Crafting Data Stories

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Abstract

This paper will discuss a recent workshop demonstrating research that looks into the possibility of making connections between physical, crafted artefacts and graphical data visualisations. The work investigates the design of tangible objects as a representation of digital information, a rendering in physical form. It questions whether the 'crafting' implied in the work occurred before or during the creation of the physical artefact to explore how technological forms can also be crafted.

Expanded Craft

The notion of traditional, material craft practice is shifting to embrace new directions that work across media and through digital networks. This expansion includes objects that incorporate techniques, tools and processes from electronic and digital domains, and integrates knowledge associated with these fields. Increasingly, physical, tangible pieces are the product of more than one individual. They are the result of several people using their combined skills to connect what might be perceived as disparate ideas and working practices. The work explores digital and handmade making practices; forms that mediate between physical, digital & analogue worlds. The resurgence of interest in craft practice is related to the proliferation and access to those technologies used to disseminate ideas and connect individuals and groups.

As an artist I wanted to explore the visual and conceptual possibilities inherent in information visualisation to determine a more practical engagement with data. To understand information visualisation as a tool to detect and uncover hidden patterns, and reveal them through the aesthetics of imagery and crafted objects. The use of technologies and applications that capture and shape digital information are pivotal in manipulating data that could be used as a *material* to work with. The result is the generation of tangible objects that respond to and reference their computational origins. The communicative potential of visuals being used to enable *stories* to emerge within data and detect messages lying beneath the surface. The question being set by the project was: how could a representation of data exist in tangible form? A physical rendering required a translation of digital information into a shape that could be constructed and fabricated using traditional methods. The tangible nature of the representation relates our experience of mediated communication to a crafted object. By placing digital information in a human, physical context embedded histories, stories and patterns are revealed. Stories surrounding collective activity and behaviour are shaped and presented in new contexts.

Digital Identity & Data Stories

The Internet has been referred to by O'Reilly (2007) as a 'programmable environment for everyone', using data sources that can be reused in a variety of forms and configurations. Social media platforms such as Instagram, Flickr or Twitter are repositories of digital

information based on rapidly updated, dynamic, user-generated content. There are few barriers to entry and users from all ages and backgrounds can join these social networks and contribute media. Media is stored on the respective host servers and can be retrieved and analysed using Application Programming Interfaces (API's). API's are used by developers to interrogate content and repurpose or remix it into new forms. Although the users of services such as Instagram maintain rights of ownership over their photos, there is an ambiguity around how other users or third parties may use their photos once they become publicly available. For the purposes of this project, I worked with a developer to retrieve photos from Instagram via the API. The work actively embraced the knowledge that appropriated media was produced by many users to highlight the collective origin of the resulting pieces.

An exploration of digital identity was the conceptual incentive for the data collection and analysis process. To probe evolving digital identities, the work explored the freedom we feel to express ourselves online through the production of personal media content. Personal content is user generated material such as photos, music, drawing, video and text in the form of comments, status updates and the like. Users are able to create rich, expressive content that communicates stories about their lives and becomes a constituent part of the *self*. Meaningful dialogue and exchange with others in a shared network space is as important as offline communication. To get a complete picture we should take account of content sharing, comments and responses made by others, number of friends/followers per user and even the number of *likes* a particular item of content has accrued. Quiggin and Hunter (2007) analyse our motivations for contributing personal content to social media networks and suggest self expression and social interaction as the overriding factors. This removes money and commerce as an incentive for contribution that enables people to produce and upload content in a freely expressive manner.

The collective nature of social media networks and the open architectures on which they are built ensures that all uploaded media can be made available and actively retrieved and stored in a model of reuse suggested by O'Reilly. In order to narrow down the field of enquiry and produce something achievable, the work concentrated on mapping content from a single social media network. Instagram is a micro-blogging, peer production, user-generated social networking tool. It is a space in which users can project a virtual identity, interact with others, create updates, share and comment on media uploaded by themselves and others. Widely adopted by users from across demographic groups, it has been experiencing huge growth and popularity. Additionally, Instagram is used by social scientists to study social and cultural patterns of behaviour and was well positioned as a rich visual source.

Revealing Visual Patterns

Visualisation tools and graphing techniques are required to explore patterns and trends in data and datasets. Standard visualisation techniques, such as bar charts, tree maps or scatter graphs, were discounted as restrictive methods for presenting visual patterns in imagery and inappropriate for highlighting the visual characteristics of image sets and their contents.

If you analyse media content based on visual parameters, i.e. colour, shape or contrast, it becomes easier to see emerging patterns. This approach enables you to experience the media set as a whole rather than simply as individual parts, and provides a snapshot picture of user-generated content. It provides a more complete sense of the images in terms of interpreting their intrinsic qualities based on a unique set of attributes.

Uploaded media and users profiles have been assigned with tags, comments, number of follows etc. by the user and assigned with metadata by the Instagram platform. In this instance, we used the API to retrieve media uploaded with those tags related to *most popular* or *least popular*. Web data related to users and uploaded media is unique and is measurable, searchable, trackable and quantifiable. In this study, web data could be analysed as an indicator of personal expressive use of media and to help understand modes of communication and behaviour.

Users annotation of images using tags is often imprecise but still acts as a descriptor for that image and can be used as a method of assigning value and communicating expression. Tags carry semantic meaning about the content of media, which allows search engines and web agents to assign significance to that content.

Mosaic was the tag chosen for the visual study as its semantic meaning relates to a montage of smaller media pieced together to create a larger whole. This suggested the holistic overview we were attempting through visualisation; an active web of affinities that is constantly shaped and reshaped by users. Another consideration was the Instagram API, which limits the number of hourly queries you can perform. #mosaic was a small enough media-set of roughly 322,000

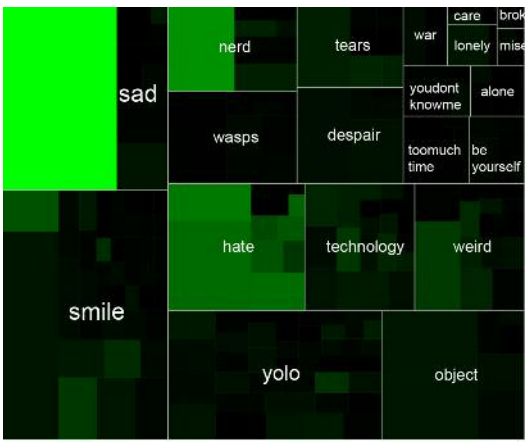

Image 1

Image 1.
Tagging Map: Media from Instagram that have been tagged with less common tags. Each rectangle represents a tag. Size shows number of likes and green brightness indicates more comments per media.

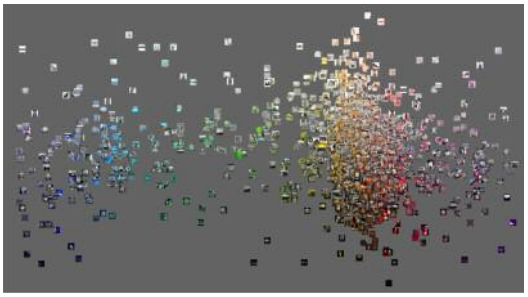

Image 2

photos, that was enough to reflect the diversity of photos uploaded while still being manageable. To refine the set further, we retrieved only those photos tagged for a particular month. We retrieved a total of 1,544 photos for July 2013.

ImageJ is a public domain, open-source image processing programme developed by City University of New York Software Studies Initiative in 2009. They describe ImageJ as a tool for the exploratory analysis of large image and video collections using digital image processing and visualisation. ImageJ plots large image sets using graphs, such as scatter plots or timelines. It is designed to work alongside other plugins that extend its functionality and enable greater investigation into attributes being explored. We used ImageJ and QTIP to extract features and colour parameters from images retrieved from Instagram. Hue, brightness, saturation, and contrast were some of the features analysed by QTIP, that resulted in a dataset which could be reused by other applications for further analysis and pattern generation.

> *Existing visualisation tools show data as points, lines, and bars. ImagePlot's visualisations show the actual images in your collection. The images can be scaled to any size and organised in any order - according to their dates, content, visual characteristics, etc.* (CUNY, 2009)

By plotting the Instagram photos onto a graph we could holistically analyse them and pick out underlying patterns. Each photo was positioned along the vertical Y axis according to its brightness value, and along the horizontal X axis according to its hue value.

The resulting visualisation was a representation and mapping of the tag #mosaic on a spectrum according to hue and brightness. The preponderance of warm reds and oranges were the strongest colour range. During the demonstration participants speculated why different colour clusters might be more or less dominant. They suggested the Instagram interface could affect the tonal colour range of images through use of *filters* that users can apply to their photos.

However, the time of year could also be a factor in the number and variety of tonal range related to seasonal variation. Influences caused by natural, urban or skin tone factors being represented in each photo could also have some significance. The visualisation gives an impression of dynamic web data, which makes visible a body of images that can be appreciated as an exploration of expressive content hinting not at one clear interpretation, but rather many possibilities.

Tangible Data

The ImageJ visualisation was to be used as a structure and visual map to inform the creation of a tangible crafted piece. To build on this, another process of translation was required to distill the colour parameters into pure colour information and RGB values. Visualisation relies on the principle of reduction in order to express the properties of the whole. You sacrifice specifics for the sake of revealing and making visible the invisible patterns in data. Working with a developer, D3 was the visualisation application chosen to translate the colour values obtained from the previous process. The values were plotted as radial coordinates onto an SVG image using a javascript library. We used the average colour value to determine the angle and the average saturation to determine the radius, and then plotted an arc of the colour described by that hue, saturation and a constant brightness.

Image 3

Image 4

Image 2.
ImageJ visualisation for photos tagged with #mosaic

Image 3.
D3 visualisation using radial mapping.

Image 4.
Pixel Mosaic: Embroidered Canvas

Each visualisation technique and application use spatial variables, such as position, size, shape or colour, to plot images or shapes along horizontal and vertical axes. We selected the properties of the web data we would most like to plot and depicted those properties to reveal the most important patterns and relationships. The principle of reduction is a key information visualisation technique which, as Manovich states:

> *[u]ses graphical primitives such as points, straight lines, curves, and simple geometric shapes to stand in for objects and relations between them.* (2011)

When producing the physical piece, the decision to use embroidery on canvas referenced the possibilities for correspondence between the simplified and reduced visual forms. Highlighting relationships between the pixels that make up a digital image and the stitches that make up an embroidered canvas would facilitate the materialised representation of digital information. Colour could also be translated directly from screen-based RGB colour space into embroidery thread.

To convert the visualisation to canvas a correspondence between the imagery and the stitches was achieved through a pixellation process that limits the number of colours. Each pixel corresponded to a stitch and the colours corresponded to a thread. The overall feeling is of an impression of colour dominance portrayed in the tapestry. As a simulation of web data, the resulting embroidery conveys a feeling of tactility and tangibility that is unlike the ephemeral information it depicts. If you consider all the translations and conversions together as a journey of visual information, the process moves from concrete, into intangible form and back to concrete form. The original *mosaic* imagery taken from Instagram referenced real, physical objects.

In a sense, the original mosaic objects have been through a process of transformation to *re-define* materialities that move back and forth between digital and physical manifestations and render tangible what was previously an intangible set of numbers.

Implications for Craft Practice

The process of retrieving data, sculpting it and representing it in physical form became the focus and outcome of the research. The demonstration interrogated the processes behind the creation of the data, graphical representations and the fabrication of crafted objects. It explained the source of the data, decisions that were made to shape it and how connections were made between data sets. It illustrated an approach to extending data visualisation into the realm of the tangible that go beyond the visual to suggest a more multi-sensory approach.

The process that has been described attempted to capture a moment in data time, which is made possible through complex digital functions and queries. Each stage of the process was overseen by more than one person and hints at the collaborative nature of future craft practice. Stages relied on tacit knowledge of information manipulation and digital processing to produce readable, understandable forms. If a true understanding of any medium is attained through habitual, often tedious, involvement then the digital processing required in this research is an example of craft practice. It references the skill involved in achieving a creative result in which so many phases contribute to the whole. 'Subjugating so many synchronised moves to a creative intent is a yet greater skill' (Mccullough, 1998). The representations provided a snapshot of the social and visual nature of our interactions in a multi-layered, mediated reality.

The future potential of craft is to occupy a position that examines the boundaries, interactions and tensions between atoms and bits. As its value becomes more prominent craft practice will acknowledge a flow of thought and knowledge into objects that connects them to other fields. To make connections with intangible, dynamic currents of activity will propel the objects we make into sharp relief. As Susanne Kuchler (2005) outlines:

> *No longer can we regard things as passive receptacles of discursive thought; rather, as we have indeed long suspected, thought can conduct itself in things, and things can be thought like.*

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