

# Taking Soundings – Investigating Coastal Navigations and Orientations in Sound

Yolande Harris  
www.yolandeharris.net  
yolandeh@terra.es

## ABSTRACT

Taking Soundings is a series of art pieces emerging from an investigation into landscape and navigation. To ‘take soundings’ is a traditional technique of determining the shape and depth of the sea-bed by means of a lead and line, and I find an obvious continuity in the gathering of information from satellites via a GPS receiver. Taking soundings of ones position relative to satellites orbiting the earth rather than relative to ones immediate environment, strikes me as a kind of blind guidance, encouraging feelings of false security. (written for the programme note of Taking Soundings performance, Cologne 2006) [7]

## Keywords

Coastal Navigation, Satellite Navigation, Sound Installation and Performance, orientation, landscape.



Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee.

*4th International Mobile Music Workshop*, May 6–8, 2007, Amsterdam, The Netherlands.  
Copyright 2007

## 1. INTRODUCTION

Navigation is essentially a calculation of position/location derived from points of information in space and time, which are continuously updated to derive moving traces (past) and trajectories (future). By starting from a human scale of navigation, taken historically from direct observation of stars, landscape features, environmental fluctuations, I hope to place recent satellite navigation techniques, into a perspective of layered accumulative technological developments. My aim in this paper is to contribute to the aesthetic development of the emerging artistic research field of locative media/mobile music by describing my experience as an artist/musician in investigating navigations and orientations through sound.

This research suggests strategies for (mobile) musical composition through an enquiry into technologies of navigation. The history of navigation is a history of bodily negotiation with and through space and is bound up with a string of technological developments. By looking at how one type of technology imposes styles of interaction, or a spatial motif of movement, these invisible structures could form a basis of bodily interactions in sound. Examples covered here include, the centrifugal motion of a lighthouse beam where one is located exterior to circular motions, or ones location inside the centripetal motion of orbiting satellites. These spatial motifs for interaction are suitable for sound art and sound installations by nature of ones spatial position within them, and the developments in the field of mobile music are potentially directly related.

The research began during an Artistic Fellowship at the Sound Department (Klanglabor) [9] of the Academy of Media Arts (KHM) in Cologne during 2006, includes a research trip to Sydney during 2007 and is still in progress. The coastline, as an area of dynamism between liquid, solid and air, is a landscape of noise. The coastline is a significant space because it highlights the body's adaptation to the contrasts of water and land through sound. We use sound for orientation, as reflected in the complex processes of balancing (ears) and moving through space. The different qualities of navigation at sea to navigating on land – land giving predefined paths/streets, views and landmarks, sea-space characterised by tides and winds and open horizon – encouraged me to focus on the navigation of coastlines. The work in this paper introduces three sites, the Atlantic coast of Brittany in France, the Spanish Balearic Islands in the Mediterranean Sea, and Port Jackson of Sydney Harbour in Australia.

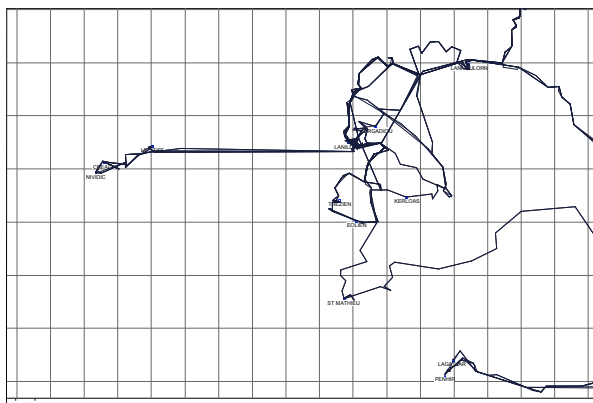
## 2. BACKGROUND OF COASTAL NAVIGATION TECHNIQUES: POINTS OF COMPATIBILITY BETWEEN NAVIGATION AND SOUND

### 2.1 Techniques of Navigation through Motion

All navigation techniques rely on time and motion as a fundamental for calculating position. An historical context of media technologies is relevant in the accumulative nature of both navigation systems and musical instruments. [14] Historical techniques of navigation at sea include: estimating position from sun and stars using a sextant, lowering a lead and line to "take-soundings" of the (invisible) sea-bed, the (visible) rotating flashing patterns of the lighthouses and the (audible) signals of their foghorns, the (visualised) scanning of radar, and most recently the adherence to an (invisible) satellite system. All offer variations on the perception of movement and subsequent calculation of location, forming an accumulative set of navigation skills and techniques.

Navigation is a combination of relatively slow, simple data of low resolution calculated to increasing precision and speed. An interesting area of technological development in navigation processes is the high precision required in racing yachts. These are now using systems that combine sensors positioned around the boat (wind strength and direction, speed over water) with satellite positioning, to infer speed, and predictive calculations based on continuously updating weather reports to optimise their performance.

### 2.2 Maps, Charts and Scores



Given the importance of time in navigation, it is relevant to consider the role of the map in locating oneself in space, and the status of the line or score in both navigation and new musical practice involving navigational data. Maps and charts are a notation that when interpreted, enables one to move through an area of land with a precise conceptual understanding of where one is and what is around the corner or under the boat. Likewise, the musical score is a notation or map, communicating a space of interaction that enables us to move in an abstract plane of sounds and forms of balance, rhythm, curve and flow.

Both the score and the map contain a trace, a trajectory, communicate a space of interaction, and require interpretation of events. Certain land-art works from the 1960's, particularly the map and text works of English artists Richard Long and Hamish Fulton, are relevant for their relation between the navigation, landscape and sound. [2, 8]



In the development of 'mobile music' can we investigate the changed status/compatibility between the score and the map? Numerous examples of 'GPS drawings', graphic lines or maps made by walking, driving, paragliding suggest an interest in an active creation of traces by the physical body. [1,10,11] The limitation of these projects is that they stop at the point of the image. The initiative C5 addresses questions further the relationship between GPS technologies and land art in the context of landscape [3]. An important point is raised in a recent article [13], about the nature of mapping in relation to national identity and power strategies, and the notion that location based technologies are tied up with surveillance issues. These issues are acutely present in the use of Google Earth as a tool from which to superimpose ones route in real-time. Particularly dominant is the 'birds-eye' or 'satellite eye' where the dominant viewpoint is from above. In *Taking Soundings* I explore these ideas through image and sound.

### 2.3 Spatialisation and Orientation During Navigation

Along the coast an infrastructure of permanent signaling lights provides a network of clearly identifiable nodes, points of light in space, each coded with a unique flashing rhythm. This lighthouse rhythm is specified on a chart as having a certain number of long or short flashes, coloured white red or green,

over a period of sixty seconds that cyclically repeats. Related together, by taking compass bearings, these nodes and the moving spatial relations between them, allow one to infer an exact position and trajectory.



The satellite trace of my movement made visible on a screen, updating in real-time, marks my movement across a space. This trace is not a map in itself, but a record or 'memory' of my movement in the form of a line. Traditional navigation by taking compass bearings on visible landmarks and plotting them on a map ('position fixing') creates a series of points strung on a line, a daisy chain. Although the data from the satellite navigation systems are also strings of points, they differ from navigation using landmarks in that they are regularly sampled (once per second) regardless of the visible, physical nature of the terrain. Floating as an abstract data above the perceivable nature of place, this striated form [4] is literally superimposed on the details of the land.

### 3. MOTIVATION BEHIND THIS PROJECT

#### 3.1 Previous Projects: Video Walker, Sargasso Sail

Very briefly, the background context for this work has built on my earlier artistic projects that have explored landscape and seascape in relation to technologies of sound, video and navigation. The *Sargasso Sail* (1997) was a sail across the Sargasso Sea, exploring sounds and the psychological impact of a journey away from land, particularly navigating across the legendary Bermuda Triangle famous for disappearing ships (!) It consisted mainly of observations and diaries over the seven days trajectory.



Another influence was the Video Walker project (2002-3) developed in Catalunya in collaboration with Bert Bongers. A portable projector with sensors to control changes in video, all controlled via a Max/MSP set-up running on the portable computer carried in the back-pack, walked along a beach at dusk. This developed into a double set for the performance *Between: Two, Duet for Mobile Video Players* in Maastricht (2003). I developed the video content with the idea that the

interface between real and projected image, and the act of walking carrying a projector much like a torch, could be a powerful experience in hybrid reality. A new much more light-weight version has yet to be built, and with developments in projection technology it should be possible in the near future.

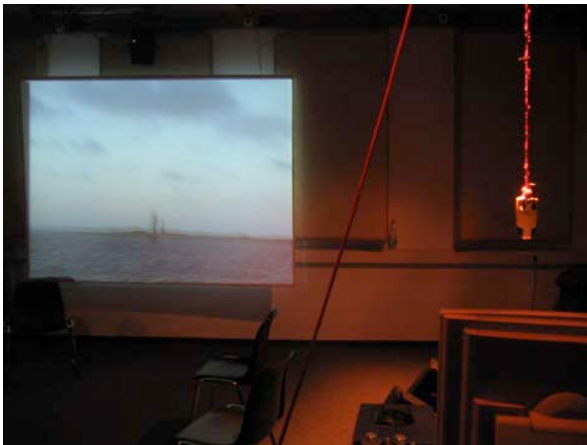
### 3.2 Conceptual Change of Satellite Navigation

Taking soundings of the satellite data reveals a different kind of relationship to motion and position. Where the lighthouse functions by our position on the outside of a series of circling lights, the satellite navigation system (such as GPS) functions by our position from inside a series of orbiting satellites. Our relation to the points of navigation and position in a terrain have moved with this technological development from one of centrifugal motion to centripetal motion, from being outside circles to being inside them, from one of searching for the lighthouses, to a position of continuous surveillance or watching from above. The installation and performance *Taking Soundings* takes lighthouses and satellite navigation as its material, sonically combined in the installation as two different positions, motions and ways of navigating.

## 4. TAKING SOUNDINGS: COMPOSITION

### 4.1 Sound and Data Mapping

The *Taking Soundings* sound installation and performance takes these simple geometric patterns and moving signals, slow data, as its basis for both sound generation and spatialisation and control of live video. The set-up consists of a handheld GPS receiver (Garmin GPS 60), connected to an Apple Powerbook via USB using the software MacGPS Pro. This data is then read continuously by Max/MSP+Jitter software where the data is converted to sound using sixteen channels of sound output, and used to control the video.



The cyclical signals of eight lighthouses located on the far Western Atlantic tip of Brittany in France, are 'sounded' in two ways. The first, keeping the original timing of the light signals, uses pure sine-waves to 'loom' in and out of focus, and maps the frequency of the sine wave to the distance of the visibility of the light signal in nautical miles. The second, treats the lighthouse

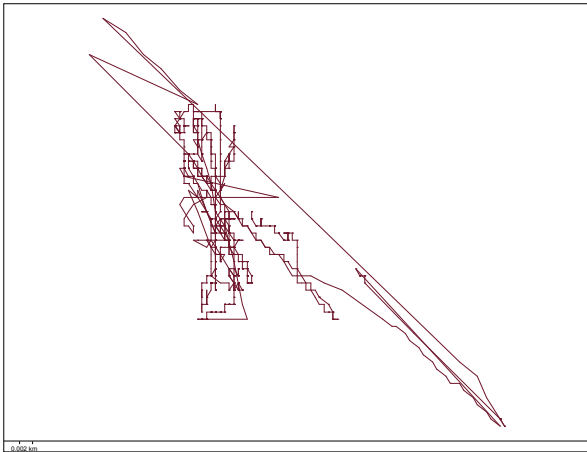
signal as a wave-form and makes it audible by compressing the time, creating low rumbles of distinctly different textures. The spatial layout of the Max/MSP patch interface corresponds to layout of lighthouses and speakers – a sort of visual mapping to aid recognition of the sounds and their spatial relationship – also each one is named after the lighthouse.



The satellite data received by the handheld Garmin GPS updates at a rate of once every second. The data used in the installation is the basic data of latitude, longitude and altitude, and the inferred velocity and compass bearing (track degrees true). The characteristic of this data is slow and simple, entirely different from for example meteorological or seismic data used in sonification/audification projects. [5,12] With a maximum of five changing values per second, and often no change, sounds were chosen to reflect this. Each type of data was given a recognisable sound, such as clicks and short tones, distinguishable from the other data, and the parameters of pitch or timbre change marginally within these limits. The data only sounds when a change is registered, and the tempo of the once per second is kept in the live GPS version of the installation. When using pre-recorded data files, for example those gathered at the same locations as the lighthouses on the Brittany coast, the tempo is increased according to the rate of reading through the data. By keeping this rhythmic quality the regularity inherent in the technological system of satellite navigation is emphasised over any form of complex natural environmental data.

## 4.2 Sound Spatialisation

The crucial element in realising this piece was the spatialisation of the sound in relation to the visitors sense of orientation in space. The two navigation technologies, lighthouses and satellite, are given two distinct layers in the space, to emphasise the different signaling roles. Eight speakers are placed at ground level, loosely derived from the location of the eight lighthouses in geographical space, where each speaker plays the sound of its respective lighthouse signal. Evenly placed around the top edges of the space are a further six speakers for the sounding of the satellite data. By mapping the change in direction inferred by the GPS (parameter track degrees true), to the location of the sound in the space, a continually moving soundscape of crisp signals is superimposed on the full and bass sounds from the lighthouse strata. Two subwoofers in the space complete the range of sound.



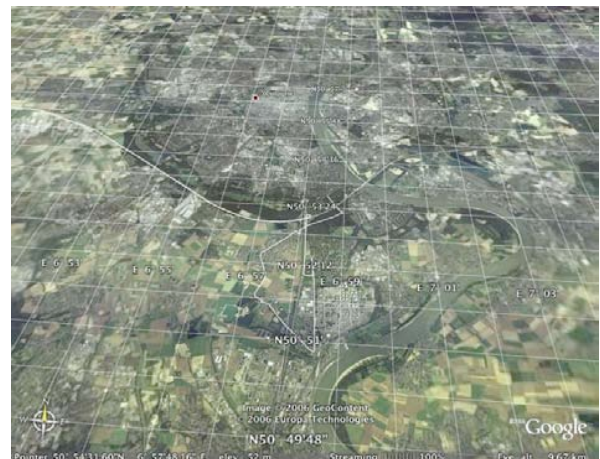
The above image shows the trace created by the GPS hanging in a fixed position in the performance space. The errors in inferred position, and the subsequent apparent direction of movement formed the basis of the audio-visual installation. The line, projected in the space, draws as it updates every second, at exactly the same minute that the sound occurs, somewhere in the space depending on the direction of apparent movement.

## 5. WORK IN PROGRESS

### 5.1 Sonic Driving

Experiments for a mobile version of this principle based on driving are called *Score for Open Car*. By reading the GPS data into the computer in real-time, and transforming this data into sounds, (using Max/MSP) taking soundings by means of 'clicks and blops', then transmitting this by radio to the car sound system, I am able to hear the change in location, altitude and speed over time, superimposed on the noises of the car and the passing landscape. I'm not using this as navigational information as I have no map connected to my GPS and I do not expect to be able to navigate by using these sounds. Different priorities arise, instead of 'getting there', I'm suspended in a continuous sound environment that has some direct relationship to my movement and my location. I propose to develop a future mobile version

where the audience hears the change in GPS data as they walk, creating their own unique and changing rhythmic soundscape from their moving position.



## 6. CONCLUSION

This artistic research has looked into technologies and techniques of (coastal) navigation in reference to sound art and its relevance to an emerging mobile field of music. It's also a way of placing recent navigational developments into an historical context of layered technological stages that do not exclude each other but accumulate. I describe an approach based on treating the technologies in relation to experiential, physical ideas of orientation, which can be re-interpreted in sound and video. The project is ongoing and further work will be presented in installations and presentations over the next year.

## 7. ACKNOWLEDGEMENTS

Prof Anthony Moore and Prof David Larcher of the KHM who supported and gave valuable feedback on the project during an artistic fellowship 2006.

## 8. REFERENCES

- [1] Behrendt, F. From calling a cloud to finding the missing track: Artistic approaches to mobile music. In *Proc. of the 3<sup>rd</sup> Mobile Music Workshop*, NIME'05, Vancouver, Canada, 2005.
- [2] Careri, F. Walkscapes: Walking as an Aesthetic Practice. Land&Scape series. Editorial Gustavo Gili Barcelona, Spain, 2002
- [3] C5 Landscape, <http://www.c5corp.com>
- [4] Deleuze, G. and Guattari, F. A Thousand Plateaus; Capitalism and Schizophrenia (original 1987 in French). Continuum London/New York 2003 translated by Brian Massumi, pp 478-482
- [5] Dombois, F. Using Audification In Planetary Seismology. In *Proceedings of the International Conference on Auditory Display ICAD*, Espoo, Finland, 2001
- [6] Gaye, L. Holmquist, L.E. Behrendt, F. Tanaka, A. Mobile Music Technology: Report on an Emerging Community. In *Proceedings of the 6th International Conference on New Interfaces for Musical Expression NIME*, IRCAM, Paris, France, 2006
- [7] Harris, Y, [http://www.yolandeharris.net/taking\\_soundings](http://www.yolandeharris.net/taking_soundings)
- [8] Kastner, J. and Wallis, B. (Eds.) *Land and Environmental Art* Phaidon London/New York 2005 pp 124-131
- [9] Klanglabor, KHM Cologne, <http://www.khm.de/klanglabor>
- [10] Lee, E., <http://www.elisalee.net/gps/julian.htm>
- [11] Polak, E. and Kee, J. *Amsterdam REALTIME*. Waag Society, 2002.
- [12] Polli, A. Atmospherics/Weather Works: Artistic Sonification of Meteorological Data. On <http://www.andreapolli.com>, 2006
- [13] Tanaka, A. Gemeinboeck, P. A Framework for Spatial Interaction in Locative Media, in *Proceedings of 6<sup>th</sup> International Conference on New Interfaces for Musical Expression (NIME)*, IRCAM Paris, France, 2006
- [14] Zielinski, Siegfried *Deep Time of the Media: Toward an Archaeology of Seeing and Hearing by Technical Means* MIT Press, Cambridge, MA, USA, 2006