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Data Walking Report

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Data and identities

Annotated Portfolio

DATA WALKING

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Abstract
Data Walking is a research project exploring the potential of walking to gather environmental data. Through multiple walks and visualisations a rich picture and sense of identity of that area can be constructed.

The project examines technology and design for creative data gathering and experimenting with data visualisation, to create tools, gain insight, and share knowledge.

Contained in this annotated portfolio are details on the ideas and approaches to the project, and notes on the process and distinct phases, as well as change of perspective that have taken place on the project's life so far.

Authors Keywords
Data; Walking; Movement; Cities; Urban; Landscape; Environment; Sensors; Physical Computing; Open Source; Tools; Teaching; Workshops; Data Gathering; Data Visualisation; Materials; Experimentation;

Introduction

Data Walking is a research project exploring the potential of walking to gather environmental data. Through multiple walks and visualisations a rich picture and sense of identity of that area can be constructed. The project examines technology and design for creative data gathering and experimenting with data visualisation, to create tools, gain insight, and share knowledge.

Data Walking has been through a series of distinct phases and resulted in inclusion in an exhibition at London's Barbican Centre 2015, as well as presentations and workshops internationally at ICTVC Greece 2016, Tatung University Taiwan 2016, TCCE Inside Out Festival London 2017, Graphic Hunters 2018 Holland, amongst others.

There have been a variety of outcomes from data sculptures to printed publications, as well as contributions to an online repository for data and code. The latest phase in North Greenwich resulted in a 96 page book, featuring the visualisations of renowned designers, studios, educators and students, as well as practical advice on beginning data walks, workshops, and tools to try out.

HOW DATA WALKING STARTED

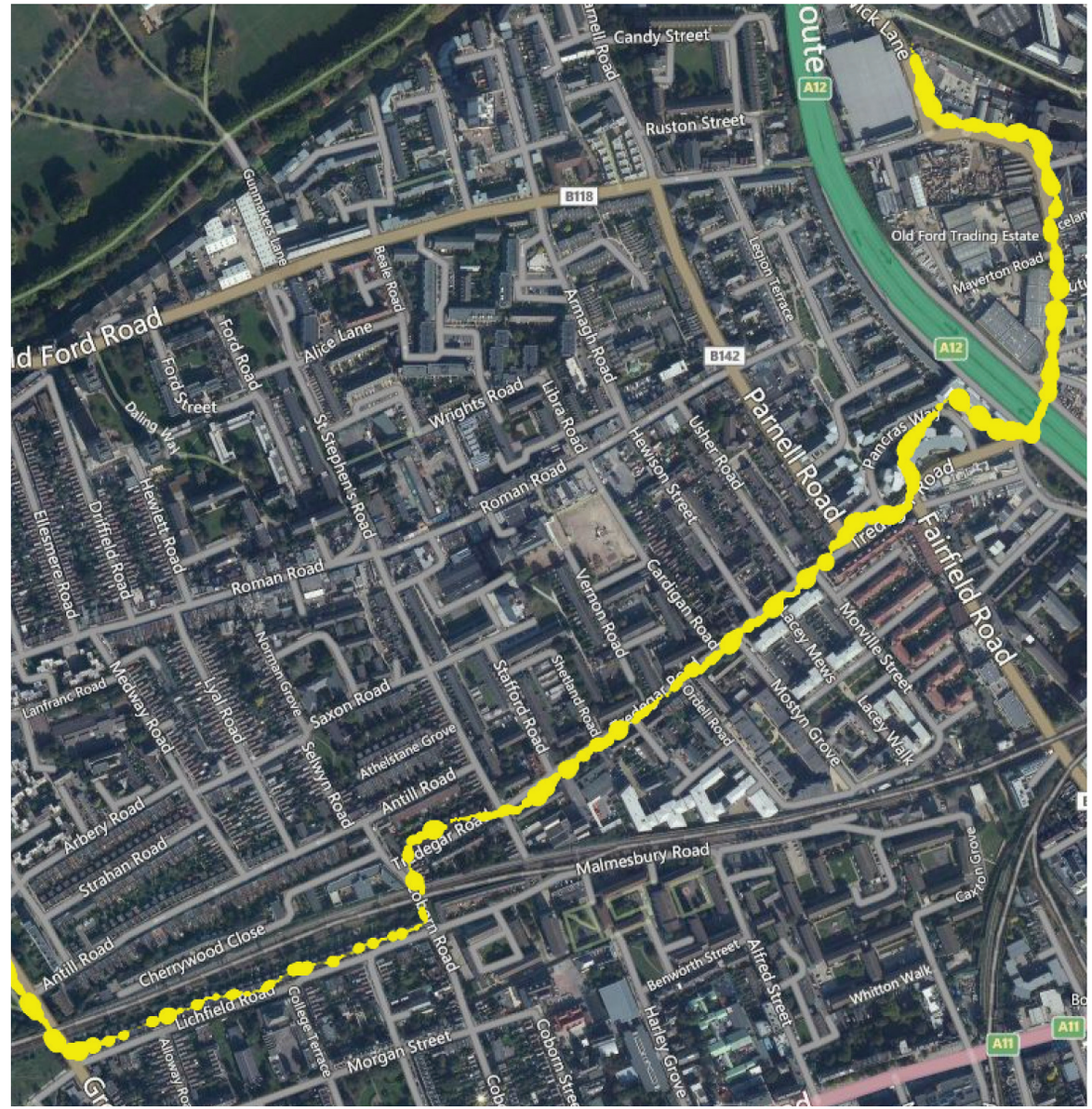
Data Walking began in response to artistic walks conducted by the Mnemonic City collective who used walking to discover and discuss memories and stories of a city. The notion of cities as data rich environments became apparent, and the idea of cutting paths or a transect through this 'dataspace' worth further investigation.

The initial aim was clear and simple: to collect environmental data while walking around a specific area to build a rich picture of that area over time. This simple aim was layered with aims to engage with a variety of recent technologies and understand their suitability and creative potential for data gathering and data visualising. Arduinos, low cost sensors, smartphones, 3D printing, laser cutting, digital textiles, could all be leveraged for data gathering and data visualising.

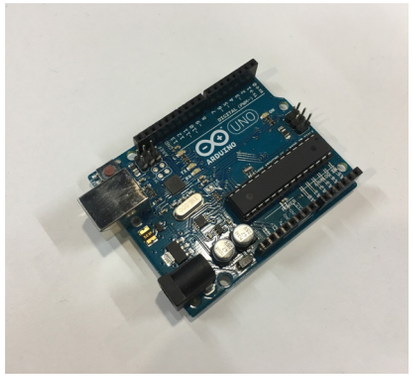
This path of research is not untrodden on before and sits within existing areas of Quantified Self movement, Big Data, Open Source technology, and Flaneurism.

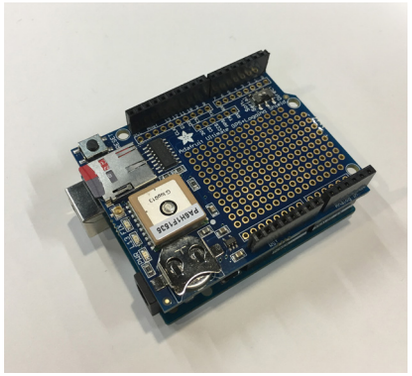
After some initial experiments a small funding application was granted by Ravensbourne University London to run a pilot scheme of the idea and to test the technology and methods and produce an outcome. Funding was also granted by the Barbican Centre.

This is a map of the first Data Walk from Hackney Wick, London, recording light levels in the evening. The yellow line marks the route walked and the expansion and contraction of the route path shows the change in light levels when passing under street lighting.



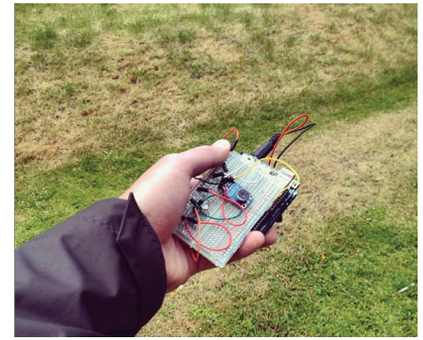
FISRT TOOLS AND TECHNIQUES



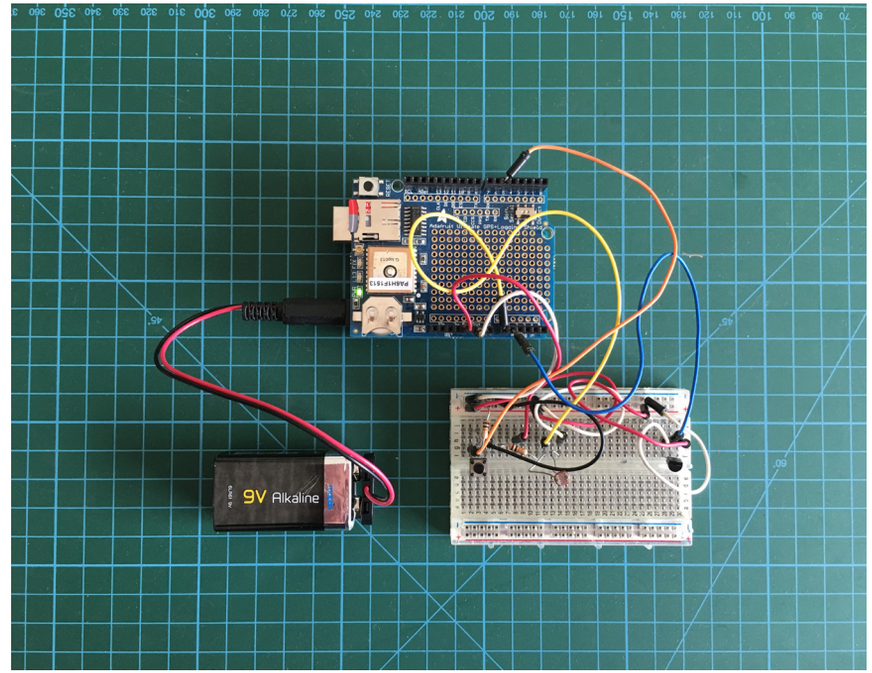


Arduino is an easy to use affordable, Open Source, physical computing platform and board which low cost sensors can be added to gather data. Shields can be added to increase functionality, such as a GPS shield, to locate the Arduino in the world and record data to an SD memory card.

Smartphones have high resolution cameras for capturing still and video images, as well as record audio, and GPS sensors to locate that media in the world.



The Arduino with GPS shield and many sensors can be powered by a 9V battery or clip of four AA batteries and carried in the hand or in a box.

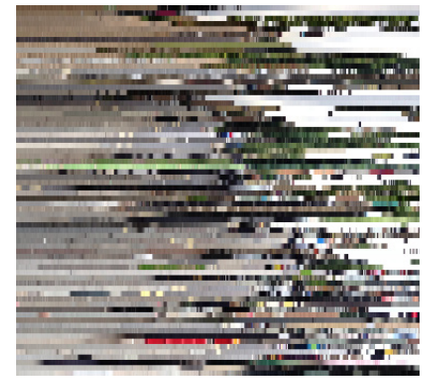


STRATFORD TO BARBICAN

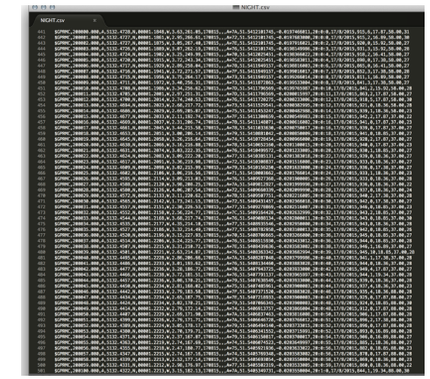
In 2015 Data Walking was part of the Fish Island Labs exhibition titled 'Interfaces' at the Barbican Centre, London. The idea was to conduct a series of walks from near the Fish Island Labs studio in Hackney Wick to the exhibition venue and turn the data gathered into 3D printed Data Cylinder, the form of the Cylinder modulated by the data. As physical objects they invite you to touch and hold them, and they can also be read as a graph. Below shows the process of gathering the data and creating the Cylinders.

Go on the walks with arduino and sensors recording temperature, light, sound, air quality. Photos were taken at one minute intervals during each walk.

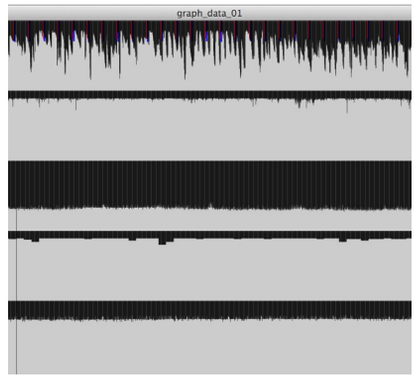
Extract pixel data in a circle from each photo taken at one minute intervals during each walk, totalling about 60 images per walk.



Unwrap those rings into strips and composite the strip from each photo into one image to represent the walk.



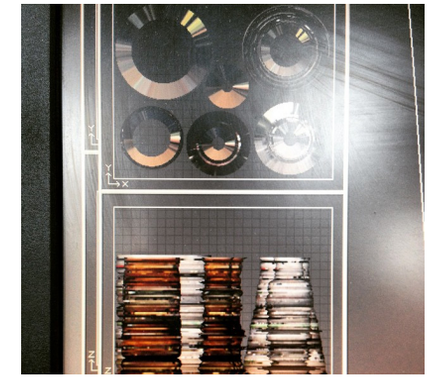
Get the raw data from the GPS shield memory card, clean any malformed data, add a file header to describe each column, save as a .csv file for use in Processing.



Graph the data in Processing. The data visualised is too fine a structure to 3D print and would break.

Reduce the data fidelity and create a shape profile that can be 3D printed and still communicates the data and trend.

Create a 3D form of the shape profile and wrap the image texture generated using the photos around it.



Send to 3D print and wait 15 hours!

STRATFORD TO BARBICAN

Below are eight Data Cylinders as the outcome of the walk from Stratford across East London to the Barbican Centre where the exhibition took place. They are read from top to bottom, the top representing Stratford, the bottom is the Barbican, and a data parameter collected on the walk between the two locations modulating the cylinder form. There are four cylinders for the day walk and four for the night walk. This exhibition marked an important milestone, gathering data and realising it in an experimental form through code and technology.

From left to right: light, sound, temperature, air quality.
Front is night walk, back is day walk.

AMSTERDAM

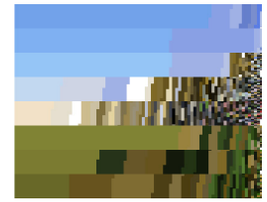
In October 2015, I visited Amsterdam for a weekend. Most of the visit was exploring the many streets and canal sides on foot and taking lots of photos. Presented here are many of the photos and an exploration of fulfilling one of the original aims of the Data Walking project: to imagine a city as a three dimensional volume or 'dataspace', and be able to cut transects through that city of data.

The tools used were a smartphone with the GPS location accessible to the camera, Open Source programming software Processing, freely available for most operating systems, with the Unfolding Maps library for Processing by Til Nagel, and ExifTool by Phil Harvey.

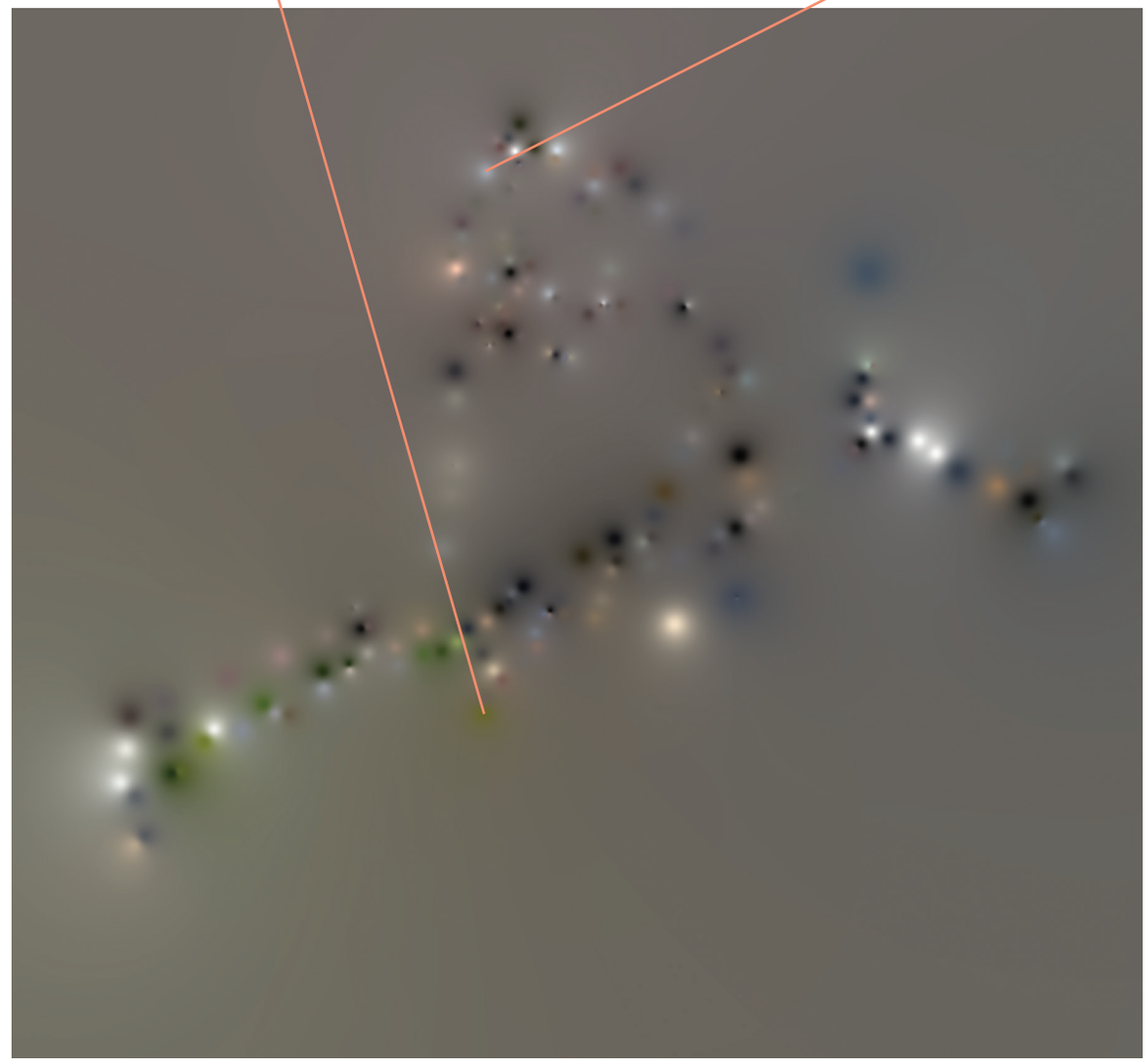
This approach contrasted with the Stratford to Barbican phase which made use of micro-controllers and environmental sensors to gather data. The idea for this phase was that even ambient information gathering through photography can yield interesting data.

The outcome was a newspaper format printed publication detailing the process of taking a collection of photos and creating maps, routes, volumes, video, in 2D and 3D, using computational design methods, processes and custom written software tools.

Smartphone images are analysed for dominant colours and plotted on a map in Processing and the colours between each point are calculated.

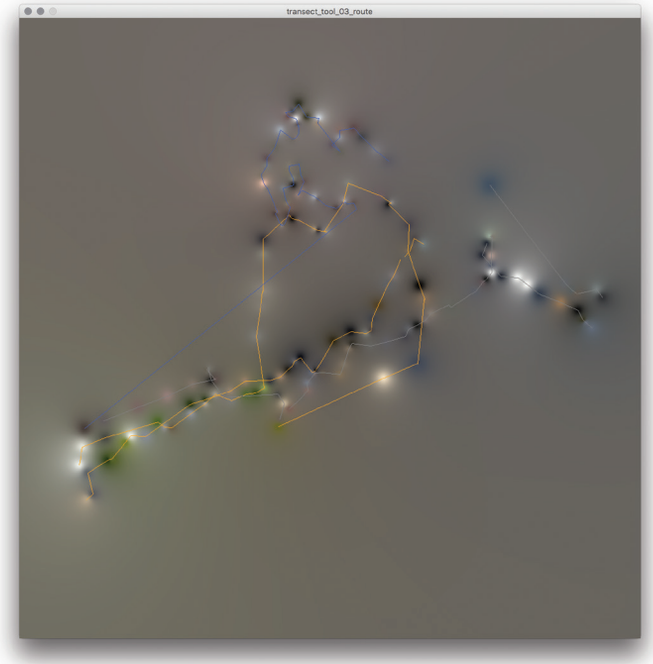


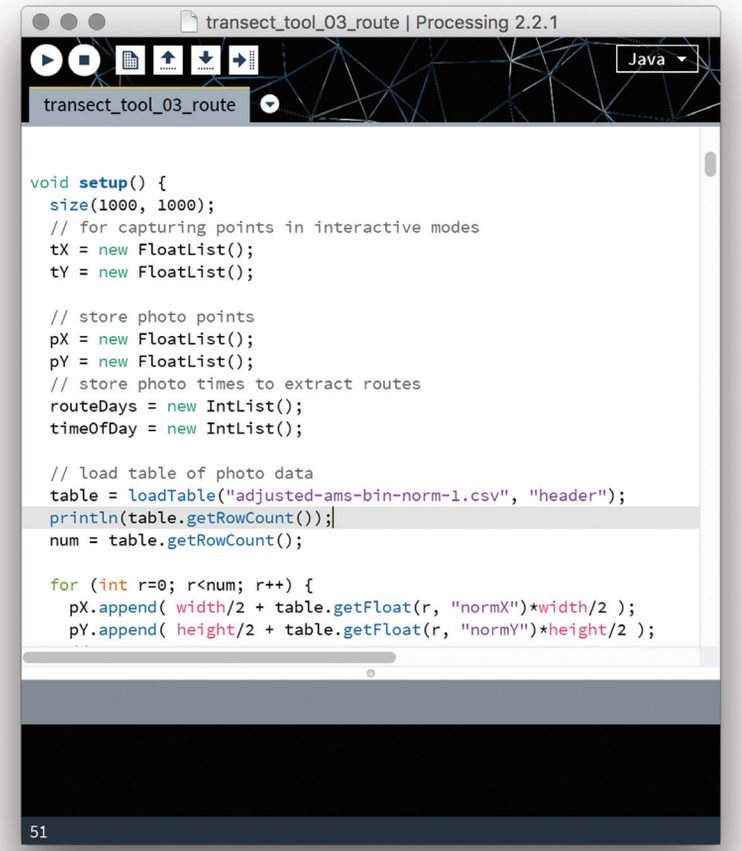
Computational image analysis opens up interesting creative opportunities and the ability to process large amounts of data.

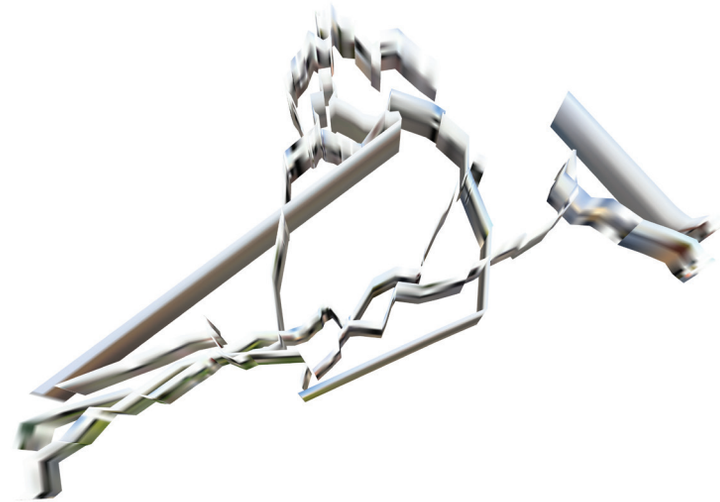


AMSTERDAM

3D interpolations of routes walked generated by custom software created in Processing using all the photos taken while walking around Amsterdam over a weekend.







NORTH GREENWICH

Following successful feedback on the early phases of the project a larger grant was secured from Ravensbourne University London. This time the plan was more ambitious with many walks over a longer period in an attempt to build up that rich picture of an area and large repository of data.

With a bigger project there was also the scope to test new technology, new sensors, and new methods of collection, particularly the mixing of photography and code, but also to introduce low technology analog methods of capture.

Another key shift in the project approach was pedagogic; to consider the project as a learning tool. A scheme was devised to make the walks suitable for groups of students to join, and provide a pre-walk session to make data gathering devices, and a post-walk session to review the data and do some basic charting and discuss any observations. A walk was planned for each month for a whole calendar year.

A website was developed to explain the project and the aims of this phase, and an online repository on github created to store the data and the code for all the data gathering devices, for people to access and reuse freely.

North Greenwich was selected due to the location of the University and therefore student population, plus the peninsula as a whole is undergoing rapid urban development.

NORTH GREENWICH

A new manifesto or set of aims for this phase of the project but also as a broader view of the project's potential and how others away from my own project may do their own Data Walks. This came about through considering the pedagogic aspect and the sharing of data and code to make data gathering devices.

Exploring our surroundings, from the environments we live in to the far places that interest us.

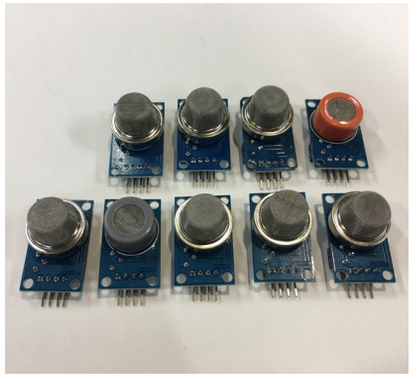
Experimenting with technology and how it can be used for creative data gathering and designing with data.

Engaging with issues and topics relevant to us. What interests and what matters to our communities?

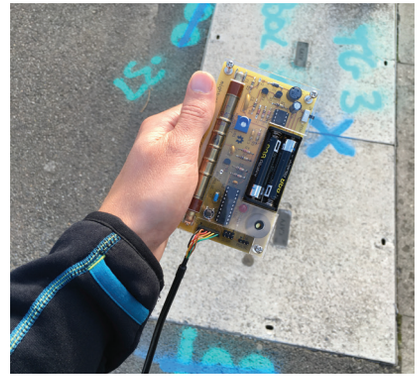
Empowering people and our communities. Getting to grips with data literacy, sharing knowledge and tools that in turn help to create new knowledge and new tools.

NEW DATA GATHERING TOOLS

A range of new sensors, combinations of technology and methods for data collection were tried and tested with different results. For example, the air quality sensors were initially easy to work with but their reliability with battery power was questionable and actually getting meaningful data required some advanced mathematics.



Using low cost sensors, air quality became a topic of interest, although the suitability of the sensors for walking applications and the data they returned was questionable.



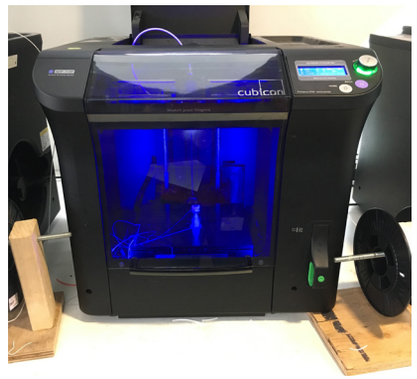
A Geiger Counter combined with an Arduino and GPS shield attached to a laptop to sense and locate radiation levels.

Using a laptop and built in webcam with an Arduino and GPS shield attached to create a geo-spatial slit scanner.

3D snapshots using kinect-like depth cameras, here of a drinks can. The range limitation and power requirements of a kinect camera meant this wasn't easy, but did spark an interest in the potential of photogrammetry for Data Walking.

NEW FABRICATION TOOLS

This bigger phase allowed experimenting with other forms of 3D printing, using laser cutters and acrylics, UV printers to apply graphics to objects, and digital embroidery machines to work with textiles.



A PLA 3D printer to print in a single colour but more robust material. This shows a visualisation of sound data recorded on a walk.

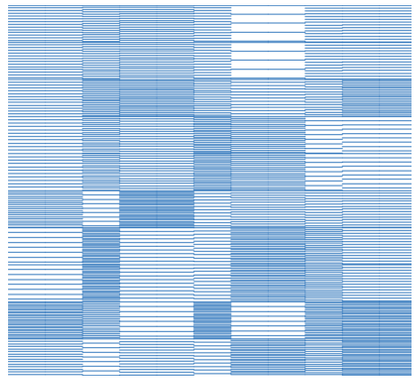
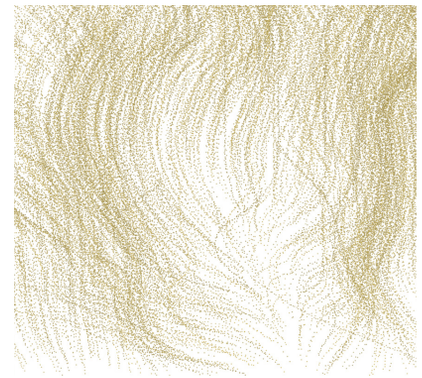
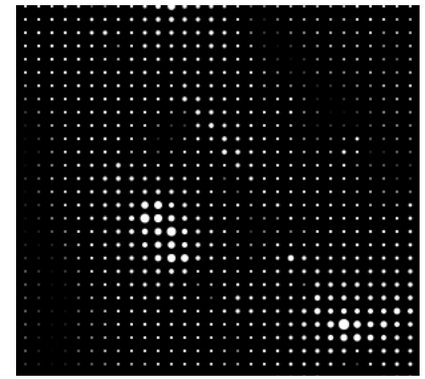
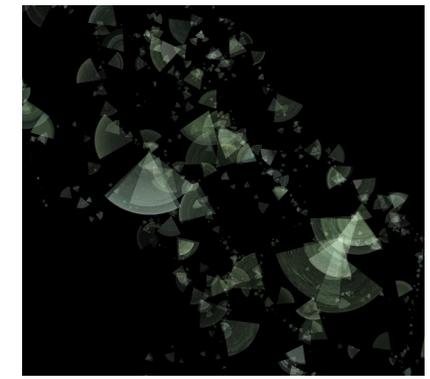
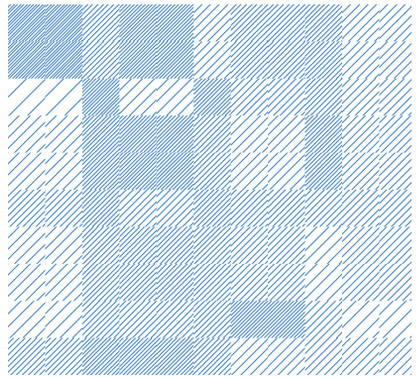
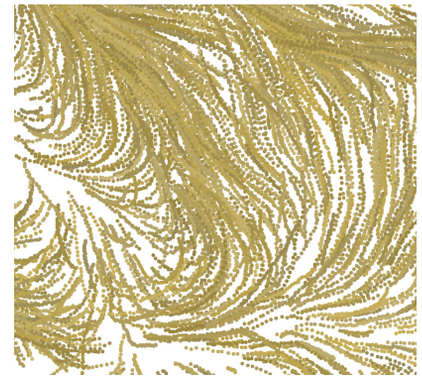
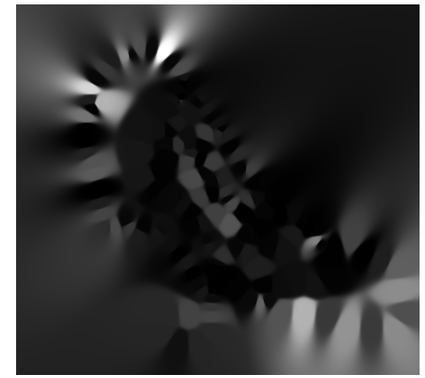
Laser cutters could be used to cut forms modulated by data, or cut surfaces and constructions to work with other methods of data display.

UV printing was used to print data graphics onto laser cut acrylic and build a stackable model of data layers.

A digital embroidery machine was used to plot different amounts and tones of organic colour extracted from photos taken on the walks. Making something in textile adds a tactile quality to an outcome.

VISUAL EXPERIMENTATION

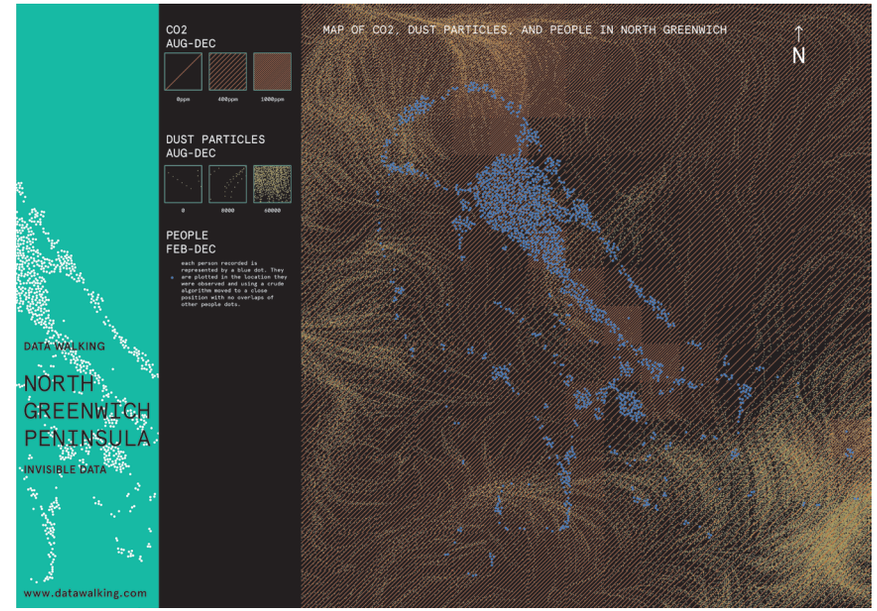
This bigger phase with different types of data to explore also allowed more experimenting with visual aesthetics.

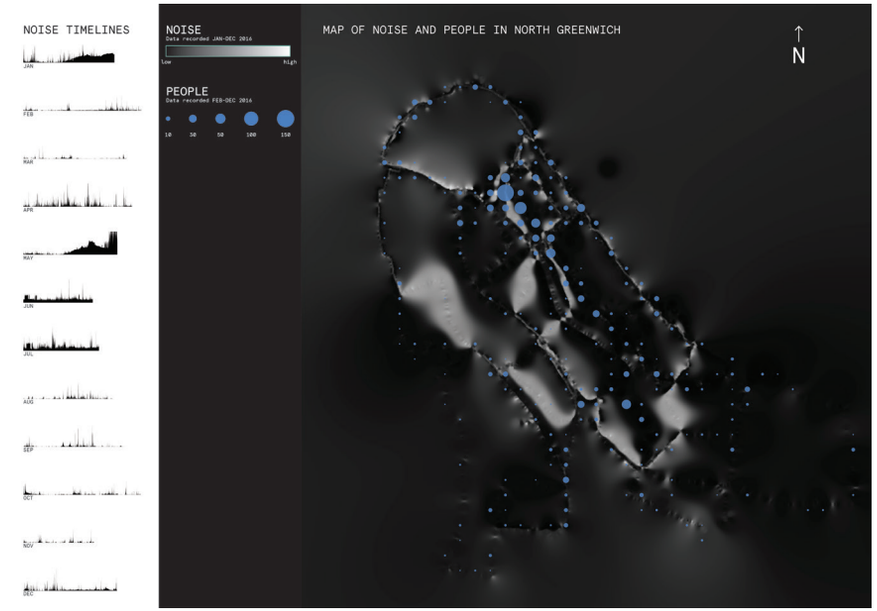









VISUALISATION

Visualisations for a walking map of North Greenwich rendering different forms of air quality and noise data, as invisible phenomena that must be sensed, alongside people counted and plotted, during walks. People are represented in two ways, a conventional variable sized circle to display larger numbers of people, and an experimental one which plots individual people but ‘jostles’ the small circles so all are visible but close to their original location, thus showing the swarm of activity in that area. Data is mapped and rendered using Processing and the Unfolding Maps library.

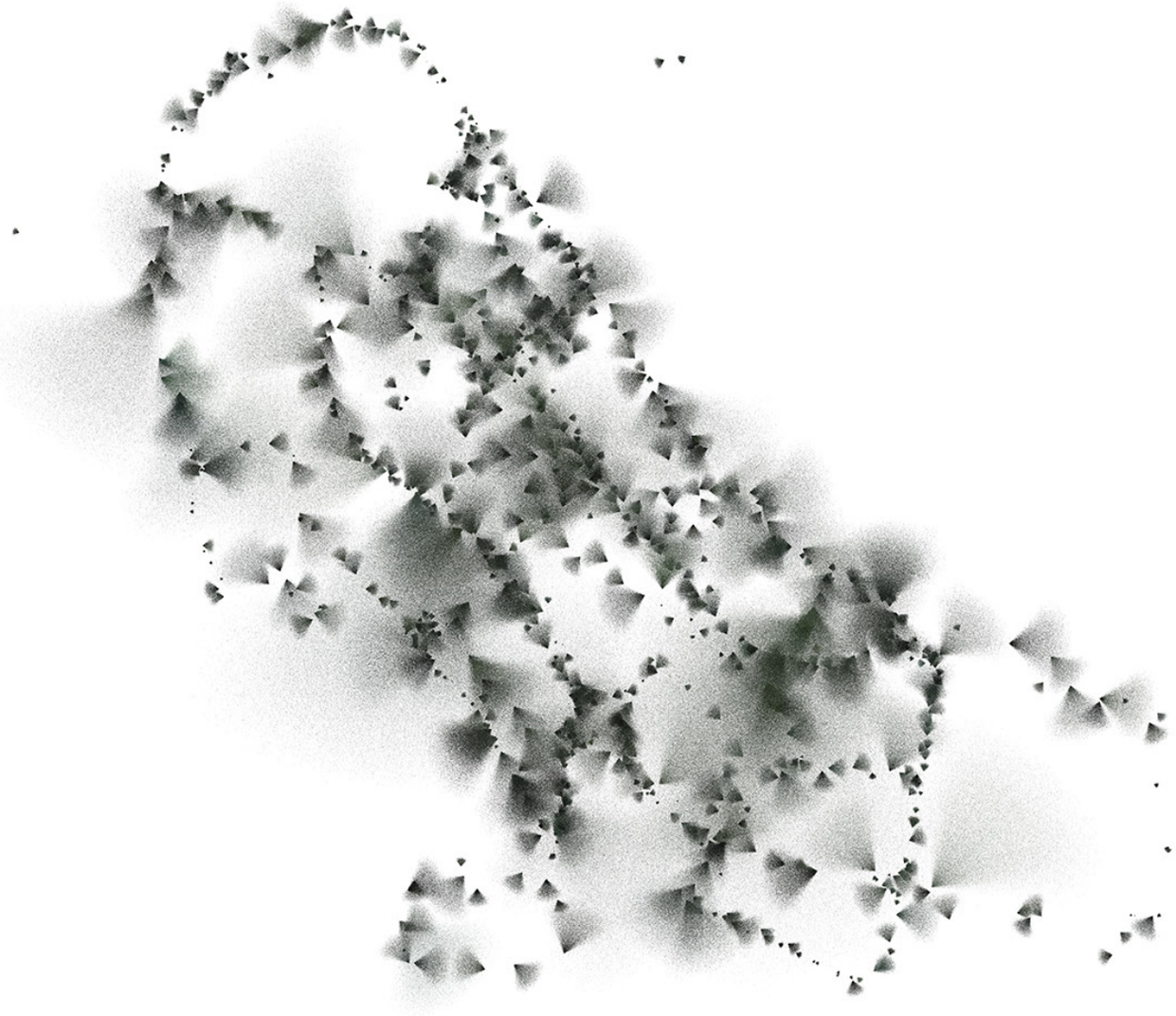
The idea was to provide geo-spatial visualisations or data-driven maps to assist visitors to North Greenwich with navigating around the Peninsula according to different invisible data metrics. The map design can be folded down to a booklet. The idea has a tongue-in-cheek element, but also a serious element in identifying data trends in an area, and pays homage to established mapping formats and materials for navigation and information.





VISUALISATION

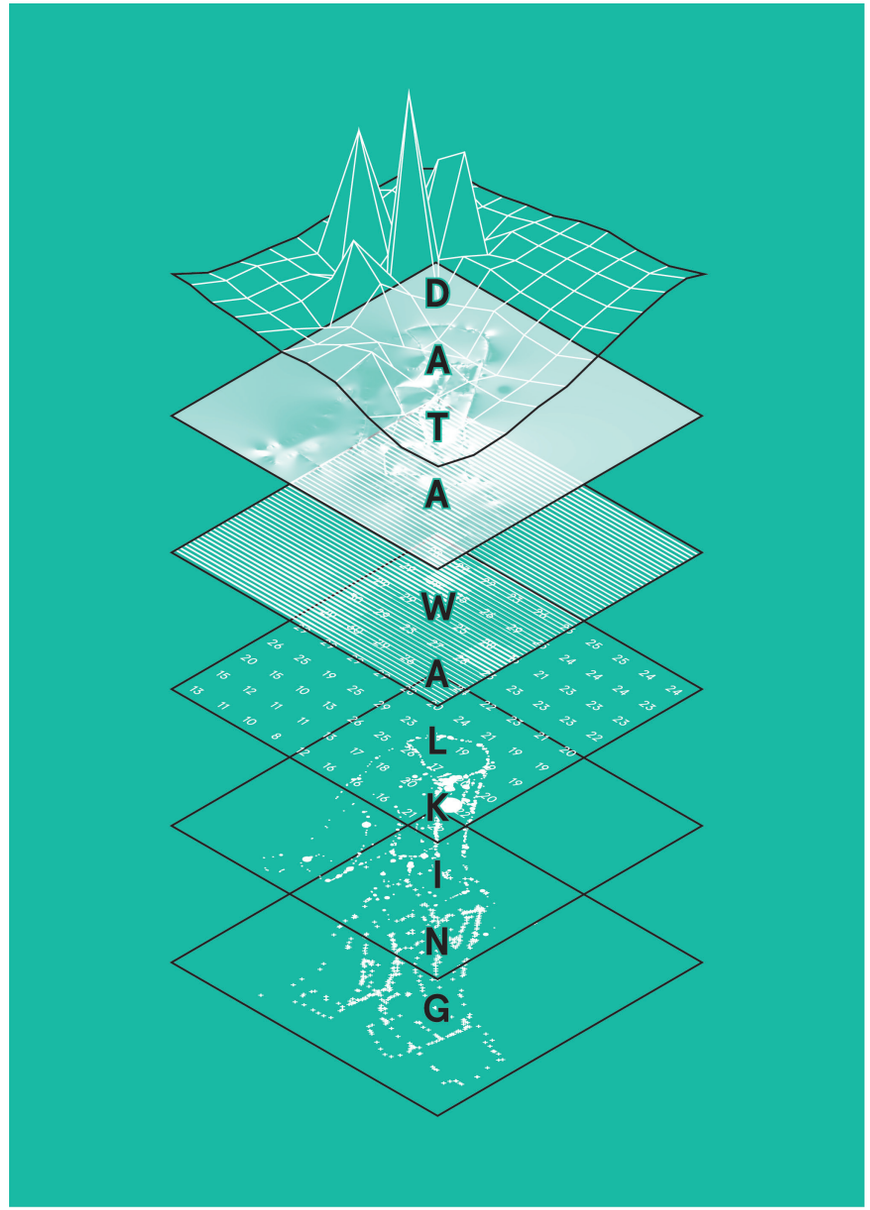
This is a map of organic green colours extracted from geolocated photographs taken on walks around the North Greenwich peninsula. Photos were analysed for green pixels and then 'sprayed' in the orientation the photograph was taken. The more organic coloured pixels, the further the reach of the spray. As many photos are analysed and layered onto the map an indication of areas with more green tones and potentially natural, green, pleasant environments can be identified. All the image analysis and mapping was done in Processing with the Unfolding Maps library, and Exiftool for extracting GPS data from photos.



DATA WALKING REPORT

The North Greenwich phase culminated in a 96 page book which contained writing on the aims and background to the project, practical advice on how to conduct your own Data Walks or experiment with technology for data gathering or visualisation, and contributed visualisations by students and educators from Ravensbourne University London, as well as visiting designers and studios who gave lectures or workshops. It was extremely important for the participants to have visited the peninsula and have direct experience of it. The publication was printed by Aspect Press, a local printer in North Greenwich.

The cover design represents the spatial nature of walking around an area, as well as the layered nature of the project, both in terms of data gathering and data visualising. The graphics at the base of the stack are simple markings of locations, and as you progress up through the stack the fidelity of data representation and interpolations between known points increases and breaks out into the third dimension.



Discussion

It has been interesting to see and be a part of the project evolving over time with different phases, durations and scopes, places, participants and collaborators. The project started as very singular, solo walks, and has become much more about participation through group walks and workshops, as well as remote collaboration on visualisations.

The emphasis for myself and my role has shifted from investigating technologies and creating final artefacts to considering the process, the accessibility and feasibility of the project, perhaps as a result of increased participation. I am now facilitating others more than walking and visualising by myself.

As more collaborators have joined, the interest has moved from gathering numbers to recognising characteristics, thinking less about quantities and more about qualities (although one supports the other). Passive data gathering using sensors has made way for active data gathering through collections, observation, and manual methods, the role of the participant reasserted. What started as a technology-driven approach has ended up more immediate and hands on, with rapid making and prototyping for both data gathering and visualising. That is down to the nature of the workshop format, the time available, and the number and nature of individuals participating.

The initial aims of making big pictures of a city have given way to smaller insights. Notable recent outcomes have been to look at local sticker culture, cctv coverage, bike locks, the surfaces we walk on. People have remained a consistent interest among participants on workshops. Pollution, particularly noise and visual pollution have become very interesting personally, and I have become more sensitive to, and we can all relate to the issue of air quality in urban areas.

Group walks have led to discussions, and walking and observing has been proven as an easy vehicle for prompting discussion. Subjects have turned from the practical possibilities of gathering data on the move, literacy with data and charts, through to the impact the urban environment has on us, to examining societal issues around a datafied city, and its citizens awareness and access. To contrast with these serious topics, it has been a happy experience to discover so many people using walking in their practices.

Every time I think about the project I draw different conclusions and see new future directions. And I suppose this is a natural outcome of a multifaceted, multidisciplinary and multi-person project.

Acknowledgements

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