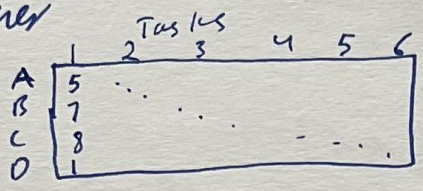
Meeting 07/12/2021

- ·) Understand the domain and what adaptation is.
- ·) Prob density of an image group to be compared.
- ·) Examine feature space [Imp].
- ·) Animal testing not working on humans.
- ·) Understanding feature maps [state of the art].
- ☆) CGI model [render] → parameter [shape, light, shading, etc] → Synthesize ↓ real photo to synthetic
- ·) Fit on both Image and Synthesize
- ·) The distance to be minimized is the domain adaptation
- ·) Color diff being massive
- ·) CGI has rendered us to be like that
- ·) generation model part
- ·) Look into paper published on ~~creating~~ synthetic, [Shrini]
- ·) distance should vary with the exhaustive list.
- ·) Co-variance and variance, balance it all out not remove everything
- ·) Simplistic Model | printed paper → homography transfer image → diff but recognisable
- ·) image distance learning
- ·) 10:30am Wednesday 15th

1/06/2022 SPI-7 Metaheuristic / optimisation

-) Limited tasks and agents, and each agent is assigned a task then make a table and optimise using "Hungarian Method" or whatever



"Problème d'affectation"

1) ~~"Capacitated"~~ "Uncapacitated Plant location Problem" UPLP

1) Combinatorial optimisation ~~can~~ can be in the form of a PL(NE)

- Linear program (PL) — Data, Variables, Linear objective func, Linear constraint
- Integer LP (PLNE)

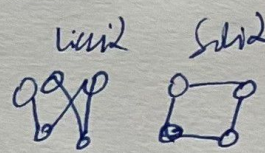
1) P=NP problem

II Methodes de Recherche Locale

1) No free lunch theorem
b) Mouvements de base

2) Stochastic gradient descent
- at each iteration a neighbour is chosen at random
  1) Adv - no need to build neighborhood
  2) Disadv - when to stop?

- Metaheuristic
  1) Simulated Annealing (1983)



- Kangoro Algo [1993]
-) Iterated Local Search [2013]
- Tabu Search [1989]

I Algorithmes evolutionnaires

1) Cleretic Algorithm

- 3ème Day

-1) Basic Concepts in Cleretic Algo

a) Initialisation
b) ~~Evaluation~~ Crossover
c) Mutation

1) Particle Swarm Optimization

1) "Hybrid Metaheuristic Models"

- General style, RGB
- optical images in general RGB
- Real image → Model → synthetic → Main objective
- RGB le kenna hai.
- Endoscop → Synthetic → specific organ → Liver
- Light is same place in camera
- open cavity has multiple light sources.
- Variance in generated synthetic data
- Fading light on the sides of object in endo.
- Motion Blur 2 types
- predict factors from network.
- Remove specific objectives like noise
- which factor to model and which factor we stay invariant to.
- Lit range of variability of the factor.
- effects of forces on object and its deformation
- Generative Model fitting
- Use yamida in his work.
- Analysis by synthesis

·) generate that model using ~~that~~ these explicit terms.

·) Variability is too high.

·) Learn using data

·) Image observed color is based on light etc texture.

·) Video data

·) Make several schematics for whited model

general + specific

Make it as explicit as possible

Next week with Dani

19th 9am [illegible]

→ immmm vs reality

Pick a live photo → Show factors

Show mms

1) problem in XCAB

1) Main point "How to build some sort of invariance to compute 3D information"

1) Deep learning is a black

1) Current approaches

1) are they black boxes?

2) Not just more data ...

1) Physics based approach ... just approximate but understandable

1) Don't model all things from data

→ Explore this spectrum in PHD

1) Make a schematic for physics based ⟷ learning based

Use this axis

19th Jan 2022

1) Images RGB, Analyze every possible factor that makes an image.
2) Make invariant to some parameters,
3) Synthesize image that looks like synthetic image.
4) Notion of invariance and discriminative approach.
5) SfM is a good example.
6) Keypoints are invariant in many aspects
7) Local vs explicit descriptors.
8) Time lapse invariant key descriptors →

Generally talks about Light

Organ Oxygenation, Lighting position problem, keypoint detection invariant to movement.

9) Domain Adaptation problem for publicity

10) Stereo recon, Measure similarity between synthetic-real using CNN

11) ~~Classification~~ DANN, Nareeds help

12) SFT in Surgery, pre-operative model registered to images and texture map it

1) Changing appearance
2) Coping with light → Brij

↓ Model/learn → light modeling explicit to get invariance

Thursday
9:30 am

13) We know the temp of the light in Lepro

14) Reflectance, specularity

Deep organs shape → texture → images
mesh

Issue subsurface factor Kiska
hai to produce the best image

Deformation + pose → Modelled
capacity

14) Statistical light ray casting, GAN

15) Shading based Nerf, then go to colour.

16) Schematic Living Physical environment Living

↓

Camera

↓

Lighting

Factors
+
Sub factors

- Generative vs Discriminative
- Analysis by synthesis
  schematic, optimization problem

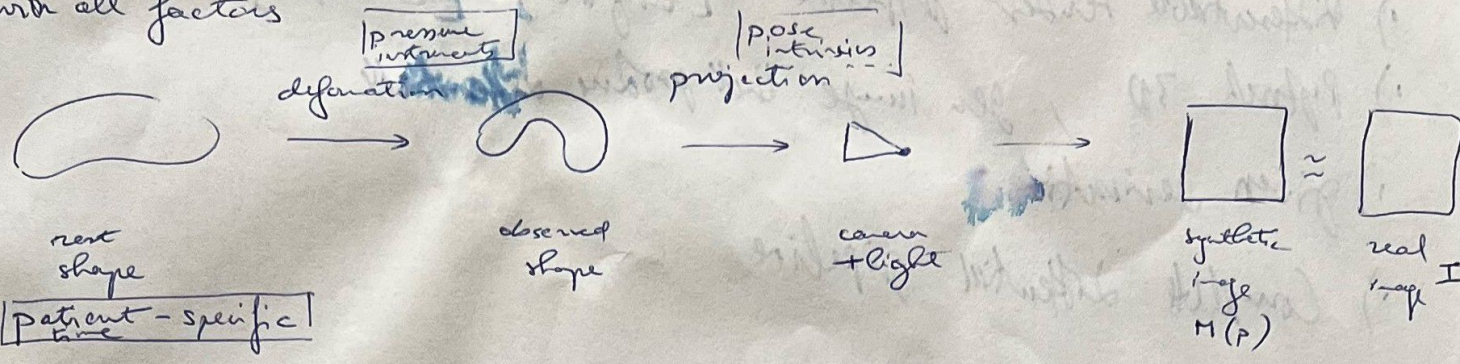
Table

- Combo
  - Nerf
  - Lighting

Presentation

1) Richard SingAr → Dynamic Webpage Light Model
2) Spherical light Models for Light
3) Definitions of invariance VS co-variance vs invariance

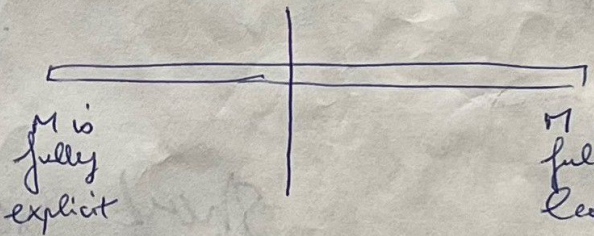
physics - based
schematic
with all factors



invariance vs modelling
- explicit = physics-based
- learnt

$$\min_p \| M(p) - I \|^2$$

M = image generation from parameters p



"blender"

p = all the 3D parameters

p = some latent variables

analysis - by - synthesis

- Differentiable render pipeline [Engine] [z-map]
- Pytorch 3D, gen image that produce differentiable
- given derivative
- Complete differential pipeline

- Diffusion Model / GAN → better — more powerful

- Be careful about complexity
- Texture Map problem
- focus on one problem
- Domain Adversarial networks — DANN

Shared Google DOC

CVIU Shrimi Sankar

CGI model ← parameters $P \in \mathbb{R}^{large}$ → CVIU Shrimi Sankar

rendering f

- shape of objects
- colour

} generation model/pose/ covariance

- light
- shadow
- ⋮

} invariance part

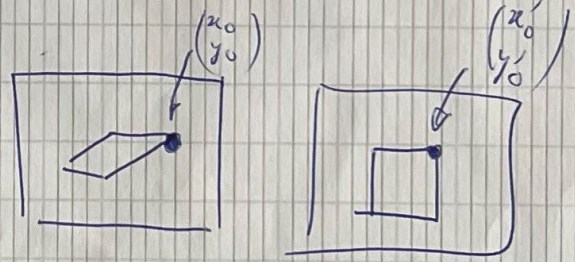
CGI image $f(P)$

$$\min_P d(I, f(P))$$

image distance learning

$\simeq$

real image I



simplistic model = printed paper + homography transfer of image

8th feb, 10am

Score = s

pm = parameters mod → alot

pp = pre param

pc = comparison

- Texture Analysis
- Model or invariant score
- span of possible textures
- ~~Different predict texture~~
- Produce diff ~~textures~~

deformation, light, texture

↓

when we put on general schematic

Damien → Blender

detinX

~~Classifier~~
Imgs texture score
Discriminator

shape is fixed no [pm]

pose

BRDF

BRDF

- Radiometry only 1 parameter
- color correction
- learn a score that's noise invariant

Yanid for Model Imgs] Liver Renal

Img database] Mathieu

Pytorch 3D

3D Mesh + Figures + camera Model

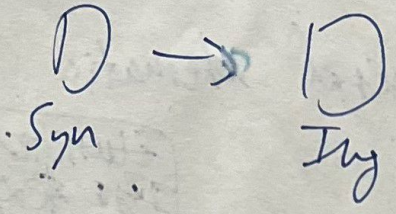
Blender

Render

Imges

- SIFT as descriptor or

- Background gen from Synthetic
- Invariant to texture or not
- Wide texture set, texture Model to capture or be invariant



Metric diff texture + lighting

- 'f' to be invariant to what variety L_2 it will be so much
- Texture Model that generates multiple textures from simple parameters
- Explicit texture Model or stay invariant
- Find transformation for invariance
- Original image to pre-trained

16th Wed 11 am

1) face of the mesh to barycentric coordinates.
2) Volumetric Meshes.
3) Refiner

↓ inside the face

Registration to 3D Model Map

↓ Mesh → repeat Map texture

(U,V) coordinates

4) Volume representation →

Bounded interior
+
Tetrahedron

GMSH

1) All hands busy with renderer

render an image and see mouse coordinates

2) Completely synthetic

3) Click all coordinates from the render to the image.

+

Play with light → spot light

4) Make an SFT system to map that

5) [Load Obj → specify camera → render [shaders] → Lights

Slides ← 2D → 3D correspondence ← Lights drawn]

1) . Texture Mapping Conditions

- Need MTL files for mapping
- Corresponding .obj files

1) Problem with deformation not part of ~~single~~ single pipeline can't use abaqus at the transfer

1) Perform deformation, create poses, fit texture on poses,

↓

Domain adaptation with images of real liver [rasterization]

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1) Mesh segmentation

1) Model to the image

1) Could be a feature map

1) Which texture mapping, registration

1) ~~Therefore~~ Tube, constant color some angular are sort of spread it.

1) Depth map + UV map = Normal map

1) Fit to image PNG -> depth map

↓

texture map

18/08/22

- Intrinsic image decomposition = decompose image in 2 layers
  1) Reflectance, albedo invariant colors of Material
  2) shading, produced between light and geometry

-) Go search the database,

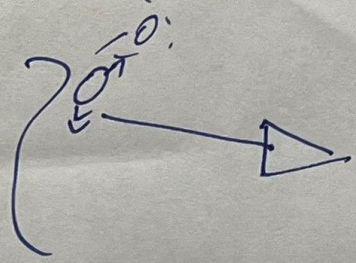
-) Result work with Liver |

-) choose my pose -> Synthesized

-) Create my 3D environment so poses are known then
   go for diff rendering ↵
   as a test case!

-) After pipeline is set up then might test it on Liver models.

-) Why Differentiable is needed



Limitations

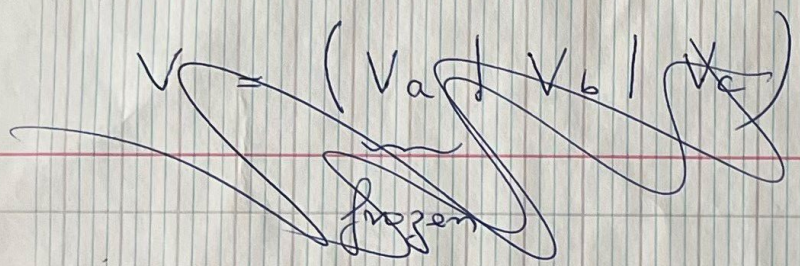
Why it works with my images?

Influenced my training and Diff rendering

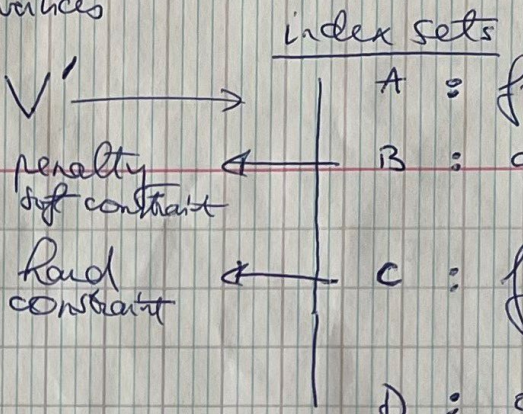
1) print ranges on Mitsuba ?

2) which params are differentiable in both frameworks
specify them !

3) Render image wrt 1 param one by one
position of light, color, etc



N vertices

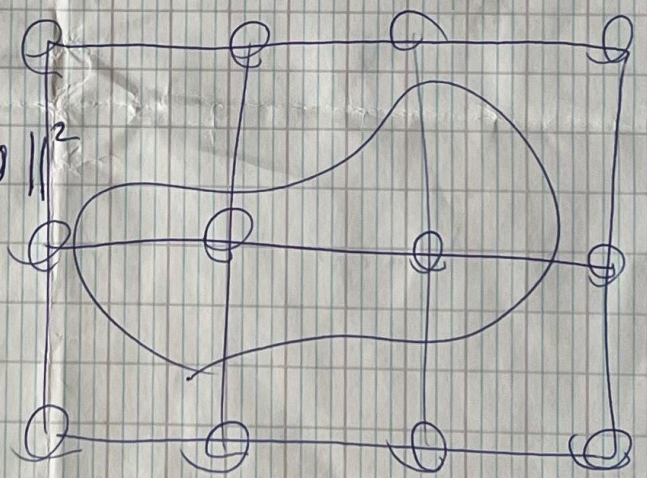


$$D = [1, N] \setminus (A \cup B \cup C)$$

$$\min_{V'(B \cup D)} \; C(V')$$

$$C(V') = \lambda \, ATTR(V'(B)) + (1-\lambda) \, ARAP(V')$$

$$ATTR(V'(B)) = \| V'(B) - U \|^2$$



~~tetto to pingle shape~~

$$M = \left(V, \begin{vmatrix} E \\ F \end{vmatrix} \right)$$

$$M' = \left(V', \begin{vmatrix} E \\ F \end{vmatrix} \right)$$

$$V' = \left(V_1', \dots, V_N' \right)$$

$$V' = \left(V'_{opt} \mid V'_{noopt} \right)$$

$$\min_{V'} \; C(V')$$

$$\min_{V'_{opt}} \; C\left(V'_{opt}, V'_{noopt} \right)$$

$$C(V') = ARAP(V')$$

$$ARAP(V') = \sum_{(i,j) \in E} \left(\frac{\left\| \left\| V_i' - V_j' \right\|^2 - \left\| V_i - V_j \right\|^2 \right\|^2}{\left\| V_i - V_j \right\|} \right)$$