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CREATIVE DESIGN METHODS FOR IOT DATA ETHICS IN HYBRID SPACES

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Introduction

Large scale data collection, data analysis and associated potential data misuse is not confined to the purely digital spaces of the internet. The prevalent use of Internet of Things (IoT) technology and ubiquitous embedded sensors is transforming physical spaces into hybrid ones; extensions of our data landscape (Jacobs and Cooper, 2018). These hybrid physical spaces include not only private domains of homes, offices and shops, but also public spaces, particularly (but not limited to) the urban landscape. As data collection becomes thus embedded in our digital public spaces, it is important to consider how public bodies respond to this in the form of policy which maximizes the civic benefits of such technologies (Lee, 2018), while protecting the public from potential harms.

We report here on a project investigating factors influencing trust in public space IoT deployments, to reflect on digital placemaking. In association with a local governmental authority located in the North-West of England, the project developed a prototype policy to support IoT deployments, to ensure they are conducted in a way that is ethical and secure. This project used a range of creative, participatory design methods to probe these questions, working with members of the City Council as well as experts in IoT and cybersecurity. This included using design fiction (Bleeker, 2009) to speculate on the implications of a range of interventions and deployments including AI and edge

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processing, in order to probe potential ethical challenges. We combined this with walking workshop ('walkshop') methods (Mullagh, 2021) to tangibly situate these potential futures in existing hybrid spaces. A virtual exploration of this walking method, introduced through necessity during the COVID-19 pandemic, created a different type of hybrid space, and offered new opportunities for engagement.

Walking methodologies: physical and virtual

As part of this project, a walkshop led six Lancaster City Council officers on a walk around the city centre of Lancaster, UK. They were guided to sensors in a series of locations, and provided with a paper field guide which asked questions intended to provoke discussion. Some of the deployments featured real sensors, IoT deployments or data collection in the city. Other deployments were fictional, and were represented by design fiction installations created by the project team. The real deployments included an air quality monitoring station and the use of QR codes at a café for COVID-19 contact tracing. The fictions included smart street lighting, a streetside bollard equipped to count passing pedestrians, and locally processed gait analysis of image data collected in a public square, to identify suspicious behavior. The fictions were intended to be mundane in nature, were based on existing technologies, and were designed with a range of levels of transparency – for example, as per the real deployments in other UK cities that it was based upon, no signage was placed with the bollard. One installation, which consisted of signage on public waste bins indicating the use of sensors to alert the council when they became full, was intended as fiction. However, on the walk, we were informed by a member of the council that the bins did indeed have this technology enabled, albeit hidden from public view. This was particularly of note since we had attempted to locate existing deployments via other council contacts. The fact that they were not aware of this context highlights the lack of information sharing and absence of a comprehensive map of local deployments.

A second walkshop with cybersecurity experts similarly probed the IoT deployments. This was undertaken online using the GatherTown platform (Jacobs and Lindley, 2021). The virtual walk replicated the tangible, situated experience of seeing the deployments, real and fictional, in-situ in the wider context of the city, and allowed the attendees to experience how the public would interact with devices. By undertaking this activity online in a recreation of the physical space, it allowed wider participation by geographically distributed participants and gave an insight into the particular features of this unique city context. While questions of accessibility still remain, the creation of this virtual city walk was itself a valuable research output which will be used in future research and public engagement activities.

Results and Outcomes: The TrustLens Tool

Council officers saw many potential benefits to the technologies, for example opportunities for supporting tourism, as well as efficiencies in areas such as waste collection and prevention of anti-social behavior. However, they also raised a number of concerns, many of which were also discussed by the cybersecurity experts. Transparency, data quality, physical device security and appropriateness were highlighted as potential areas which require detailed consideration, as well as data

storage and transfer in addition to initial collection. Much discussion related to complexities arising from the nature of data processing and the use of AI. Legal requirement exist such as the EU General Data Protection Regulation (GDPR), but considerations of data usage stretched beyond this.

Two key outcomes were delivered as a result of this process. Based on the data collected during the walkshops and in combination with prior work, a policy prototyping workshop was held with City Council officers at which policy components were evaluated and compiled into a draft policy for secure, trustworthy IoT. This policy was delivered to the council. Future work will implement this policy in the local region, which will demonstrate a model case for transferability to other localities.

A second outcome, which also developed on previous work (Jacobs et al, 2022), is an online tool to support organizations in consideration of IoT deployments. Potential users of this tool include public bodies evaluating whether or not deployments conform to policy, those undertaking the design or procurement process for a deployment, and any other organizations assessing ethical and security aspects of IoT. Taking the form of a set of questions, the tool prompt users to consider a range of transparency, security, privacy and ethical aspects of their deployment, and is adaptable based on the specific stage of the deployment under scrutiny and its features.

Conclusions

Through this work, we have investigated ethical factors which must be considered in the construction of hybrid digital physical spaces where IoT deployments bring a data element to public space. This is a contribution to work on digital placemaking (Halegoua & Polson, 2021), as well as policy and governance of data collection, sharing and use. It is important that policymakers are provided with support for considering these complex areas which may impact a wide variety of stakeholders.

In this project, we created a hybrid digital space to virtually experience a physical space which is itself a hybrid space – and speculated on future data flows shaping places. Combining such creative methods with others such as speculative design allows us a deeper insight into questions of data ownership, ethical data practice and data governance.

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