The Haptic Lines of Homeland

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Abstract. This paper discusses the conceptual underpinnings, working processes and the tools used for preparing the scene files of a holographic art work which offers a subjective viewpoint on the idea of homeland. The art work, Homeland, an optically formed fringe digital hologram, which is contextualized by the holographic maps used in situational awareness, indicates its subjectivity by strongly referencing the human body, particularly the lines of the palm of the hand.

…because the body belongs to the order of things as the world is universal flesh.

Maurice Merleau-Ponty

1. Background

The military applications of technologies have long been a part of the discourse of art practice engaged with these technologies, but until recently, such issues of military agency were not applicable to the field of holography. Now it is widely known that holograms are playing a role in homeland security. A description of the use of holograms from the Army Times article 12/3/2012, Intel in 3-D Imaging technology provides new edge in preparing for battle states:

This three-dimensional representation of complex urban, nonurban terrain, subterranean bunkers, and other combat and non-combat environments aids the warfighter through providing high-resolution 3-D battlefield infrastructure intelligence … this is critical for planning and executing combat and noncombat operations (1)

According to Lynn Schnurr the Army intelligence chief information officer and director of the intelligence community’s information management directorate:

…so far, about 12,000 holographic images have been sent to soldiers in Iraq and Afghanistan…any unit preparing to deploy can ask for one to be custom-made for its area of operations. Run by the Army deputy chief of staff for intelligence (G-2), the Tactical Battlefield Visualization program provides soldiers with these holograms, made by Zebra Imaging in Austin, Texas. (1)
2. Conceptual Underpinning

Dora Apel’s article, *Technologies of War, Media, and Dissent in the Post 9/11 Work of Krzysztof Wodiczko*, 2008 provides a view of some of Krzysztof Wodicko’s artistic works which engage with the idea of homeland.

In addition to its formal intertwining with media technology, the multiple environments of Wodiczko’s installation demonstrate the infiltration of war technology through the trope of surveillance. Conceptually, the project addresses the effects of contemporary war culture and the incursion of the heightened power of the state into every kind of domestic or homeland space, creating a perceptual state of hyper-vigilance, in which the ‘homeland’ is always already mobilized for war. If military technology can be domesticated, the domestic also becomes militarized. (2)

These ideas about homeland provide a framing/context for the overarching experience of viewing Krzysztof Wodiczko’s works, which is one of deep empathy and compassion for all people. Such an experience of empathy and care is also the objective of the *Homeland* art project. The *Homeland* art project puts on display in a museum/art gallery the way of looking associated with holographic Tactical Battle Visualization in order to propose homeland as a personal subjective domain. This is accomplished by shifting the ‘area of operation’ to the space and time of human life. The *Homeland* art project image was made using the same technology and is displayed horizontally in the gallery with the bunker purpose-designed rugged Grasshopper lighting stand with rotating turntable used by the military to closely examine holographic images. As the Army times article states:

Using these holograms, soldiers can improve their understanding, retention and situational awareness of the area of operations... leaders reporting they used the holograms to better analyze, assess and determine different courses of action. (1)

Inviting this strategy of keen awareness in the art gallery viewer, the project visualises homeland as the terrain of traces of the hands of many humans. In a phenomenological sense this visualisation suggests homeland to be the traces of life, registered in the fabric of the body. In the words of the philosopher Maurice Merleau-Ponty:

The thickness of the body, far from rivalling that of the world, is on the contrary the sole means I have to go unto the heart of things, by making myself a world and by making them flesh. (3)

3. Processes and Pictorial Agency

The ground of the *Homeland* art project image is green and looks similar to the military terrain holograms, which are monochrome green. However there are some significant differences. Describing the military scene preparation process Rick Black, a retired chief warrant officer 4 who is director of defense/intelligence programs for Zebra Imaging states:

To make the holograms for the army Zebra imaging uses data from the army-classified and unclassified along with open-source data, photographs, and light deception and ranging, or LIDAR imagery (1)

The ‘terrain’ of the *Homeland* art project is made in an entirely different way from an aggregate of ‘lands’, which were formed by directly casting silicone into the palms of several people’s hands who
were asked to imagine they were holding a piece of light. These positive shapes with their complex organic ridges and valleys are the materialised form of an invisible place, a personal and subjective ‘homeland’ which people carry with them everyday. In contrast to the significant reduction in scale and resolution of terrain elements in the military holograms, sufficient palm casts were made to cover the 60 x 60cm area to enable each of them to be life size. Each silicone cast was photographed and made into a 3D form using Agisoft Photoscan software and then the forms were assembled in Maya.

The prominent, spatially positive, path of the lifeline is obvious on each of these casts. The lifeline is unique in the repertory of lines encountered in the world in as much as it does not denote a physical edge or boundary of a three-dimensional form, rather it is a body marking which is integral to the body. Its contours and length have a questionable but long established association with life prediction, potential(4) and mortality.

5. Lines
Apart from the terrain itself, sometimes for clearer military pre visualization, 2D lines drawn onto acetate and overlaid on the hologram, are moved around e.g. a printed straight line used to indicate an approach path. When drawing is presented in a two-dimensional format, as the beholder moves through space no new visual information becomes available. For this reason a two-dimensional drawing enables specific types of representations of space such as the use of line to enclose discrete spaces by marking their boundary and illusions of depth from projection systems such as perspective.

In the Homeland art project the quality and placement of lines made by hand and placed in three-dimensional space extends the expressive potential of hand made marks. Once the viewer or the hologram is moving and the drawing is distributed throughout a spatial volume, neither of these familiar ways of representing space with line on a two dimensional plane are appropriate. This is because the mobility of the beholders line of sight makes available numerous possibilities of composition from the 3D line relationships. As Emma Dexter writes in her introductory essay to Vitamin D: New Perspectives in Drawing:

> Drawing exists at another level within the human psyche it is a locus for signs by which we map the physical world, but it is itself the pre-eminent sign of being. Therefore drawing is not a window on the world but a device for understanding our place in the universe.(5)

Hand drawn line is used in the Homeland art project to trace the potent subject of the lifeline. Using the haptic Phantom interface and Holoshop software, lines were drawn by feeling the paths of the lifelines on the three-dimensional templates of the palm casts.
6. Tool Development
A major pictorial objective of Holoshop is the assignment of appropriate visual characteristics to
gestures. The Phantom device is used to capture the gestures made by the artists. It is a haptic device,
which allows a user to input three-dimensional (3D) spatial movement through a pen-like grip. The
grip is attached to a mechanical arm with 6 degrees of freedom, hence it is capable of recording all 3D
movements of the user. The device is also capable of generating a synthetic force field based on the
computer generated 3D graphics. Various types of synthetic force fields (such as a magnetic field) can
be programmably generated based on the 3D geometries.

For artists to fully express their 3D spatial movement using this device the Holoshop software
needs to be able to capture various physical characteristics of those movements through adjusting the
Phantom device’s mechanical parameters; they are angular and linear tolerance, force, stiffness, and
damping parameters. These parameters will determine the physical response of the Phantom device
when it interacts with the 3D virtual objects. Those parameters also influence how much detail of
artist’s movements is captured. Hence, these parameters serve two purposes: 1) adjust the levels of
detail of the artist’s movement, and 2) adjust the tactile feedback. While these parameters, which are
directly associated with the Phantom device, play a certain role in determining the range of expression
lines can convey, there are other factors, which have significant impact on how artist’s movement is
expressed. They are 1) an encoding method of the speed of the artist’s hand and 2) computational
constraints applied to the movement of the Phantom device.

6.1 Velocity Mode. In order to truthfully capture the characteristics expressed in the form of speed of
the artist’s hand, Holoshop software has implemented methods to control the thickness (width) of the
drawn line depending on the speed of the hand movement. This method transforms a velocity value of
the device into a width of a line using a sigmoid function, whose minimum and maximum values
correspond to the minimum and maximum width of lines. The normal velocity mode will apply a
normal sigmoid function to the velocity so that the faster the speed of the movement, the thicker the
line becomes. The reverse velocity mode allows a user to produce a thicker line when the speed is
slow and a thinner line when the speed is fast.

6.2 Magnetism Mode. Another factor, which significantly influence how the artist can efficiently
work in the 3D environment, is the provision of spatial constraints on the haptic device. Without any
spatial constraints, an artist will be able to freely move the device in the 3D space to draw
lines. However, if the lines need to be drawn with respect to other geometry in the same space, having
the 6DOF device often provides too much free movement. This usually results in the user not being
able to have total control in determining the location of the haptic device in the 3D space. In order to
reduce this inconvenience, Holoshop software exploited the virtual magnetic field to constrain the
movement of the haptic device. When this virtual magnetic field is turned on, the space where the tip
of the haptic grip can move around is restricted to the nearby surfaces. This function is particularly
useful if the movement of the artist’s hand needs to be guided by the underlying geometry template.

With the provision of these parameter controls and different line drawing modes to capture the
spatial movement of the haptic device, the changes of momentum caused by the topography of the
contours and the speed of the gesture were registered in the varying width and orientation of the lines.
The lines are flat, red and ribbon like, referring to approach path planning lines yet they strongly
evidence the inflections from changes in direction and speed familiar from direct hand made marks.
7. Composition of Lines

The red colour of the lifelines is symbolic of the luminous presence of life. (6) The lines were translated at varying heights, above the lifelines templates from which they were formed. When viewed directly from above it is possible to superimpose only one line at a time with its lifeline. As the viewer’s line of sight changes, the amount and types of occlusion between lines at different levels obscure or open sections of the terrain.

The depth of Tactical Battle Visualization holograms is intentionally restricted to enable the subject matter to appear sharp. Generally lines superimposed are 2D and on the hologram picture plane. The red 3D contoured lines of the Homeland art project are translated at various distances from the holographic plate so they range from sharp to blurred. This is contrary to the perception of real space, in which sharpness and colour fade with distance. Similar to the use of low resolution in the works of Jim Campbell(7), the sliding scale of blur in the Homeland art project image acts as a metaphor for the distant in its objectification to be gradually dissolved into intangible softness with closeness. As the red Homeland lines become less opaque the green background shows through reminiscent of green under-painting lending vibrancy to painted flesh.

These dissolving intertwined lines conflate the rational purpose of line as intension with the predictive association of the lifeline and destiny and invite the viewer to reach out and touch. As Dianna Petherbridge notes in the Primacy of Drawing: Histories and Theories of Practice:

The linear paths that the spectator/interpreter directly perceives or infers in the drawing constitute cognitive mapping. And such readings are inseparable from the affective response to the gestural traces of the hand and the echo of the body, as well as the expressivity of the topic or subject matter of the drawing – or its absence. The difference between these readings constitutes the surplus of the drawing within which meaning is constituted.(8)

8. Conclusion

The expressive potential of drawing is broadened by the availability of drawing tools, which enable the free-hand inscription of space with line. Holoshop software which in conjunction with a haptic interface (Phantom Omni) to feel virtual contoured surfaces provides a means of using forces to modulate line quality through velocity, damping and friction. Future work in Holoshop will focus on expanding the scope and understanding of haptic, hand made, three-dimensional drawing for holograms and other three-dimensional displays. The use of Holoshop software and ZScape™
technology developed by Zebra Imaging enabled a subjective and personal visualisation of homeland, which unites people in an awareness of the mysterious and precious nature of life.

The views expressed in this paper and the art work Homeland are those of Paula Dawson and are not necessarily shared by the friends, colleagues, loved ones and institutions involved.

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