

Timestreams: Supporting Community Engagement in the Climate Change Debate

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ABSTRACT

Arguably two of the greatest risks that the UK faces in common with the rest of the world are dangerous climate change and energy insecurity. Despite our best efforts to date, policy level discussions and climate science have not motivated a great deal of public response. An alternative to top-down science communication is of paramount importance to tackling these issues. We present a disruptive innovation that facilitates culturally-aware artistic community engagement with these issues through sensor data and blogging.

Keywords

synchronised data logging, artistic practice, public engagement, energy, climate change

1. INTRODUCTION

Disruptive innovations are more than just the introduction of new technologies to existing markets [1]. Technologies are the enabler, but these are used within a strategy to reach new customers or those that are not focused on by previous business strategies. For example, the introduction of portable MP3 players did not disrupt the music distribution business. The disruption came when Apple, Inc. combined the hardware and software innovations of the iPod with the iTunes business model.

In this paper we describe the Relate Project, that is innovating technologies to enable partially-connected data harvesting, federation and visualisation. The project is also developing these technologies within a context of a disruptive value proposition focused on transforming the ways that communities around the world discuss energy and climate change by engaging artists and the creative sector as primary users of these technologies working with these communities. This paper describes the need for change within the energy

and climate change debate, the Relate Project's proposition, and the enabling technologies that are being developed.

2. COMMUNITY ENGAGEMENT IN THE CLIMATE DEBATE

Threats related to energy and climate change have not diminished; they are as great as ever. Yet societal interest in the topics have waned owing in part to shorter-term economic problems [3] [4]. In addition to short-term factors, there is a degree of general public apathy in the face of these important issues. This was initially considered by the scientific community to arise from low levels of scientific comprehension by members of the public, however, Kahan et al. found no support for this belief [2]. They found that those members of the public that had the highest levels of scientific and technical literacy had little concern for climate change. Kahan et al. highlight cultural conformance (conforming one's beliefs to those prevalent in one's group) as the overriding factor governing behaviours. This means that people tend towards beliefs that maintain healthy peer relations over those that benefit the environment. The challenge, therefore, is not to focus on individuals to alter their views and behaviours, but rather to work with communities to accept scientific views in such a way that does not threaten group values. The proposition of the Relate Project is that artists, working together with scientists, and enabled by technologies, can reach communities and help them engage with these issues in a culturally-meaningful manner.

3. A SOCIAL PLATFORM FOR DATA

The Relate Project is developing a data publishing system, Timestreams, to enable artists to engage with communities about energy and climate change by developing a series of playful, creative activities involving data capture, visualisation and comparison. Timestreams allows communities to capture live sensor data from their local environments, and to report this in a timely manner to a cloud-based social platform. The system comprises components for mobile sensing and logging, synchronising mobile instances with external services, visualisation and social communication about and around the data, and federating data between communities.

The WordPress content management system is at the core of the Timestreams platform. WordPress was chosen be-

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DIGITAL-FUTURES '12 Aberdeen, UK

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cause of its large existing user base, relative ease of use, wide ranging feature set including user management and theme support, along with its plugin architecture and open source license. WordPress is used in two settings within Timestreams. Firstly, single-site instances are used within local data capture hubs to support mobile sensing. Secondly, a multi-site WordPress network forms the basis for social collaboration amongst federations of communities that the mobile sites can use for long-term data storage and controlled exchange of information.

3.1 Logging for Community Interventions

Timestreams supports the engagement of artists with communities in the UK and Brazil through a series of creative interventions. These interventions consist of activities where community groups collect “time-streamed” sensor data that are visualised, annotated and fed back into the activities, and made available to share with other groups. To facilitate off-grid activities in rural locations, the Timestreams platform provides a mobile hub which various sources can feed data into. Sources include sensors for the capture of data about atmospheric CO₂ levels, temperature and humidity, as well as photos, videos and anecdotal textual accounts.

The mobile loggers consist of specially configured WordPress instances running on small form factor computer servers (plug computers). The Timestreams WordPress plugin implements the Timestreams API ¹ and provides local data administration and visualisation capabilities - essentially providing a portable, disconnected Timestreams cloud for local activities. The plugs are configured with special sensor drivers as needed to adapt data from formats that off-the-shelf sensor may use to relay their data.

3.2 Timestreams API

The Timestreams plugin implements an XML-RPC API which can be called by external clients to create sensor reading tables, add readings, metadata, contextual information and timestreams, as well as search for such data. The Timestreams API extends the native Wordpress XML-RPC API so all of the native functions are available as well within the reference implementation. The Timestreams API is built around data-classes describing measurements, metadata, context and documentation.

Measurements contain values at given points in time for instance devices. These are grouped into measurement containers that have associated metadata records describing the data being collected in the given container. Context records help users understand and reason about their data. They describe what was going on at the time that data was being collected, such as the location of the collection and activities that were being performed. In addition to storing time series data, Timestreams also supports the collection of documentation. Such documents are single snap-shot records of engagement activities, such as anecdotes and photographs.

3.3 Federation of Data

Mobile loggers are useful for harvesting data from the local environment but suffer from limited data storage and potentially disrupted network connections. As such, they are not viable for long-term data provisioning. Therefore, the mobile loggers push their data up to corresponding blogs to a

¹<https://github.com/pszjmb1/Timestreams/wiki/Timestreams-API-Documentation>

cloud-hosted WordPress multi-site Timestreams network.

This provides artists and communities self-service capabilities to generate their own functional, globally visible Timestream blog. Each Timestream blog instance has its own identity, theme and content. The Timestreams plugin allows data to arrive at the network from disparate sources and get stored for use by the appropriate community. Data may be shared between blogs using the WordPress capabilities system, to support comparison and conversation between geographically distant communities.

3.4 Visualisation and Data Blogging

Sensor data are made available through the Timestreams platform in the form of data visualisations. A control panel allows users to create a new timestream that is fed from a particular data series - either from a live sensor or an uploaded existing data set - and this controls how the data is played out in an associated visualisation. The control panel allows users to dynamically modify the flow of data to visualisations, changing rates or offsets, or underlying source.

The Timestreams platform provides pre-defined visualisations from charts to more aesthetically imaginative displays that can be connected to data sources and embedded within the blog. Several visualisations can be included to encourage comparison between sites, for example comparing the local and historic climate of Brazil and the UK, and combined with documentation allow users to blog around their activities and data. The API supports the creation and hosting of custom visualisations involving multiple timestreams.

4. FUTURE WORK

Progress to date has focused on developing the Timestreams platform for its initial deployments, and developing supporting activities in collaboration with local schools. In the autumn we will collaborate with a Brazilian artists collective to begin to understand how they make use of the platform as a disruptive technology to engage with rural Brazilian communities. However, we aim that this interaction is primarily a seed activity, and that the platform subsequently remains available and is used by the wider creative community.

5. ACKNOWLEDGMENTS

This work was funded by the RCUK Horizon Digital Economy Research Hub grant, EP/G065802/1.

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