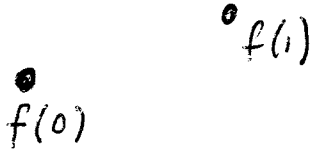


11/4

Pragmatic Issues in Curves

Drawing

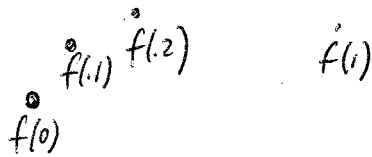
- have algorithm for drawing lines (and hardware)



Can we just draw a line?

- Yes IF small or straight

idea: break curve into pieces
sampling



Fixed vs. Adaptive

pick N and divide uniformly

vs.

break into pieces, keep breaking until OK

Is it OK

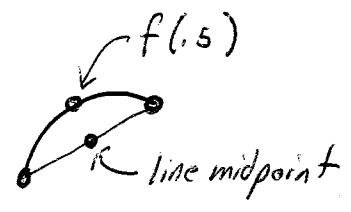


How do we know how big/curvy a curve segment is

- Bounding box
 - Easy to divide
 - Easy to know ends
 - Easy to assess curviness
- Would be nice to have curve that do this
↳ Bezier (later)

Simple idea:

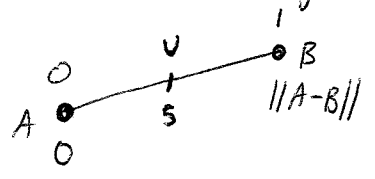
try $f(.5)$
 if $f(.5) \approx \frac{f(0)+f(1)}{2}$
 then line is OK



Note: work for straight or small

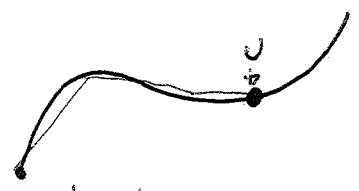
ARC LENGTH Parameterization

① if ~~line~~^{curve} is straight, easy!



$$\frac{U}{1} = \frac{S}{d = \|A-B\|}$$

② given U, getting S is easy



break curve into small pieces
 sum length

going backwards is harder
 build a table, use lookup / interpolation

U	S
0	0
.1	s_1
.2	s_2
.3	s_3

← if have S here,
 then $U = .2 + \frac{S-s_2}{s_3-s_2} \cdot (.3 - .2)$

A TRICK FOR TRAINS

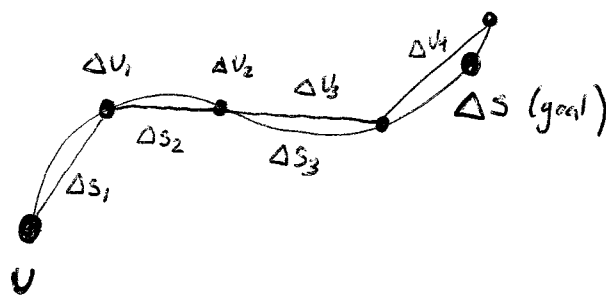
HAVE U , and ΔS (how far between ties, train speed)
 compute ΔU

idea: pick a small ΔU so straight line is OK

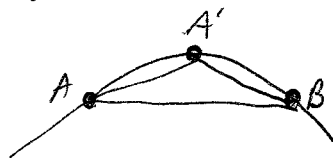
figure out the corresponding ΔS

too small? use it as a step

too big? either divide the step or interpolate



how do you know if ΔU_i is too big?



if $\|AB\| \approx \|AA'\| + \|A'B\|$
 then its nearly straight

NOTE ALL THIS WORKED FOR ANY CURVE
 just evaluate f

In practice: be careful to get wrap around correct!