proboscis

CULTURAL SNAPSHOT
NUMBER ELEVEN

Public Authoring & Feral Robotics

Giles Lane, Camilla Brueton,
George Roussos, Natalie Jeremijenko,
George Papamarkos, Dima Diall,
Dimitris Airantzis and Karen Martin

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Introduction

Our everyday lives are increasingly infused with electronic and digital technologies – facilitating new modes of communication as well as major changes to private behaviour in public spaces. These technologies also have an environmental impact – from increasing levels of background radiation to producing mountains of 'disposable' artefacts for which there are few recycling initiatives but which contain many serviceable components and parts.

What background environmental factors such as air quality, noise and light pollution affect our neighborhoods?

How can we measure pollution in our own localities and make this data visible?

How can we make sense of this in the context of what we already know about the places we live, work and play in?

Robotic Feral Public Authoring[1] links together two branches of action research for community fun and activism. Hobbyist robotics and public authoring (knowledge mapping and sharing) both enable people to use emerging technologies in dynamic and exciting new ways. Brought together they open up whole vistas of possibilities for exploring our local environments with electronic sensors – detecting all kinds of phenomena and mapping them using online tools.

The Robotic Feral Public Authoring project is part of Proboscis's Social Tapestries[2] research programme, exploring the potential benefits and costs of public authoring through playful and challenging experiments. It is a collaboration between Proboscis, design engineer and technology artist Natalie Jeremijenko and the Department of Computer Science at Birkbeck College (University of London).

Public Authoring

Public authoring is the term used by Proboscis to describe the mapping and sharing of knowledge, information, memories, stories and experiences. We contrast the concept of a publicly authored knowledge and experience commons to the traditional way in which information is passed from a centre to the margins – the broadcast model of newspapers, television and radio. Public authoring offers an alternative to the implied passivity and narrow focus of consumerism. It presents a new opportunity for people to be agents, actors or authors in the world of communications and knowledge sharing. Public authoring proposes that everyday people become the authors of a complementary flow of knowledge that adds local specificity to the more generalised material that can be offered by media companies.

Over the past few years Proboscis has been developing a series of public authoring tools, techniques and platforms. They range from our Bodystorming Experiences to StoryCubes and StoryBoxes; from the DIFFUSION eBook Generator to the Urban Tapestries[3] knowledge mapping platform. Proboscis' focus is on exploring the social and cultural implications of these technologies and practices – how they are part of our changing relationship to community, place and space.

Feral Robotics

Natalie Jeremijenko has been working on the concept of feral robotics since 2001, when Proboscis invited her to participate in a project called Private Reveries, Public Spaces[4]. Natalie's contribution was the first iteration of a reconfigured robot dog adapted to sniff out chemicals in the atmosphere[5]. Her vision has been to break robotics out of the academic lab by fusing hobbyist and amateur enthusiam for robotics with products benefitting from the economies of scale of consumer manufacturers, specifically the toy industry. This way it is possible for the general public to acquire sophisticated equipment which would otherwise be prohibitively expensive. By reconfiguring low cost robots that are sold as consumer toys into vehicles of social and cultural activism, it is possible to adapt the toy robots into powerful sensing devices for locating and identifying chemical pollution and radiation.

A feral robotic dog pack release is an opportunity for evidence driven discussion so that people who might not normally have evidence about contaminants in their local environment can participate in some way. It's rendered in such a way that it's legible to diverse participants – a robot dog following a concentration gradient doesn't look a bit like a public health report, but it is something that a two year old or a ninety-two year old can understand. The feral robots allow voices and interpretations that might otherwise not have been heard to be heard – important interpretations of local history that could be forgotten – which inform where and how and why the contaminants are there and how they are distributed.

Feral Robotics questions the social role of technology and tries to raise awareness for polluted habitats. In particular Natalie's workshop model, where participants build their own feral robots, creates a unique experience beyond simply capturing environmental evidence.

> *'[Natalie Jeremijenko's] mission is to provide people with the ability to read the environmental conditions of their living environments, using the approach of scientific disciplines such as bioengineering or robotics. She says politicians use scientific charts and solid data to pass environmental laws but people are expected to merely consume the information and not question it. But what's not revealed or discussed is more interesting to Jeremijenko. "I am committed to the idea of information politics. That is how contemporary politics are played out," she says, explaining that in an information society it is easy to juggle information without telling the whole story.'*
> *San Francisco Chronicle, October 2004*[6]

Robotic Feral Public Authoring

The Robotic Feral Public Authoring project seeks to bridge the fields of experimental robotics and pervasive place-based public authoring. It combines low-cost robotics with geo-annotation in an innovative way to develop a novel approach for galvanising social activism on a local level around environmental issues. By adapting commercially available toy robots with a variety of sensors and uploading the readings to a spatial annotation database for visualisation, we have explored new ways in which the exclusiveness of pollution sensing and robotics can be dispelled and a new sense of empowerment promoted for grass roots communities.

The collaboration between Proboscis, Natalie Jeremijenko and Birkbeck College's Computer Science department has enabled the project to achieve a vision that bridges social and cultural practices with robotics engineering and computer science. This transdisciplinary approach has enabled us not only to demonstrate the technical possibilities of combining hobbyist robotics and spatial annotation, but also to gain new understandings of how this could be used in local settings by non-specialists.

At the outset we set ourselves several questions:

> *How can ordinary people adopt and adapt consumer technologies to do more than entertain them – to intervene socially and culturally in their environment?*
>
> *What kinds of social and cultural issues can be explored through this combination of experimental robotics and pervasive location-based public authoring?*
>
> *How can artists and engineers inspire and influence the roll-out of emerging technologies by manufacturers and network providers as enabling tools for users, not just modes of consumption?*
>
> *How might perceptions of place and space be altered by these new public abilities of collaborative mapping and annotation?*

It was important to us to work out how we might leverage the practical, hands-on approach of 'hobbyist' robotics with the ability to annotate specific places with the Urban Tapestries mapping platform. Following the conceptual direction of public authoring we decided that a crucial outcome of the project would be not only how we visualised the outcomes of the project to communicate the vision of environmental sensing and mapping, but also how we documented the technical aspects of the project. Our aim has been to disseminate the knowledge and methodology of our research in a way that is accessible to audiences wider than peers in the academic and arts communities. To do this we have created experiences based on the research for the public, which aim to inspire and influence not only our public audiences and peers in academia and the arts, but which also speak to civil society organisations, government agencies and industry.

Community Mapping

What does placing pollution sensing equipment in the hands of everyday people actually do? Does it enable a community to comprehensively map it's locality or does it just produce a set of data, which exists outside of the scientific framework needed to make it meaningful? Does it encourage people to investigate and look more closely at the area in which they live? Or does simply mentioning the word 'pollution' reinforce negative ideas and encourage people to think that the area they live in is dangerously polluted?

'As soon as the word pollution is mentioned, one is made to feel like something is under threat or being destroyed.' [7]

Living in London it is impossible to ignore the pollution which creates a backdrop for our everyday lives. Noise pollution, light pollution; fears about the possible negative impact of mobile phone masts on health and air quality are all important concerns for Londoners.

London's air quality is monitored by the London Air Quality Network (LAQN); an extensive series of sensors in fixed location across the London Boroughs (and beyond into Kent and Surrey) monitoring air quality on an hourly basis[8]. This is a important resource but considering that Hackney itself only has one pollution monitoring station in the entire borough (located towards the north end of the borough), there is clearly an argument for examining the environment on a more local level.

The Robotic Feral Public Authoring technology enables a group or individual to collect data on pollution and locate this to a specific geographical area, via a robot equipped with air quality sensors, a GPS locator, a wireless internet connection and the Urban Tapestries software platform. The portability of the technology both in terms of its scale and the inbuilt mobility of the robot makes it easy to hone in and explore the pollutants present in any number of locations.

But can this kind of data collected by non experts be useful, without the scientific rigour to map comprehensively or knowledge to interpret results? Feral robots and the mapping technology the data collected is linked to can provide a snapshot of pollution in a specific place at a specific time. It is not designed to collect data to replace or replicate the structured LAQN network mentioned above. What is does do is open up an interesting dialogue about how pollutant sensing technology placed at a grassroots level can function, its potential applications for community action and interaction; and altering perceptions of how one's environment is perceived.

People have an interest in what is on their doorstep, their local environment, the locality that they interact with; where they and their children play. An interactive tool such as a feral robot and the process of taking part in a community mapping exercise can be the starting point for a much larger conversation about the many different elements which influence the local environment.

At a recent community mapping workshop[9] in London Fields, Hackney, the interaction with the location triggered off many historical stories from participants highlighting previous activities in the area which could have left a pollution thumbprint. This kind of 'local knowledge' is invaluable expertise and could help locate pollution hotspots on a daily and even hourly basis through knowledge of traffic flow and possible polluting industries in the area. An outside 'expert' would not have access to this knowledge without considerable resources for research.

Enabling people who are not specialists to access pollution sensing technology and the data it collects (which was previously the reserve of a scientific community) can only be empowering. It explodes the notion that only experts can or should collect 'scientific' data.

> *'we have come to accept air pollution because we are culturally habituated in it... that's got to change and if this doesn't happen at a grass roots level with tools that we can handle ourselves governments will not shift because they are in with the big corporations'*[10]

But do people have any control over their local environment? Vehicle emissions are the major cause of air pollutants in London. If traffic perceived to be passing through an area is the major cause of pollution, what can local people do about it?

> *'The more I think about it, the less I want to have any access to any data about air pollution in my locality, or information about this park. I don't have a garden, I have a kid, I'll always use it'*[11]

It is estimated that twenty percent of car journeys in London are actually less than one kilometre[12] – evidence of people directly affecting the air quality of their locality through their choice of transport. In many cases these journeys could easily be undertaken (and probably just as quickly) on foot or by bicycle. Teaming up Feral Robots, with a local cycling campaign at an event could be a useful way of helping people to visualize air pollution and thus promote the uptake of a local solution (cycling) by local people.

> *'In London we have the highest level of asthma in the world. There must be a reason for this. If people don't have the tools they can't make this jump... to enable them to visualise the pollution that they in part cause'*[13]

Additionally, the process of community mapping throws up other reflections on our lifestyles that pose hard questions for which there are no easy answers.

> *'Most peoples homes are more polluted than the outside space we occupy, through chemicals in furniture, upholstery and construction materials such as MDF.'*[14]

The strength of Robotic Feral Public Authoring lies in the diverse agendas which it cross pollinates. A tool and social practice with a strong visual impact, it creates an aesthetic agenda making technology appealing and accessible through the subversion of the (increasingly) familiar interface of toy robotics. The technologies they are equipped with and their ease of use allows an exploration of a local environment at a local level without professional expertise. The mapping of the data gathered back to the geographical area it originated from via the Urban Tapestries software platform produces a real, tangible outcome, which again has the potential for visual impact. Robotic Feral Public Authoring can thus act as a catalyst for social exploration and activism.

London Fields

Proboscis chose London Fields as the focus for the project precisely because of its strengths as a public space used by distinct and diverse communities. To enable us to reach out to local people in the area, as well as to others who use the park, we collaborated with SPACE Media Arts[15] based on nearby Mare Street. SPACE's extensive local community networks enabled us to create swift and trusted links which led to the highly successful community mapping workshop in November 2005. The time constraints of the project didn't enable the deeper and longer connections with the area and local communities that we would have preferred, but the groundwork has been laid for future collaborations.

London Fields is a popular local park in Hackney, East London. Bounded by Richmond Road to the north, not far from Mare Street (Hackney's busiest road) its an important resource for local communities in a built up area. The park is used by local people for a variety of activities; as a space to play and socialise in (with two children's play areas), organised cricket and football matches, and many dog walkers. It is also a popular walking and cycle route. As part of a global city, London Fields and the area around it is constantly changing, adapting to accommodate the differing needs of the surrounding population. London Fields' origins (first recorded mention in 1540) and its existence today are related to its use as Lammas land, an area for communal grazing. It was the last piece of common land for livestock on a drovers' route from Essex to London Town before being herded off to 'Slaughter Street' off Brick Lane or East Smithfield.

Currently the intervention of property developers in the locality of London Fields is raising serious concerns about the gentrification of the area and the impact this will have on local communities. During the Nineteenth century the Fields themselves were under threat and only just survived a number of attempts to change their use. In the 1860s agents for landlords began promoting the site for development, dismissing the Lammas rights as rarely used and pointing to the neglected state of the fields. The importance of London Fields location as large open space so close to the city was recognised, and thus development not allowed. London Fields became a public park in 1872.

Technical Development

The Feral Robot system follows the standard client/server pattern employed in all clients within the Urban Tapestries (UT) public authoring system. One or more feral robots act as clients sending real-time data to a UT server. This geo-referenced, environmental data is written to a database for later retrieval via a web interface.

Creating The Robots

The first generation of feral robots was developed using the very low cost PIC microcontroller family which provides computing power roughly equivalent to that of a remote control. The requirement for location annotation and wireless and internet connectivity for the new version implied that an altogether new design was required. We also wanted to be able to support a more extensive collection of sensors, several of which required an extended period of warm-up. For this reason, we designed a new printed circuit board that provides several advantages:

1. *Provide power to the gusmtix stack assembly*: The processor board and its peripherals required a clean 5V supply in order to feed their internal 3.3V regulators. It was not clear how much current would be required though. Experimentation with the prototype showed that a current of 800mA would be required. This meant that the use of a switch

mode power supply circuit would not be necessary as its linear alternative was much simpler and lower cost to implement. In practice the line regulation provided was satisfactory, but the solution lead to two problems: the regulator generated a lot of heat, and the internal Hirose connector provided a rather high impedance path to the supply current. The large amount of heat generated was dealt with the choice of a bigger heatsink. A heatsink with a thermal resistance of 3.7 degrees per dissipated watt was finally chosen, thus ensuring the reliable operation of the circuit beyond the winter months. The relatively high impedance of the Hirose connector manifested itself through unexpected resets occuring during the power-up sequence of the wi-fi card. A sudden drop to the overall supply voltage activated the reset circuit of the processor. The solution to the problem was to distribute the current to the power hungry parts of the assembly via an external wire. In this way, the supply by-passed the Hirose connector and the voltage drop was minimised.

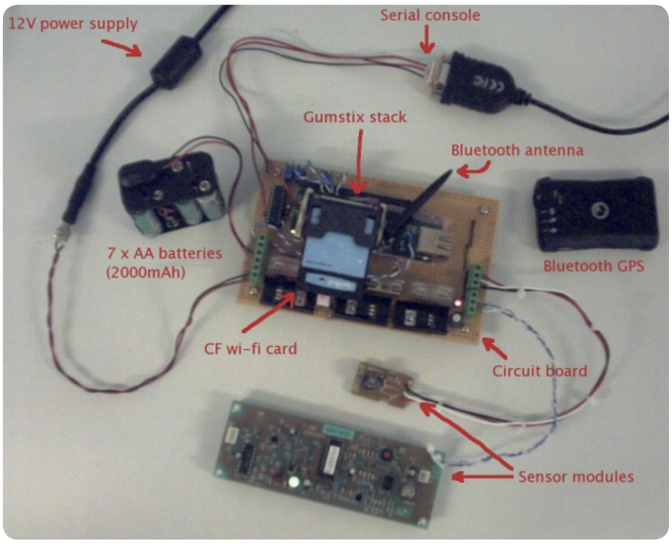
2. *Provide power to the sensors*: Power to the sensors was provided by a second linear regulator. Because the overall power consumption was within the limits of the regulator (less than 1A), the same heat dissipation solution was applied as in the case a, above. A fuse was provided towards the sensor boards in order to avoid any problems that might have been caused by a short circuit occuring on the external load.
3. *Charge and maintain the battery cells*: The choice of batteries was rather limited to NiMH cells due to their good performance/price ratio. Their weight was not an issue so Li-based options were ruled out. A constant current source providing charging current to 1/10 of the capacity was formed. Their capacity (2000mAh) would provide enough charge for a significant number of readings to be sent to the server, but would not provide the necessary power for the sensor warm-up period. The circuit would have to be powered by the external wall transformer during that period. A fuse was included towards the battery connection so as to protect both the battery and the PCB from any potential short circuits.
4. *Provide serial console access to the gumstix system*: The robostix brings out the gumstix console port on a 4-pin header. This port is a TTL level signal, so a standard TTL to RS232 level signal translator was used. No special protection was built into the circuit as the console port was expected to be connected directly to the PC within a rather well protected environment.
5. *Form the mechanical host of the gumstix stack*: The overall mechanical assembly of the heatsinks, the terminal block connectors and the processor boards was quite heavy. A final choice of epoxy glass pcb was made in order to cope with the weight.

The heart of the new design is the Gumstix[16] small form factor system, measuring 80×20x6mm, which incorporates the Intel Xscale network processor and supports an embedded Linux distribution including a full implementation of the IP stack. A summary of the hardware setup follows:

1. *Linux-based system*: gumstix connex 400xm-bt single-board computer with stackable add-on boards for extended I/O capability, running the main feral robot client application.
2. *Environmental sensors*: Figaro AM-4-4161 (carbon dioxide gas concentration evaluation module) and Figaro AMS-2100 (air quality sensor), attached to ADC pins on the robostix add-on board. Sensor readings from these sensors are converted to digital measurements via the Robostix data acquisition board (par of the gumstix platfrom) which includes a 10-bit analogue to digital processor.
3. *GPS receiver*: external bluetooth device, wirelessly linked to main gumstix system (in our prototype we used an OEM version of the Socket BT receiver).
4. *Wireless TCP/IP networking*: Netgear MA701 wi-fi CF card, connected on gumstix netCF add-on board.
5. *System integration*: The above components are assembled and fixed on top the custom-built electronic circuit board and a battery power supply; finally, the package is mounted independently on top of an remotely controlled all-terrain R/C vehicle at 1:14 scale.

In particular, the following gustix modules where used:

1. *connex 400xm-bt*: main processor board (80×20x6mm in size) featuring an low-power Intel XScale processor with maximum clock frequency of 400MHz, 64 MB of RAM, 16MB of flash memory, and a bluetooth interface (antenna included).
2. *robostix (with headers)*: add-on board featuring an AVR ATmega128 microcontroller unit (MCU) with analog to digital capability (10-bit resolution ADC, with 8 channels).
3. *netCF*: add-on board with integrated ethernet port and CompactFlash slot (suitable for a wi-fi card with the same interface).



Two Figaro[17] sensors were used in this prototype:

1. Figaro AM-4-4161: an evaluation module (with on-board microprocessor that linearises results) for the TGS-4161 carbon dioxide (CO_2) gas sensor. The module's output range is 0.0 to 3.0V corresponding to a gas concentration of 0 to 3,000 ppm. After power-on, this sensor module needs a 2-hour warm-up period (for sensor output calibration).
2. Figaro AMS-2100: a precalibrated air quality gas sensor module. The output range is 0.7 to 2.5V, but the datasheet does not provide details on how the results are to be interpreted.

Obviously, the choice of sensors will depend on the type of pollutants to be detected or measured in each case. Up to eight different inputs can be attached in this prototype's setup.

Finally, the feral robots require wireless internet connectivity to access the UT server. Although the current version can connect to any open wireless LAN, a mesh network infrastructure provides maximum coverage and flexibility. In the London Fields outing we used a portable WiFi mesh node from Locustworld.[18]

Software Setup

The gumstix hardware platform is supported by customized GNU/Linux distribution based on the Buildroot system—"a set of Makefiles and patches that makes it easy generate a cross-compilation toolchain and root filesystem for [a] target Linux system using the uClibc C library"—and the U-Boot boot-loader. The evolution of the gumstix distribution (or buildroot) is maintained under version control with Subversion, and the repository is hosted at http://svn.gumstix.com.

To develop applications for gumstix platforms it is recommended to use a Linux-based host system with a fully-featured GNU software development environment properly set up (autoconf, make, gcc, etc), including the Subversion tools (svn, etc). Alternatively, Microsoft Windows with COLINUX can be used as host system for gumstix development. The host must be connected to the Internet in order to interact with the Subversion repository and download software packages during the build process.

There are several ways to gain command-line access the GNU/Linux system on a gumstix, but the most powerful (as it also allows access to the boot-loader) and failsafe is usually via the serial console. For this, the host computer must be connected to the gumstix's serial console port with a null-modem cable. The default parameters for the serial terminal emulator on the host should be the following: 115200 bps, no parity, 8 data bits and without flow-control.

More details about programming and building gumstix systems is available at the community website and technical support can be obtained through the user community mailing list.

Besides the main gumstix buildroot development trunk, a structure is defined in the Subversion repository for branching different buildroot configurations to meet or implement a specific project's requirements. Several branches can coexist in the repository and be developed independently in parallel, while changes can be merged back and forth between branches or the main trunk. For the feral robot prototype such a branch was created on the gumstix hosted Subversion, not only to track modifications to the custom buildroot's configuration, but mainly to ease the process importing bug-fixes or new features developed in the main trunk (after the branching has occurred). This allows great flexibility and availability to the software developed; for example, simple build commands can be used to download and build a working copy of the customized "Feral Robot" buildroot branch, including the extra software for the robostix board (further described in Robostix ADC).

There is no analogue to digital conversion (ADC) capability directly available on the main gumstix processor board. Thus, the robostix add-on board was used in this prototype, due to the ADC functionality present in its AVR ATmega128 microcontroller. The gumstix and robostix boards are interconnected via their serial ports making data exchange between software running on both processors possible. This feature is exploited to give the feral robot client application (running on gumstix) access to sensors attached to any ADC channels of the robostix.

In essence, the communication protocol on the robostix side consists of waiting for incoming ASCII characters on its serial port, that represent ADC channel numbers (from '0' to '7'), and responding with the current voltage value on that ADC channel, in hexadecimal format encoded as an ASCII string (e.g. "0×03f9"). On the robostix's ATmega128 this function is implemented with an endless loop using native C. After compilation, the resulting binary file must be programmed (i.e. flashed) to robostix. Several possible methods to program microcontrollers of the AVR family do exist, and in this case the most straightforward way of doing this is to take advantage of the gumstix/robostix serial interconnection setup to perform in-system programming (ISP) of the software image, directly from the GNU/Linux system running on the gumstix: the binary image file must be transferred from the host computer to the gumstix by console (Kermit) or network (SSH), and then (on the gumstix) use the uisp command-line tool.

The utrobot application forms the core of the current feral robot behaviour—sampling its attached environmental sensors, reading the GPS position and sending data to the UT server. This application requires TCP/IP access to an active GPS daemon (gpsd), either running locally (default) or over a network connection. Also the serial port of the robostix may have to be specified to access the sensors. Finally, the robot id (MAC address) and remote UT server address must be specified on the command-line—on the gumstix this is done by a wrapper script.

Integrating With Urban Tapestries

Collecting and processing the data sent from the Feral Robot required a series of extensions to the existing Urban Tapestries backend system to fit with the special needs of the robot client. A separate server component was designed and implemented that establishes connectionless communication with the robot. This accepts the robot's data packets which contain the robot's GPS position along with the corresponding value of each sensor measurement and the time this measurement was taken. After extracting the packet contents they are stored in the database, from where they become available for processing and visualisation.

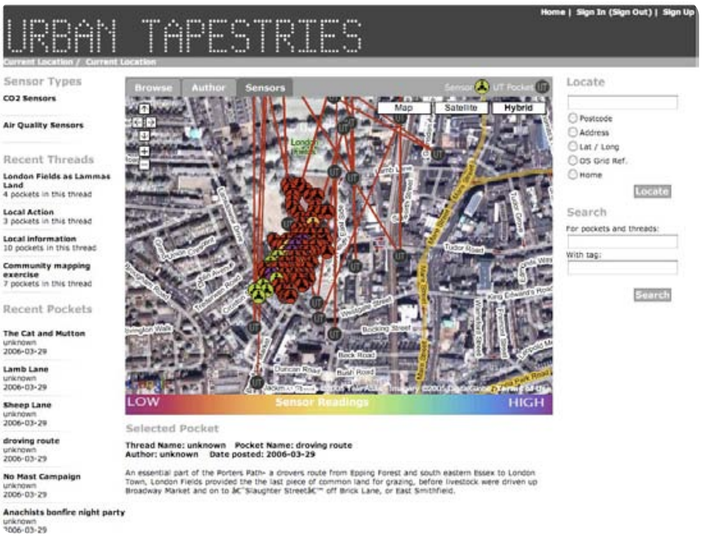
A very simple UDP-based protocol was devised for communication between the feral robots and the UT server. Basically the clients are programmed to periodically sample their sensors and the GPS receiver and, for each reading, packages the data into a UDP datagram, that is then sent to the server. The protocol, in its version 1, defines a packet structure with the following data fields:

- Status information
- Client identification (MAC address)
- Latitude/Longitude
- Time stamp
- Sensor type and value

Sensor Visualisations

The initial visualisations of the feral robot sensor data were made by processing a static high quality aerial photo of the area in which the measurements were taken, and overlaying it with an extra transparent image layer. The sensor values and each reading's position were fetched from the database, associated with a colour from the visible spectrum, then drawn onto the image layer as a dot with diameter equal to the maximum GPS position deviation. This forms a dense coloured "cloud" over the subject area.

Our next stage was to develop a dynamic mapping representation using Google Maps and associating the sensor data with other contextual knowledge in the Urban Tapestries web interface. The Google Maps API[19] makes



it possible to overlay information onto a detailed map by placing markers, drawing lines and linking information to latitude and longitude co-ordinates. The API provides a series of commands for adding markers, information windows and events to a Google Map embedded in a web page. It also offers a way to link to external information stored on a server via the GXmlHttp command. Information returned by a GXmlHttp call can then be used to update the map, the graphical overlays on the map and the associated information. AJAX (Asynchronous JavaScript and XML) allows us to make this update without needing to reload the entire page. Information sent to a server via this command can be stored and retrieved the next time the map is accessed by a client.

As well as displaying location-based information spatially, the Google Maps API detects user events like dragging the map. Along with the Google Maps control panel for controlling zoom level, this provides the viewer with many options for browsing. When the map is clicked on by a viewer, the map detects this event and returns the co-ordinates of the click as latitude and longitude. This provides a way for viewers to add their own location-based information to the map.

The feral robots sensor data contains latitude and longitude for each sensor reading, which is uploaded to the UT server and can be called and diplayed in the UT web interface. The GXmlHttp command returns the .gpx file generated by the UT server from the sensor packets uploaded by the feral robots, from which the relevant information is extracted to represent the robots findings. The feral robot takes readings every two seconds, resulting in an average of seven hundred readings per sensor per trial. As the performance of Google Maps is reduced when displaying a large number of markers simultaneously the UT web interface only represent every other reading with a marker on the map. These markers are linked with a GPolyline illustrating the path the robot followed when making the readings. The colour of the marker represents the level of the sensor reading.

In a separate call to the server all UT threads labelled with an ‘environment’ tag are requested, which are also displayed on the sensor readings map. As the Google Maps API enables custom markers to be used, the UT web interface can visually differentiate between the UT threads and sensor readings.

Social & Cultural Benefits: Everyday Archaeology

In the two years since we formulated the project we have seen its emphasis shift from ‘pollution mapping’ to what we now describe as ‘everyday archaeology’. Our vision has been informed by the process of working on a site with local people, many of whom were concerned for their environment, but for whom the initial focus on pollution proved questionable. Gathering data on environmental phenomena such as pollution was seen as a major benefit for local people to campaign around, but others saw it more as a valuable creative activity in itself.

Electronic sensors are now cheaply available for detecting a wide range of phenomena such as carbon monoxide, nitrogen dioxide, solvent vapours, electro-magnetic emissions (mobile phone masts, electricity generators etc), light and noise pollution. These can be combined with other cheap electronics (such as toy robots) that engage people in evidence collecting in a fun and tactile way. Adding the sensor readings to online mapping tools (such as Urban Tapestries) suddenly brings the relationships between environment and home vividly to life. It enables people to feel they can learn about their environment and have the evidence to do something about it.

We think that the greatest potential for Robotic Feral Public Authoring lies in linking robot building and mapping workshops to existing community events such as village fetes and local festivals. This idea of embedding the practice into familiar rituals offers opportunities for involving a wide range of people in gathering and sharing knowledge about their environment. Through the concept of everyday archaeology Robotic Feral Public Authoring can tap into popular interests and past times – not only those of robotics hobbyists, but amateur historians and environmentalists.

Economic & Political Benefits: Learning Games

The use of Robotic Feral Public Authoring as a tool for learning also represents a significant potential benefit. With some further technical refinement to make the 'adaptation' of toy robots more accessible to people without specific electronics and engineering skills, and the creation of materials like activity and lesson plans, the project could quickly move into formal and informal education settings.

The benfits of this are multiple: from bringing children and other learners into direct contact with practical skills of making and building technologies and the representation of the data they collect; to stimulating the commercial production of new learning aids that are designed to enable people to develop their own creativity and analytical and communication skills.

It is possible to see that, just as the choice of toy robots was inspired by the ability to use the economies of scale of the toy industry to put sophisticated electronics into the hands of the general public, so Robotic Feral Public Authoring could inspire toy manufacturers to develop cheap 'feral robot' adaptation kits. This could amplify the effect of the economies of scale whilst encouraging a generation of people to be co-creators, not just consumers of toys designed simply to entertain. Robotic Feral Public Authoring offers exciting new ways for electronics manufacturers and network providers to allow their customers to use their products in a socially and culturally enriching way – enabling new dialogues to be explored between industry and the people they create products for.

The greater the emphasis on participation at every level of society and culture, the greater the diversity of voices, ideas and knowledge can be contriuted to society at large. Stable and healthy democracies are the product of wider participation and sense of responsibility. The vision of Robotic Feral Public Authoring is to contribute to a greater local sense of empowerment and impact of local people on environmental issues. It seeks to act as a model for how artists and engineers can collaborate to bridge the gulf between pragmatic technical solutions to social problems and the cultural interventions that artists bring to their communities. It is political is the sense that it inspires people to act; to investigate and collect evidence and use it to affect change.

Robotic Feral Public Authoring in Everyday Life

This project has demonstrated that it is possible, using cheap electronics and publicly accessible mapping solutions, to create an exciting and engaging new form of environmental sensing at a very local level. Although our prototypes require a level of electronics and engineering skill above that of most people, it is well within the realm of the hobbyist and will not require a huge step to reduce the complexity of creating a feral robot even further as new platfroms and products (such as Motes and Sun SPOTS[20]) become more readily available and cheaper.

The next stage for Robotic Feral Public Authoring is to make this transition, focusing not only on the technical but, more importantly, on the social, cultural and educational uses and techniques needed to add the sense of purpose and context to environmental sensing. Designing the activity materials, whether for schools running geography and science projects, or campaign tools for environmental activists will provide the impetus for adoption and adaptation of the project's vision. Over the next few years it is easy to imagine a growing network of hobbyist data collectors springing up to help map our environment, learn about our effect on it and take action.

Notes

1. http://socialtapestries.net/feralrobots/
2. http://socialtapestries.net/
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Credits

Principal Investigator	Giles Lane
Visiting Research Fellow	Natalie Jeremijenko
Project Assistant	Camilla Brueton
Project Partners	Gini Simpson at Space Media Arts
	George Roussos at Birkbeck College Computer Science Department.

Robotic Feral Public Authors designed and built by Dima Diall and Dimitri Airantzis
Software development and integration with Urban Tapestries platform by George Papamarkos with Dima Diall, Dikaios Papadogkonas and Kren Martin
Feral Robot (Dublin Ark version) built by Matt Karau
Community Mapping Workshop
Participants – Arkem, Melissa Bliss, Colin Bloxham, Michael Calderbank, Heather Corcoran, Corinna Drossel, Jennifer Gabrys, Lewis Griffin, Kevin Harris, Siraj Izhar, Kevin Moore, Christian Nold, Rokeby, Paula Roush, Ben Scott.
Facilitators – Alice Angus, Camilla Brueton, Giles Lane, Sarah Thelwall and Orlagh Woods.
Aerial Photo of London Fields provided courtesy of Getmapping.com

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CULTURAL SNAPSHOTS

A series of essays, polemics and manifestoes designed to provoke comment and debate on the contexts in which research and creative projects are carried out by Proboscis. Cultural Snapshots are commissioned and edited by Giles Lane.