

Bio-creation of Informatics: Rethinking Data Ecosystems in the Network Economy

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Abstract

The evolution of the information society has seen 'data' becoming the most important economic resource of the networked economy, mediated by the co-located and instantaneous access, dissemination and sharing of information amongst people across vast distances. Central to these various transactions that occur in our network culture, there exist numerous policy propositions that seek to regulate the archiving, access, sharing, use and dissemination of data. These policy propositions are often enforced upon users as encoded rules of the informatics of bio-creation, rather than being modeled by the very participants of the network who created the data in the first place - bio-creation of informatics. Furthermore, the design of most policy recommendations that have deep socio-economic and political implications have been restricted to reflecting the views of legal scholars and members of the technology industry, giving little or no room for a larger public discourse that is fuelled by multi-stakeholder approaches. This panel seeks to explore how trans-disciplinary media practitioners and creative art and design practitioners in tandem with information policy activists can address the context of data ecosystems to re-imagine them and at the same time engage members of the general public to reflect and contribute to a larger inclusive discourse that can help re-shape public policy surrounding data ecosystems

Introduction

The relevance of data is not as much because of its value as chunks of information, but because of the ecosystems where data is created, transformed and disseminated that makes it possible to use pieces of information to achieve larger goals. Data ecosystems have the potential to become spaces for positive economic, social and cultural adaptations. However, current ecosystems tend to respond to particular interests that challenge democracy, and radically transform our reach as autonomous individuals, citizens and members of socio-cultural groups. We will look at these scenarios through the lenses of ownership, privacy, transparency, openness and choice of individuals. Furthermore, we will elucidate the role of creative practices in designing data ecosystems that are inclusive and allow the public to contribute. Cultivating cultural participation in collective electronic spaces and shared knowledge in the networked realities of hypermedia meshwork is the foundation for an ecology of information.

Provocations for the panel

The Panel situates itself across trans-disciplinary modes of enquiry, shifting gears between policy and design factors that influence infrastructural and informational aspects of the network society while dealing with multiple provocations: How can we shape ecosystems that mediate flows of information and data in a decentralized and self-governed manner? How can we create mechanisms for data ecosystems to be mutable and capable of infinite expansion? Can there exist different networks that are mutually incompatible with each other, encoded by specific group of users? How can the often concealed inner-workings of infrastructural components and processes behind user interfaces be exposed, so that best practices of data sharing, privacy, and intellectual property decisions be encoded into the design tools for creating data ecosystems?

Further, the panel underlines the importance of developing an informed art and design practice that takes into account communication policy recommendations needed to tackle and comment on the desirable state of data ecosystems. A set of provocations to this end includes: How should we rethink the right to participation in the digital age? How can we balance notions of privacy and transparency while understanding the involvement of users in a data ecosystem? What are the implications for data policy, when shaping networks that involve users with access to digital devices and code literacy and those without? What are the socio-cultural implications for technology policy law and data protection laws, and how often are they considered by top-down replications in global policy? These are but some of the provocations that the panel seeks to answer across four papers that give ample room to invite diverse points of view from the audience

Civic Media & Data (h)ac(k)tivism: Environments, tools and practices for critical data+code literacy and visualization

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This paper is one of the contributions to an academic panel titled: "Bio-creation of informatics: Rethinking data ecosystems in the network economy". The panel seeks to explore different approaches for trans disciplinary media art and design practitioners in re-imagining data ecosystems and at the same time engaging members of the general public to reflect and contribute to an inclusive discourse that may re-shape public policy surrounding data ecosystems, from the lenses of ownership, privacy, transparency, openness and choice of individuals. The panel is moderated, co-authored and edited by Catalina Alzate.

Abstract

A responsible data-driven environment must consider data as a political human construct, and be spaces for empowering citizens. One important aspect of citizen empowerment involves prototyping of tools and practices that challenge hierarchies, by blurring binary constructs like author / lector, developer / user, document / data, binary application / source code. On this line of thought, a set of tools and practices will be described that look at data from a critical perspective, contrasting the neutralized "Hello world" approach to technology learning, and allowing the emergence of diverse communities of authorship. The tools blend code, document, data, query and visuals, and propose strategies to make the source code and history of all digital artifacts open to share, for improving the traceability of data and data derived arguments. I call them "pocket infrastructures" because they are self-contained, work online and offline and run on modest common technologies, from USB thumb drives to modest laptops and anything in between and beyond. These infrastructures try to put data in "everyone's pocket", contrasting sharply the exclusionary 'cloud', 'big data' & 'always connected' discourses, where infrastructure can be owned only by the ones with "deep pockets". This tool and its related practices are in dialogue with other approaches like the feminist data visualization (D'Ignazio and Klein 2016), literate computing (Perez and Granger 2015) and reproducible research.

Keywords

Citizen empowerment, Prototyping tools, Open infrastructures, Data visualization, Data narratives, Data activism, Hacker spaces, Democratization of technology, Knowledge commons.

Introduction

With the aim of exploring reciprocal exchanges between communities and digital artifacts, and using design as critical enactive knowledge, I have been iterating on the question "How can we change the digital tools that change us?" or how to enable the reciprocal modifications between digital tools and communities? Approaching that fuzzy problem from a design research perspective implied to inhabit a particular community, in my case, HackBo in Bogotá Colombia, and to use prototypes to explore and communicate the problem (Saikaly Fatina 2005). Aiming to explore the direct relationship between design epistemologies and enactive knowledge (understanding by doing in a context), this text will present a historic development of that understanding process in dialogue with other theoretical approaches (design research as a reflexive practice). This reflexive trace of history would hopefully bring light upon this kind of contextual research by de-neutralizing the results and connecting them with the process that create them. At the end some provocations will be provided to connect these particular experiences with areas across bio-creation, data and power.

Historical perspective of HackBo and the beginning of Grafoscopio

Hackbo is a hacker space in Bogotá exploring community engagement with a set of iterative digital artifacts and practices around them to challenge the deconstruction of the binary divide between those who made them ("coders") and those who use them ("end users"), and to find out if such processes were relevant in a hackerspace where most people are familiar and proficient with coding.

In the beginning (from late 2010 to early 2013) I tried building digital habitats (Wenger, White, and Smith 2012) by using web technology (wiki and customized Content Management Systems CMS), but the HackBo community's approach to them was mostly operational: the most used feature of the CMS was the one that allows to schedule face to face activities in the hackerspace. Some other parallel explorations about using CMS to publish data notebooks were made from 2013 to early 2014 with some participants of the hackerspace (Luna 2014b)(Luna 2014a)

But at some point in late 2013 the HackBo hackerspace was a focal point of resistance against gentrification of the hackathon (a prototyping by coding marathon) by the private and public sectors, with the implementation of the now common and oversimplified "social problem solving hackathon" (Lilly Irani, n.d.) the HackathonGEL. The proposal of a counter-hackathon (the Gobernaton (Luna 2013)) contextualized the hackathon as a performative act of civic critic and dialogue with public and private sectors and from there the idea of storytelling with data (particularly the integrity codes called hashes, of the contracts for the execution of the HackathonGEL), brought some light over these alternative ways of data activism that could survive the volatility of hackathon prototypes. Techniques, infrastructures and knowledge to support data storytelling as a form of critical dialogue to deconstruct power, will last longer than the "app" or "social network" or "uber for" monocultural approach that has been built in the "social innovation" hackathon model.

Grafoscopio, a moldable tool for literate computing and reproducible research evolved from there with the companion Data Week, a recurrent hackathon/workshop where attendees learnt how to use and modify Grafoscopio to create data visualizations and tell stories with data. Both can be seen from the duality of experience (participation/reification) proposed by Wenger (1999): participation produces artifacts that enable (or not) future ways of participation and introducing feedback in the design cycle. The participation in the HackBo and Pharo communities created Grafoscopio¹, (as detailed on Luna (2014)), and the existence of such an artifact allowed for the creation of the Data Week, to extend and deconstruct Grafoscopio and other digital related artifacts. The design issues behind such a duo are considered below.

Critical instances of Grafoscopio

Grafoscopio crystallizes design positions belonging to the free 'libre' open source software (FLOSS) communities that are in dialogue with several authors: technologies as political devices (Langdon Winner 1989), code as an exercise of freedom of expression (Coleman 2013), knowledge as a commons (Ostrom and Hess 2006), and software as a craft that embodies design experience and allows research through design (Blackwell and Aaron 2015). This way of embodiment draws on several sources and concerns reflected in the activities that Grafoscopio supports: deconstruction and extensibility of tools, open educational resources, alternative educational practices, non-hegemonic places, discourses and practices for knowledge, activist objects, reproducible research, garage and citizen science (early documentation of them are in (Luna Cárdenas 2014))

Grafoscopio is also 'a pocket-infrastructure' (explained in the abstract of this paper) and is based on Pharo

Smalltalk, an environment that blends together source code, application, software development environment and adds/blends in the idea of interactive notebooks. On the other hand, Grafoscopio tries to mix ideas of Leo Editor, Jupyter/IPython notebook and Mathematica, by creating an interactive documentation environment with a tree-like (outliner) interface that organizes the document, giving it sequence and hierarchy.

Iterative design circumstances in the Data Week

Given that the Data Week was related to data activism, storytelling and visualization, participants were generally interested in acquiring new symbolic and visual languages and knowledge to represent their concerns. Attendees came mostly from outside the core community of HackBo, including increasingly diverse lines of practice: journalist, teacher, philosopher, researcher, student, philologist and activist.

The roots of data activism from the Gobernaton were evident in the deployment of a critical approach to data and code literacy by choosing themes related to government transparency, like the political public discourse on Twitter and awareness of our own Twitter discourse with the implementation of Twitter data selfies (Luna Cárdenas 2016).

The above practices and artifacts took a critical approach to data, code literacy and visualization. Our curriculum included: a historic approach on computational traditions (comparing the Unix tradition and the Smalltalk/Dynabook ones), design as the study of bifurcation points (Jonas 2007), linking tradition to our present understanding of computers as cognitive devices that can help us into putting into dialogue different representations to understand and express a problem -- particularly symbolic (code), graphical (visualization) and quantitative (data) representations, the relation between technology, politics & power, moldable tools, Smalltalk/Pharo learning from basic syntax to medium scripts to finally tackle an open problem (the Twitter data selfie).

Participants consistently reported a change from understanding technology as a given, to recognizing how technological systems can be constituted by more fluid devices. The idea of coding as storytelling instead of a practice to build apps or websites seemed more plural to most of them, although they recognized that as a form of literacy it does take time to acquire. Some questions remain to be used as future provocations, and have been outlined in the next section.

Provocations on bio-creation, data and power

How can we foster a dialogue around socio-technological artifacts and practices in a permanent and powerful way, including institutional setups in academia, government and enterprise, without being co-opted by them? Is data at the service of bio-political forms of surveillance and control,

¹ Pharo provides the Technology ecosystem behind Grafoscopio.

the quantification of existence and the creation of equivalences between what exists and is visible, and between what is visible and what is measurable? If this is the case, how can alternative metrics, dark information (as a metaphor/analogy with dark matter and the relation between visible and invisible), and data activism propose alternative ways of governance, fluid power structures and hierarchies for a more plural and open society?

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Author Biography

Offray Luna-Cárdenas is a long time hacktivist for knowledge and culture as common goods and digital technology as a particular embodiment and enabler in several fields: Free Libre Open Source Software and Openness in Data, Science and Reproducible Research, Educational Resources and Government & knowledge management. His undergraduate degree was in Informatics-Mathematics, Masters in Education and a PhD(c) in Design and Creation. He is a founding member of the HackBo hackerspace in Bogotá (Colombia) and is working on the reciprocal modification between communities and digital artifacts, by building and bridging critical code+data literacy and visualization, as well as community practices with moldable digital artifacts and pocket infrastructures. He works as a consultant, coder, teacher and researcher.

Data and Public Policy: An approach to data ecosystems from a Human Rights perspective

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This paper is one of the contributions to an academic panel titled: "Bio-creation of informatics: Rethinking data ecosystems in the network economy". The panel seeks to explore different approaches for trans disciplinary media art and design practitioners in re-imagining data ecosystems and at the same time engaging members of the general public to reflect and contribute to an inclusive discourse that may re-shape public policy surrounding data ecosystems, from the lenses of ownership, privacy, transparency, openness and choice of individuals. The panel is moderated, co-authored and edited by Catalina Alzate.

Abstract

The public policies that encourage the implementation of infrastructures for data management are mostly adopted by governments with great technological enthusiasm, leaving aside the notion of human rights and potential effects for freedom of expression, privacy, inclusion and security of citizens. The government of Colombia encourages spaces for citizens participation like public consultations, in order to include people in the design of policies that can dramatically modify the way they interact with other citizens and with the state.

In this paper two examples that look at policy for data infrastructures will be discussed for researchers and information artists interested in public interventions and engagement. 1) The discussion around the copyright reform, as part of the implementation of the FTA (Free-Trade Agreement) of Colombia with the United States. 2) The implementation of cell phone registry as part of the strategy against mobile theft in Colombia. As a civil society organization, our advocacy strategy has included creating or taking advantage of participative spaces to introduce new narratives into public policy.

Keywords

Internet policy, Human rights, Data infrastructures, Freedom of expression, Privacy, Inclusion, Copyright, Cell phone databases, Citizen engagement, Advocacy.

Introduction

The promises and benefits of Information and Communication Technologies (ICTs) and particularly the Internet, are gaining special attention because of their potential to enhance interactions between the citizens and the state. However, when it comes to analyzing the design of infrastructures that support such interactions, the impact of ICTs regarding human rights are either underestimated or governments fail to estimate the degree of

consequences that in many cases entail hindering the very access of people to governance and their possibility of achieving full citizenship.

In Colombia, where the most prevalent relationship with technology is instrumental, meaning that technology is used but not created, and that knowledge is transferred but not appropriated, the scope of introducing ICTs on society is not predicted and the impact of such technologies is not measured. A common belief is that introducing technologies in the *citizen - state* equation, will benefit people and the system in evident ways: less time spent in legal procedures, less use of paper and greater control of official processes. These assumptions reveal the general lack of knowledge both in governments and in the society about the design of technological platforms, the management of information and the roles that these platforms suppose people to adapt: merely as passive users.

There are particular manual requirements for the generation of public policies that take into account the necessary discussion about the design of infrastructures and platforms that manage large amounts of information of citizens, as well as the inclusion of participative mechanisms for citizens to contribute to the evaluation and the design of requirements for these platforms. In the general framework of these discussions a frequent reference is made to 'the *respect and promotion of human rights*', but what this implies for the construction of public policies is still uncertain. Beyond introducing analysis of security and privacy risks, the design of public policies in Colombia suffers from a profound gap in terms of approach to human rights, that could allow governments to measure impact and evaluate the scope of the introduction of ICTs in the interactions between government and citizens in the short, medium and long term. Above all, it is necessary to re-think the future implications of collecting, storing and managing vast amounts of information that circulate through these platforms.

This paper introduces two case studies where it is possible to trace the need to explore the relationship between the design of the platforms and human rights challenges emerging in a digital context.

Case study 1. The discussion on copyright, access to knowledge and culture and the challenges to freedom of expression

The right to freedom of expression contemplates not only the possibility of individuals to express their opinion, but also the right to access information to understand the world around us. This dual character of freedom of expression is permanently in tension with other rights. This is the particular context of copyright.

In its conception, copyright is born as an exception to the right to access knowledge and information, recognizing the role of authors and artists in the creation of culture and granting them with the monopoly of commercial exploitation of their works for a limited period of time. In theory, after the lock-in period determined by law, all works become part of the public domain and therefore of the universal cultural baggage. Once the works are located in this realm, they can be freely used by anyone. Some of the concerns for public policies developed in copyright laws include: when and how works move into the public domain, in which cases or under what requirements can such works be used by others before being in the public domain and how can authors and artists control access to their work when they are still under their ownership? Even though the issue of access should be central to the discussion of these policies, the commercial interests and the heavy lobby of large corporations that own the title of the works (and therefore the rights of commercial exploitation), have tipped the balance towards protectionist policies of the rights held by authors, harming the open access to knowledge, which is a central aspect for achieving freedom of expression.

Designed for the world of atoms and not for the world of bits, control and access in the digital world simulate the depletion of the tangible by creating mechanisms of artificial scarcity, as it is in the case of the technological measures of protection. The extensive use of these measures is encouraged through their incorporation into the copyright law in the United States (Digital Millennium Copyright Act MCA) and the exportation of this model through free-trade agreements (FTA) to countries like Colombia.

As in all negotiations, there is a margin for local implementation and the adaptation of national laws. This particular process could be highly enriched with active participation of citizens. In the case of Colombia, the implementation of the free trade agreement with the United States includes the need to adapt the national copyright law and incorporate on it a chapter on technological measures of protection that without proper balance can result in a huge barrier for accessing knowledge. There have been two reforms to the copyright law in Colombia: On the first case, the law was approved by the congress but declared unenforceable by the Constitutional Court. On the second occasion, the law was archived without debate.

For the second reform, Karisma Foundation requested the government of Colombia for a space of participation where citizens and experts from different disciplines could contribute to the debate. The request was made by the collective “RedPaTodos” and was effectively opened up by The Ministry of Commerce¹. After providing feedback and comments, the same copyright project was proposed again a couple of years later by the government, without the comments being addressed. Even though it is possible to open up spaces for discussion, there is scope for creative practitioners to intervene in communication strategies that can involve more citizens, and come up with strategies to escalate the comments and increase the effectiveness of the feedback between civil society organizations and governments.

On this line of thought, there are also several fields of investigation and dialogue where artists can adopt active roles of participation and contribute to the gathering of detailed information to model public policy. Given that current policies are being designed without considering their consequences, there is scope to explore with citizens the balance between copyright and freedom of expression. There is also a clear need for collecting data to clarify the following provocations: What are the effects on freedom of expression of increasing the term of copyright protection? How does protection time affect the dynamics of production of new works and how does it affect growth and use of the public domain? How much public money is spent on paying for access to information that should be publicly accessible (such as research results or state-funded educational resources)? What is the scope of promoting access to community information such as libraries and cultural centers and how much of the budget is spent on licensing?

Elucidating answers to these provocations through artistic and public engagement will greatly contribute to discussions regarding public policy and copyright, and to support arguments on favour or against particular regulatory proposals.

Case Study 2. Cellular databases in Colombia: Underestimating their scope as massive surveillance systems

The cellular registration system in Colombia is considered a strategy to prevent cell phone theft. However, due to its design and characteristics, it can easily become an instrument for massive identification and surveillance of citizens, available to the reach of any authority.

¹ The request to the government can be found on this link: <https://redpatodos.co/blog/mesas-de-trabajo-con-mincit-para-leylleras4-apuntese/>, and its results on this link: <https://redpatodos.co/blog/mesas-de-trabajo-con-mincit/>. The comments to the several versions of the copyright law can be found here: <https://redpatodos.co/blog/vuelve-la-burra-al-trigo-leylleras-5/> (all the links are in Spanish).

In order to use any mobile device in Colombia, the International Equipment Identification Number (IMEI) must be registered on a centralized database. Each mobile phone operator not only registers this number to the database, but also includes a set of personal information about the user: the number of the operator's subscription (IMSI) and the line number (MSISDN). Mobile phone operators also create a database of the mobile phones that have been reported as stolen or lost, in order to disable such devices. These two database bases are delivered from the Mobile phone operators to a third private party called "Informática El Corte Inglés", which is commissioned by the country's operators to centralize, store and manage all the databases provided by the operators. As a result, there are currently two centralized data bases: Positive (contains information of all devices that can be used in the country) and Negative (devices that have been disabled). This same company, by law, must give access to this information to any authority.

The databases described are used for a variety of purposes like controlling the legal validity of devices that are being used by people, and other processes that require the operator to disclose phone numbers that are making or receiving a call, location and time of particular calls. The centralization of this information is highly problematic for ensuring privacy and security of cell phone users: from the databases, it is easy to infer the name of the user and other personal information. As a result, the ecosystem does not allow for anonymous communication amongst citizens, violating the right to self-expression, for which anonymity must be protected.

According to the current regulation, any authority can access information from the databases without an order from the Court. This provision is not constitutional, since access should be authorized by a judge, and granted only in cases of criminal investigation. In addition, the verification procedure uses very sensitive data and metadata that can be used to profile a person's activities and preferences. Even though it has been established that access to communications metadata enhances the state's capacity of surveillance, the lack of control over access to this information opens up the possibility of abusing the infrastructure especially as it is centralized.

In terms of spaces for dialogue with citizens, the regulations regarding cell phone databases in Colombia have been subject to numerous modifications which makes it difficult for civil society organizations to find the time and space to hold public debates. On this scenario, Karisma Foundation has invited delegates from the Commission for Communications Regulation to join the conversation about particular research projects conducted by the organization. On this regard, as it was established on the first case study, there is a need for joining efforts of different practitioners to create spaces for socialization and for effective communication of public opinion.

As creative practitioners, artists and members of the general public, we need to be less complacent with technological solutions and more critical and reflexive about their consequences, especially when it comes to protecting the privacy of citizens and favouring the access to information and culture.

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Signal Territories, Infrastructures and Intermediaries: New interfaces for Art Science and Communication Policy

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This paper is one of the contributions to an academic panel titled: "Bio-creation of Informatics: Rethinking data ecosystems in the network economy". The panel seeks to explore different approaches for trans-disciplinary media art and design practitioners to re-imagine data ecosystems and at the same time engage members of the general public to reflect and contribute to an inclusive discourse that may re-shape public policy surrounding data ecosystems, from the lenses of ownership, privacy, transparency, openness and choice of individuals. The panel is moderated, co-authored and edited by Catalina Alzate.

Abstract

This paper shifts the critical focus away from the aesthetics of fetishized interfaces of access amplified by today's networked consumer technologies, towards invisible broadcast infrastructures and data ecosystems that exist in demarcated 'signal' territories that harness the natural resource of the wireless electromagnetic spectrum (Parks, 2013). At the outset it calls for the need to revisit the role of the public as an active contributor to conversations in the broadcast media sphere and how as a practicing transmission and information artist, one may contribute to this goal. It takes a closer look at the nature of media infrastructures to bring to focus new trans-disciplinary fodder that exist for rigorous art-science interventions that explore the role of broadcast archives, network intermediaries and the transnational lines that they traverse. In the first section, it presents the history of contentions that the science and practice of public transmission is embroiled in. Next, it looks at other opportunities and hooks for public engagement with broadcast media that provide various entry points to engage in public discourse. Finally, the paper makes a theoretical contribution by introducing a new trans-disciplinary lens to look at network intermediaries in order to explain various dynamics that occur in the physical and social transmission and mediation of information.

Keywords

Transmission Art, Spectrum Policy, Broadcast Media archives, Intermediary Liability, Art-Science, Public Engagement.

Signals, Transmission and the Public

The wireless spectrum, unlike other exhaustible and geographically specific commodities is an infinite natural resource of the commons, currently circulated as a mobile currency 'guaranteed' and produced by owners of communication infrastructures, who play a central role in mediat-

ing data transactions as well as media dissemination in the public sphere.

Walter Benjamin in his 1930 reflections on the medium of broadcast communication infrastructures (Benjamin, 1999) underlined the fundamental separation between the practitioner and the public that the system had perpetuated, thereby alienating individuals into passive listeners rather than active contributors to a real-time conversation - "...the public has become quite helpless, quite inexpert in its critical reactions, and has seen itself more or less reduced to sabotage (switching off). There has never been another genuine cultural institution that has failed to authenticate itself by taking advantage of its own forms of technology - using them to create in the public a new expertise." It was in the interest of broadcast media he claimed, to empower the public to contribute to conversations in which anyone might have a say. Heavy regulated ever since its tactical use in wartime communication, large chunks of the wireless spectrum have been administered through various licensing mechanisms for human telephony, broadcast media, satellite communication and military systems. However to celebrate the spirit of open science by early wireless experimenters who fostered inventions and innovations in the field of wireless communication, a number of licensed as well as de-licensed frequencies have been designated to these science and citizen communities. These include reserved bands for radio-astronomers in various ShortWave and Microwave spaces as well as bands of 1420Mhz and 1667Mhz where the Universe's neutral Hydrogen line is transmitted. Amateur radio (HAM Radio) bands, including the de-licensed citizen band at 27Mhz are reserved for the community of licensed amateur practitioners where some of the most groundbreaking innovations as well as artistic works continue to happen. With old technologies like analog TV and commercial FM radio being discontinued, previously allocated frequencies have been de-licensed and given to industry players for commercial and artistic exploitation. One such phenomenon is ubiquitous computing (also dubbed 'the internet of things') that has gained widespread attention creating large scale mesh networks of micro nodes that transmit information on many de-licensed frequencies. The central question being argued for by policy makers is the efficacy of dynamically allocated spectrum using universal machine protocols to facilitate multi-

ple transmitters requesting to access the spectrum when it is free, rather than top-down service specific and inefficient allocation by spectrum auction.

While bringing aboard the practice of working directly with the medium of broadcast to create experimental interventions in the public sphere does reduce the gap between practitioner and the public, the question is to seek ways or hooks by which members of the public play a primarily active role in contributing to the larger discussion on communication policy and media. The ecosystem of Broadcast News media provides us with one such opportunity for public engagement with art, data science and policy, which has been dealt with in the next section.

Nature of the broadcast medium (and of archival propensity)

The practice of radio broadcasting entering the field of journalism and dissemination of News created what came to known in the 1940s as the Press Wars between radio broadcasters and print media publishers that included newspapers and magazines. Ephemerality and co-located simultaneity are central to the nature of broadcasted media (be it television or radio) -- a feature that markedly differs from the permanence of print, further underlined by the creation of such temporal hooks for public engagement such as 'Prime Time', 'News Night' and 'Late Night Live'. As with any momentous event or fleeting occurrence is born a need for physically storing and remembering its immediacy, it can be argued that a similar need is felt by a discerning viewer or consumer to negotiate the immediacy of an eventful media broadcast (Newbold,2013). By this act of archiving, he transcends into a new role as an invested consumer of the medium and a custodian of the stored broadcast content.

The most substantive instance of this, apart from the 'selfie-archives' of today, dates back to the early 1950s when there emerged a band of creative practitioners who engaged in what has been called armchair photography or TV video portraiture, a widespread trend overlooked by most media historians (Newbold,2013). Articles related to photographing television broadcasts appeared across many popular magazines and newspapers since



Fig1: DIY Decametric antenna for SW news broadcast reception (Chandra, 2014)

the late 1940s, elucidating techniques to acquire the best 'live' image and how to display TV photographs as markers of technical excellence and sociocultural value. Around the same time, emerged a new generation of hobbyists dubbed 'SWLs' or 'Short Wave Listeners' who used inexpensive World Band Radio receivers to listen to and archive news and entertainment broadcasts.

In order to gain a well-rounded perspective of an issue, it might be necessary to be able to access and analyze connected artifacts present in a media archive over a period of time. This is partly due to the opportunistic nature of the medium in which sound bites of broadcast news are delivered in fragments and does not allow the public to comprehend the meta-history of complex issues and all the different points of view in a single instant. This fact is well elucidated by Geoffrey Baym in his seminal book that covers the evolution of the broadcast medium (Baym,2010). Baym cites media historian James Carey's allusion of news media being 'hot light' and just as the same object appears different in varied lighting conditions, so does the 'hot light' of different news items create varied interpretations of the same issue.

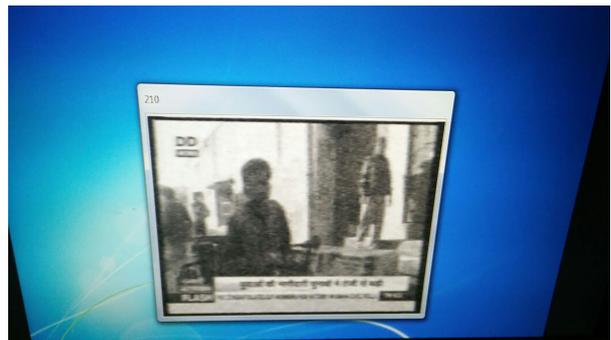


Fig 2. Digital archiving of Local Analog TV Transmissions for Media Analysis using Machine Vision (WYDSIWYG, Sharath Chandra Ram, Video Vortex XI @ Kochi Biennale 2017)

What might be the design of a broadcast archive that facilitates this sort of large-scale content analysis and opinion mapping to extract narratives from broadcast media into the contemporary information arts and society context? What other modes of interventions in virtual sphere and offline contexts using communication technologies maybe used to gather public opinion and encourage the social transmission of information within communities?

Fuelling Maxwell's Demons in the Networked Society

The role of intermediary induced bias in a neutral network is now the center of the net neutrality debate. The author has previously outlined (Chandra, 2013) the role of intermediaries in communications networks marked by the significant invention of the Automatic Telephone Exchange (Strowger switch) by Almond Strowger, an undertaker by

profession, who came to realize that the reason he received fewer phone calls was his business competitor's wife who was a telephone operator, preferentially routed all callers seeking Strowger's funeral services to her undertaker husband instead. The advent of packet switching followed by the rise of the Internet started a long drawn feud between owners of services that generate packets of information and the underlying physical infrastructure that facilitates the seamless routing of information bits amongst nodes connecting users.

This paper contributes to a new lens of art-science and policy enquiry by drawing a parallel between the dynamics of transactions occurring within intermediaries (that consist of both physical infrastructures as well as social infrastructures) and the thought experiment of Maxwell's Demon from the literature of information, entropy and thermodynamics. There is always a 'cost' related to reducing entropy in a system, and in the 'self-routing' communication networks of today this has come to bear an 'informational cost' required for the temporary storing, transmission and erasure of networked data. At times when the cost of temporary storing and erasure of transactional data is not justified, an accrued value is created by mining patterns from a long-term storage of big data. Opening the potential of big-data analysis to public reduces its hoarded value in the hands of owners of network infrastructures, but on the other hand has the potential for new knowledge to be mined.

An example of this is the author's media art project titled 'Traffic'- Traffic Dabolim/Traffic Joga 2015 contrasted the time synchronized nature of data transmission seen in the wireless spectrum employed by intermediaries (navigation of military acrobatic pilots at 118Mhz AM Band, and the navigation of civilian aircrafts in aerospace at 1090Mhz by human operators in the air and ground control station). This data archived over a long time, reveals statistics such as peak time of arrival and departure of aircrafts, and airspace occupancy patterns, that is useful for the future of aviation transport policy as well as optimal logistical planning of high value cargo services.

Further exploring alternative forms of information access, networked delivery of information and re-appropriating communication technologies into new contexts, has the potential to disrupt established intermediary driven power imbalances. For instance, alternate low cost community owned 'offline' infrastructures using open spectrum devices and antennas to access and archive GIS satellite climate imagery within fishing communities (Chandra 2016), was found to compete with the subscriber based weather update and market delivery systems promoted by mobile phone operators to profiled individuals in the same community.

In conclusion, this paper calls for new approaches in critical making methodologies that take into account the intersection of law, technology and society to facilitate art and design interventions that expose and disrupt the role of intermediaries in our data driven ecosystems and also en-

gages the public for influencing policy makers. This paper is being written at an important time when the 2017 US Senate has voted against a 'broadband privacy law' that will soon enable Internet Service Providers to sell user data to advertising companies without the permission of users, a turning point in the way bio-created data ecosystems will lead to a self-perpetuated trans-national undermining of human rights and media consumption.

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Author biography

Sharath Chandra Ram's (Sharathchandra Ramakrishnan) practice and research interests lie at the intersection of law, technology and society with a focus on Open Education (Open Science and Open Hardware), Open Spectrum, Citizen Science and ICT4D. As a licensed amateur radio broadcaster (callsign: VU3HPA), he is actively interested in communication policy research, radio astronomy, extends his art-science practice as a transmission artist and has installed his sound and multimedia work in several national and international avenues. He is currently Faculty at the Srishti Institute of Art Design and Technology at the Centre for Experimental Media Art and the Information Arts and Information Design Practices (IAIDP) Program.

He engages actively with the local open source and policy research community at the Centre for Internet and Society and organizes the annual NASA International Open Data Challenge at Bangalore. Previously he has worn many trans-disciplinary hats from being a cognitive neuroscientist, a Software Engineer to being a radio journalist.

Democratization of Data: The case of Internet of Things (IoT)

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This paper is one of the contributions to an academic panel titled: “Bio-creation of informatics: Rethinking data ecosystems in the network economy”. The panel seeks to explore different approaches for trans disciplinary media art and design practitioners in re-imagining data ecosystems and at the same time engaging members of the general public to reflect and contribute to an inclusive discourse that may re-shape public policy surrounding data ecosystems, from the lenses of ownership, privacy, transparency, openness and choice of individuals. The panel is moderated, co-authored and edited by Catalina Alzate.

Abstract

Given the rapid adaptations of technology and the heavily corporatized world that manages data at large scales, users, especially those without technical knowledge, are losing control over the decisions they can make when interacting with digital devices, amplified by recent phenomena such as the Internet of Things. However, there is a lot of potential in allowing spaces for users to create or adapt their own technologies as a way to reclaim control over their data. Analyzing and discussing the role of the user as a creator, and not only as a consumer, is crucial for creating discourses of empowerment and democracy. Treating technology as if it were autonomous is the ultimate self-fulfilling prophecy. There is no difference between machine autonomy and the abdication of human responsibility (Lanier, 2010).

As a result of the interest on this subject, the Hypermedia Laboratory of Technologies for Communication, at Fundación Universitaria Los Libertadores (Bogotá, Colombia), earlier this year began a research project ‘Controller for IOT devices’. A free and open-source authoring tool, that allows users to control content, data or electronic devices from a web browser or mobile application making use of a low-cost Wi-Fi module. The aim is to democratize this technology, so it can be used by people from different disciplines including design, art, journalism and other social and human sciences rather than STEM (Science Technology Engineering and Mathematics) disciplines only.

Keywords

Internet of Things, Authoring tools, Open-source software, Responsible data collection, Interoperability, Wi-fi modules, Low cost infrastructures, Creative practices.

Introduction

The aim of the ‘Controller for IoT devices’ project is to empower non-expert people to use the Internet of Things

technologies as an actionable alternative expression of their creativity with the potential to influence data management and control. The project expands to the creation of free and open-source environments and authoring tools with intuitive interfaces. Concepts and methodologies of Citizen Science, Do It Yourself and Do It With Others are an effort to contrast the monopolization of data from the hands of big corporations and government bodies, being also potential tools to influence policies regarding data ecosystems. As pointed out by the renown media theorist Kurenniemi: “Technology won’t take control as long as man can misuse it.” (Kurenniemi, 2003).

Motivations

The intention of this paper is to elucidate alternatives to current closed source authoring tools that are primarily targeted to people with knowledge in programming, leaving little or no room for non-programmers to adapt and explore the potential of such tools. By challenging the notion that considers the creator and the user of technology to be two separate entities, the authoring tool project brings together both aspects of technology production and consumption to the hands of creative practitioners without the need of in-depth knowledge of low level programming. The outcome is to facilitate understanding and engagement with custom IoT applications for controlling content, data and electronic devices remotely.

We have identified particular needs in the academic sector of Colombia, which calls for an integration of conceptual, creative and practical skills in order to enhance current interaction design and strategic design metaphors in the fields of information and communications technologies. The challenge for the implementation of our project in an academic environment is to cultivate the values of open innovation as a premise for the generation of knowledge, and move towards the seamless transfer of technological skills and information within a community of makers.

We see great potential in including these tools as part of communication strategies, where artists, designers, journalist and related fields can make use of this technology as raw material for the development of communication projects. This project is based on the model of open innovation that happens to be the main

philosophy of operation at the Hypermedia Laboratory of Technologies for Communication.



Figure 1. Recreation of the demonstration by Ilett (2015) in his project: "Web Enabled LED - WiFi Internet-of-Things IoT." Using the LUA programming language, he was able to control from a web page, electronic components connected directly to ESP8266 low power low cost module.

Expanding the scope of the 'Internet of Things'

One case study of the 'Controller for IoT devices' was deployed under the name of ATOMIC Authoring tool in 2009, a free software for Augmented Reality developed by Cuartas (2009), for non-programmers to create Augmented Reality applications in a few steps. At the time of deployment, these tools challenged mainstream modes of production which required vast amounts of programming. The ATOMIC Authoring Tool is a multi-platform software, written on the Processing platform and licensed under the GNU GPL V2.

Borrowing from this experience with Augmented Reality, the current 'Controller for IoT devices' project focuses on the Internet of Things and the ubiquitous computing phenomenon as the area for intervention that has a wide range of applications for citizen science as well as art and design. While controlling devices at home, and receiving data from sensor networks in 'Smart Cities' are mainstream applications, we propose to the use of this technology in creative practices to transform traditional ecosystems like journalism and public communication systems, and other artistic and creative projects that require designing infrastructures for collecting data.

Investigating closed, open and interoperable architectures

The open source ecosystem has always contributed to the implementation of interoperable architectures that allow for two disparate entities to communicate, as Golan Levin in his critical making research saw the need for 'universal building blocks' to link and make interoperable toys made by LEGO and another competitor with a different design patent. Similarly, democratization of essential firmware is needed to co-operate ubiquitous computing architectures, for artists and designers to explore more possibilities and interconnections.

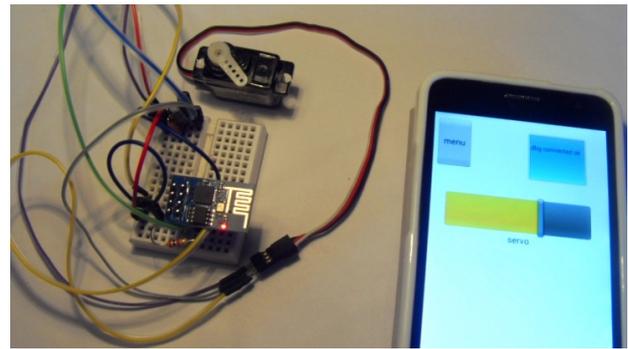


Figure 2 (above) depicts a project inspired by the simplicity of the demonstration made by Ilett (2015) in his project called: "Web Enabled LED - WiFi Internet-of-Things IoT." In which using the LUA programming language, he was able to control from a web page, a lightbulb connected directly to ESP8266 module, a breakthrough in low cost Wi-Fi modules with an inbuilt microcontroller (as detailed in Follower (2014), that has transformed the role of art-scientists ranging from bio-hackers to the balloons of astrophysicists working in trans-disciplinary teams.

Another parallel movement that has gained global participation is the LoRA Alliance. LoRaWAN™ is a Low Power Wide Area Network (LPWAN) specification intended for wireless battery operated nodes in a regional, national or global network. Operating on a variety of de-licensed wireless frequencies they are able to form a mesh network of distributed sensors and interface nodes in a city.

While many countries are currently planning on standardizing M2M (Machine-to-Machine) protocols as part of nationalized grids and smart cities, others including HongKong, who have an active cyber-security program and strict telecom policy and spectrum allocation have displayed caution and deemed such implementations illegal. The problem of privacy encroachments and cybersecurity is even more amplified with the use of closed source hardware and firmware as is seen now in various Chinese manufactured phones that have an inbuilt hardware trojan in its hardware design that sends user data back to servers in China. The recent Mirai IoT Botnet and more sophisticated attack vectors being planned, further raises questions about the security of IoT networks and devices, even if they may have been built upon open standards of trust and assumed negotiations between intermediaries in goodwill.

The IoT ecosystem is currently an inevitable behemoth catalyzed by the IPV6 roll out that allows billions of devices to be assigned IP addresses to allow them to be connected onto the internet. Most deployments by the State (in tandem with commercial startups) have been top-down implementations with a revenue generating model that is heavily dependent on the mining of Big Data. This paper points out to future directions for artists, designers and creative practitioners to be well aware of dynamics of data

exchange that occurs at IoT interfaces, as well as intellectual property regimes that control the use of IoT hardware and software, in order to effectively contribute human centric design decisions that are democratic and inclusive – a process that is completely lacking in the silicon-valley ethos of technologically driven innovation today.

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Author Biography

Jose Cuartas is a visual designer and PhD candidate in Design and Creation at the University of Caldas (Manizales, Colombia). He is a full time professor in the Graphic Design program and director of the Hitec Lab (Hypermedia laboratory of Communication technologies), at Los Libertadores University (Bogotá, Colombia). Jose is a promoter of the use and development of free technologies in the field of art, design and entertainment, with experience in hypermedia programming and creation of interactive installations. Some of his research areas include tangible and perceptual user interfaces; specifically, he has several developments around the Augmented Reality technology, such the ATOMIC Web Authoring Tool software and the ATOMIC Authoring Tool software, developed with the support of the Center of Experimental Media Arts, at the Srishti Institute of Art Design and Technology in Bangalore, India.