draw a smooth curve that passes through or near 3 points (A, B, and C). ➔ expand $((1\text{-}t) + t)^2$ and write: $P(t) = (1\text{-}t)^2A + 2t(1\text{-}t)B + t^2C$
    - This is called the Bezier curve for points A, B, and C. It can be extended to 4 points by expanding $((1\text{-}t) + t)^3$ and using each term as the coefficient of a point.



t=0

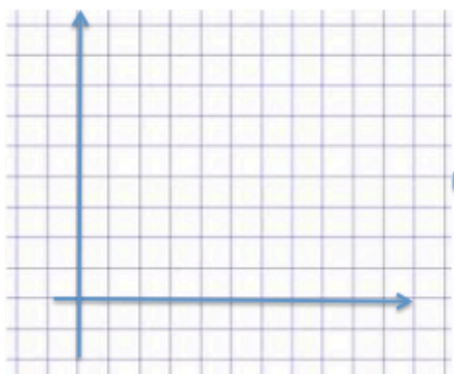


t=0.3

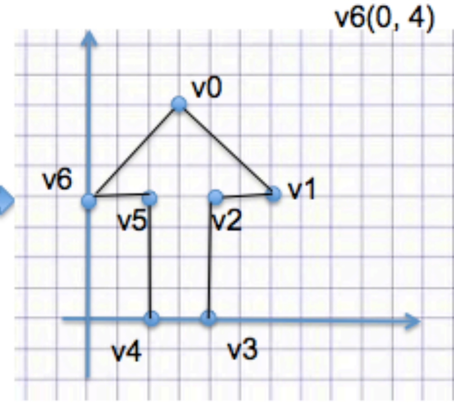


v0(0, 5)
v1(1,5)
v2(1, 2)
v3(3, 2)
v4(3, 0)
v5(0, 0)
v6(0, 3)

v0(3, 7)
v1(6, 4)
v2(4, 4)
v3(4, 0)
v4(2, 0)
v5(2, 4)
v6(0, 4)



t=0.6



t=1