Parameterization –

Why this paper:
- Has a cool app to motivate
- Tackles an easier version of the problem
- Is actually easier than most methods
- Builds on other concepts
- Implementable by an undergrad as a class project

What is parameterization? Why? (texturing, remeshing, analysis, ...)
detail transfer, completion, fitting, ...
- mapping (usually to a plane / disc)
  - ⇒ sometimes sphere

Can we parameterize anything?
- Paper Folding → Developable
- Stretchy
- Cutting
- Charts and Atlases

> what is a good parameterization?

Local vs. Global
- local (topological disc)
  - where we can get a "good" (enough param)
- global
  - all over
  - 1 common coordinate system (or at least a good atlas)

Why does decaling only require local (what can't you do)
What needs global?

Local Distortions

"Dishortion"

- circle (infinitessimal) on plane ⇒ ellipse on surface
  local metric distortion

Less Differential

- What happens to the triangles

preserve length	isometric	$\delta_1 = \delta_2 = 1$
preserve angles	conformal	(harmonic?) $\delta' = \delta^2$
preserve areas	equi-areal	$\delta_1 \delta_2 = 1$
preserve length + angle ←	developable	

Why choose?

different apps are sensitive to different things
minimize different kinds of distortion
isometric ⇒ conformal
but min isometric != min conformal

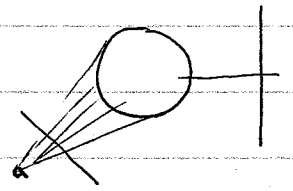
Globally isometric only for developable surfaces

In general no "good" (eg isometric globally) parameterization

Seek something that is locally good (or as good as possible)
everywhere

Some parameterizations

"Decal Projection" — surface maps to screen
Orthographic projection (or camera projection) → gives a mapping



Easy
Local
Good for painting
Supported by graphics hardware ← get for free when drawing

Variant → project onto tangent plane at point

DISTANCES NOT PRESERVED WELL

FOLDOVER

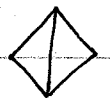
Does give a local parameterization method

Geodesics

An aside -
distances on surfaces

Geodesic path = shortest path between 2 pts on surface
- not always "straight" ← but as straight as possible on the curved domain
- great circle routes

Mesh shortest paths
ring distance
shortest edge Distance ← Dijkstra's distance
NOT GEODESIC!



in fact, arbitrarily bad

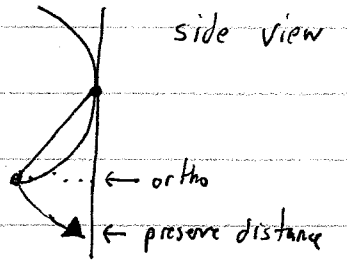
true geodesics can be hard to compute
(there are methods)

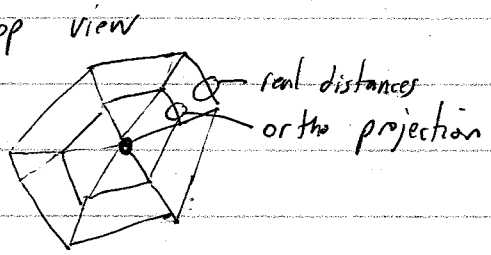
The exponential maps paper -

Only a local parameterization
- no need to consider charting, segmentation, ...

Idea (of param part)
preserve the distances to the center point
projection onto tangent plane
greedy / local method
each point handled seperately
(as opposed to optimizing overall quality)

Understanding this -
rotate onto plane (same direction, preserve length)

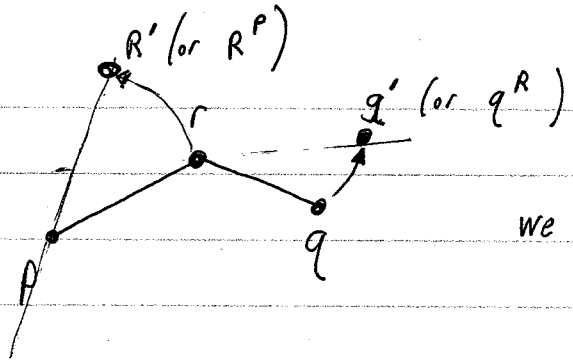




~~Now we've gotten~~

polar coordinates r, θ ← somewhat arbitrary
↑
make sure we get this right

Now we've gotten 1-ring

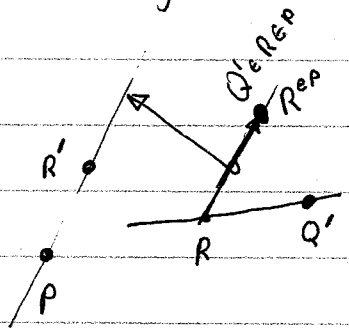


we know how to put q onto r's tangent plane

we know how to put r into p's tangent plane

put r's tangent plane ∥ to p's

now you can move the vector



What does this minimize?

radial distortion from center point

no overall minimization

↳ is this a problem?

Image and Video Abstraction

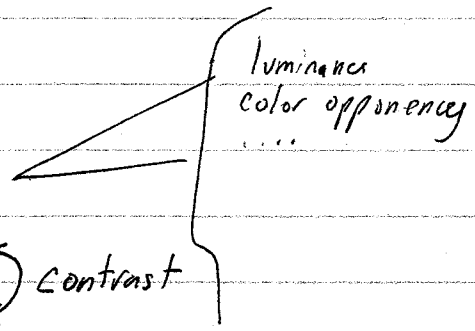
→ Why abstraction / What is abstraction

→ Applications

Retargeting — Easy Viewing — (Where's Waldo)
Stylization
Coding / Compression

What is important

Salience - (vs. Importance)



low-level features (edges)
motion features
identifyable objects

Does eye tracker give salience or importance?

Is automatic recall "art"

Where to guide the eye?

Diffusion

~~$\frac{\partial I}{\partial t} = -\nabla I$~~ (stuff flows to places where it fills in fastest)

$\frac{\partial I}{\partial t} = \frac{\partial^2 I}{\partial x^2}$ Heat equation - heat flows from warm to cool

Equivalence

Diffusion = Blurring / Smoothing

$I * g^t$

$*$ ↑ convolve, g ← gaussian

Step wise -

step of PDE

filter w/ Gaussian

Bilateral Filter ≈ Anisotropic Diffusion

Mean Shift

Lecture Administrivia

- What do you expect to have to turn in?
  - write your own assignment ?
  - evaluation standards (how will you do self-evaluation)

Blogging on Projects

- What to expect
  - Turn in project
  - Self-Eval + Evaluation ← reflection lets lessons sink in
  - Process ← narrative of what you did + discussion
  - What would you do differently
  - Critique of me / assignment ≡ what did or did not cause the project to work

∈ How many people went to talk? (there are more)
- time slot
- was it valuable?

| top people
| general audience
| speakers trying to be good

① what did it have to do with graphics?

② what is a faculty job talk anyway
(this was not a standard one)

combination - standard talk (but more general audience)
- why me ← why was this hard / challenging
- why my solution (need to set up problem since general audience)
- I can give a good talk (teaching)