Computationally Recognizing the Subconscious

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Final Research Proposal

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Concept

With the rapid technological advances of the photographic image, there is one linking characteristic: the edge. Objects, persons, nature though the photographic lens are only understood by the surface where they interact with our external environment. Essentially the object can only be represented in its relationship to what it is not. This relationship becomes exaggerated with the use of photogrammetry, where the mass/interior of the object can be essentially taken out of the equation. Augmented Reality and Virtual Reality show the degree to which worlds can built entirely on their edges. Then further, what are the implications of an artificial intelligence trained to only understand the external condition of human life?

In *The Machine Vision*, Paul Virilio (1994) states the "philosophical question of the splitting of viewpoint, the sharing of perception of the environment between the animate (the living subject) and the inanimate (the object, the seeing machine)"(Virilio). As we build seeing machines, and strive for creating understanding machines, how do we computationally consider the internal reality of humanity? To quote Virilio again, "paradoxical logic emerges when the real-time image dominates the thing represented, real time subsequently prevailing over real space, virtuality dominating actuality and turning the very concept of reality on its head"(Virilio). When reality is accompanied and often eclipsed by a virtual reality that is based on edges, how do we account for the internal condition of the body?

As a conceptual gesture, this project seeks to create a computationally recognized subconscious through the fabrication of internal organs by current systems of artificial intelligence.

Methodology

As a starting point, raw data will be harnessed from depth sensing cameras capturing an individual's body. The raw data required would be both a point cloud mesh of the exterior surfaces of the body and an exterior mask of the body stitched together using photogrammetry. From there, the exterior mask will need to be unwrapped to create a 2D UV map (shown in figure 1). The UV map of the body will then be processed through a convolutional neural network trained on an image set composed of ultrasound images of internal organs.

In theory, the CNN will fabricate internal organs based on the visual information provided in the external scan (illustrated in figure 2). The fabricated organs will be disorganized, biologically not functioning, and will theoretically cover the entirety of body. The UV map with the disorganized organs will then be wrapped back around the point cloud of the body in its originally 3D shape.

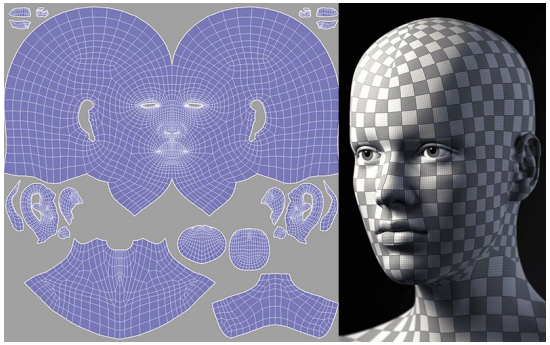


Figure 1. UV Mapping
Source: https://www.vectary.com/docs/uv-mapping/

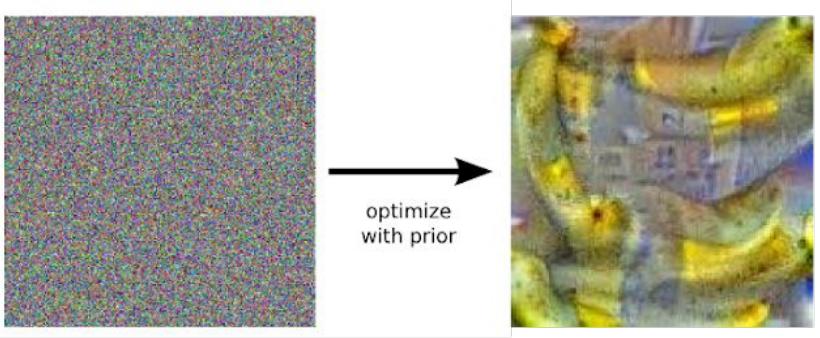
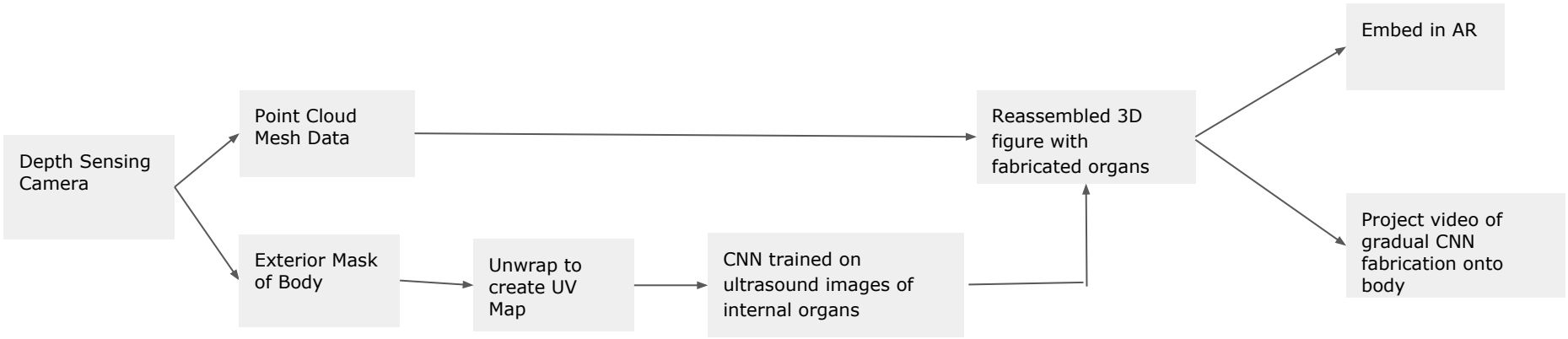


Figure 2. CNN Image Generation from Noise
Source:https://ai.googleblog.com/2015/06/inceptionism-going-deeper-into-neural.html

Methodology Workflow



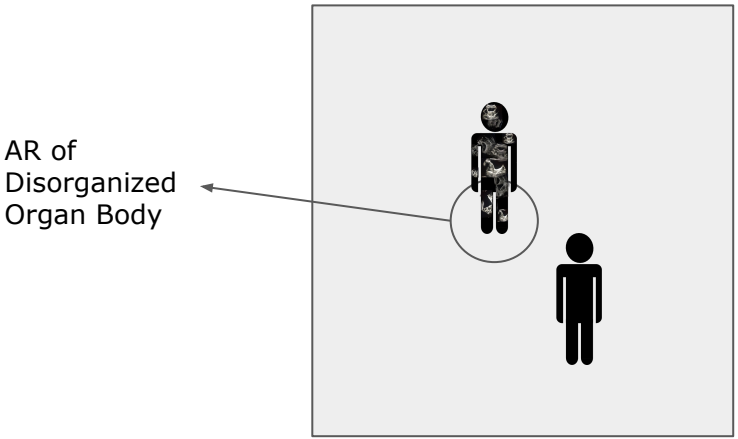
Required Materials

Hardware: Depth sensing camera(s), computer able to process CNN, projector, AR glasses.

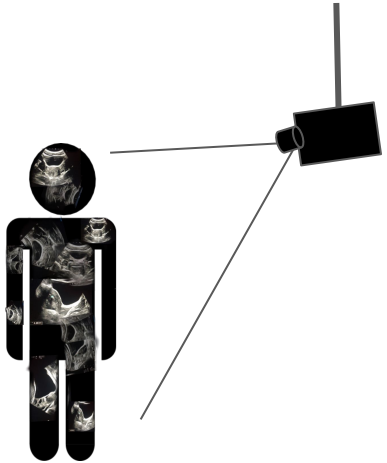
Software: CNN trained on ultrasound images of internal organs, Reality Capture, AR Software, Projection Mapping Software.

Installation Outline

Two Potential Presentation Methods



Option One: The reassembled 3D figure will be imported into an AR processing software. Viewers will be able to walk into the AR of the disorganized body.



Option Two: The reassembled 3D figure will be projected back onto the original individuals physical body using projection mapping. Would be exhibited as a performance piece.

Alternate Iteration: The reassembled 3D figure will be wrapped in video showing the gradual CNN fabrication of organs instead of a still the final image.

Research Questions

Practical Technological Questions

- What current training sets of organs do CNN's operate with? Scientific illustrations vs. ultrasounds/ x-rays. Is this neuron isolated or able to be isolated with current data sets?
- Can CNN "deep dream" software work on 3D images without being processed as UV map? Would it be more practical to have the CNN process individual frames used to create photogometry?
- How can the edges of the UV scan be treated so that they are recognisable when reassembled?
- What is the time span for CNN neuron isolation iterations? How many iterations are needed to produce recognizable images? What additional filters are used to tease out images?
- Can this be made interactive if the the processing is quick enough?
- Would it be possible to have AR interactive or track moving bodies?

Conceptual Questions

- What does it mean to have a body without organized organs? How does this relate to a "body without organs" by French philosophers Gilles Deleuze and Félix Guattari?
- How does this relate to the internal condition vs external condition in ImageNet characterization?
- What does it mean to internally empty and externally composed of what should be inside of you?
- What does it mean it mean to visually see the subconscious body working without conscious intervention?
- What does it mean for AI to fabricate a bodily functions? Can consciousness exist without a subconscious?

Potential Implications and Limitations

Limitations

- The organs will more than likely not line up once reconstructed into a 3D body as they are processed as a flat UV surface.
- The externally represented organs will have little to do with actual biological function.

Implications

- Can AI GANs eventually be taught to generate internal organs in a functional, organized 3D body? What are the potential implications for incorporating medical imaging to specify organ dimensions?
    - Is it ethical to create a system on a generalized internal processes? Potentially abilitist: having human condition and characterization related to bodily function. However, system could be applied to current AI diagnostic research that is limited to 2D imaging.

Related Existing Research

Art Installations, Internal Organs, and Healthcare

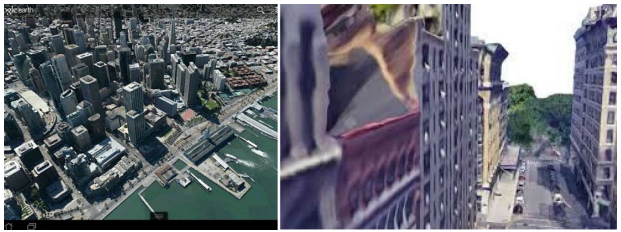
- ABC News, 11/06/2017. How the 'poo machine' was enlisted in the fight against bowel cancer
- Heather Dewey-Hagborg, 2017. Probably Chelsea
- Sofia Crespo. https://www.interaliamag.org/audiovisual/sofia-crespo/

Artificial Intelligence and Healthcare

- Harvard Business Review, 12/1/20. Can AI Fairly Decide Who Gets an Organ Transplant?
- Pattern Recognition Letters, March 2020. A comprehensive review on multi-organs tumor detection based on machine learning
- American Cancer Association, Feb 2019. Artificial intelligence in cancer imaging: Clinical challenges and applications
- Health and Technology, March 2017. (PDF) Google DeepMind and healthcare in an age of algorithms

Related Method

- Towards Data Science, 5/3/20. Dreamscape — Using AI to create speculative VR environments



Dreamscape Source:
https://towardsdatascience.com/dreamscape-using-ai-to-create-speculative-vr-environments-bdfedd32ae54