A Speculation on Interacting with Information in Public Space: Using Augmented Reality to Create an Alternative Media Infrastructure

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Abstract: Public spaces, beyond direct communication between individuals, also support communication with the public through urban media, which has the potential to support the public's access to critical information and raise awareness on various issues. Therefore, this study speculates on an alternative urban media infrastructure that spreads throughout the city through public spaces and supports the public in obtaining information regularly. Accordingly, it first examines the current urban media practices through a field study and further questions them while speculating on the use of augmented reality as an alternative media infrastructure for information dissemination.

Keywords: Urban media, public space, augmented reality, data visualization, speculative design

1 Introduction

In today's rapidly changing and developing world, it is important for individuals to acquire information on various issues and be knowledgeable about them. On one hand, information acquisition can occur through individual efforts in private spaces such as homes, in semi-public spaces such as libraries, or as part of a shared experience in semi-public educational spaces such as universities and exhibitions. On the other hand, public spaces such as streets, which not only provide a place for direct communication between people but also support communication through carrying messages (BARBAUX 2010), also have significant potential for information acquisition by being part of people's daily flow.

Historically, the first urban messages were road signs, which were introduced in Roman times and formalised for the first time in France in the 19th century. They continued to develop, with the first red and green traffic lights appearing in England at the end of the century, followed by traffic signs such as the stop sign in Detroit in 1914 (BARBAUX 2010). However, the messages had gone through changes. One of which happened with the emergence of outdoor advertising. The transition to an industrial economy in the 19th and 20th centuries, with advances in manufacturing and production, required new areas for displaying these products, and the centers of social life were chosen for this (SILLA 2020). Accordingly, advertising, which began to be a part of cities with shop signs in the Middle Ages, took the form of posters in the 19th century, and over time, new forms of urban furniture, such as the Mupi, began to emerge (BARBAUX 2010). While this kind of urban media has been primarily aimed at displaying advertising content, it has been used to communicate topics of public concern, too such as posters to give information about laws in 19th century (BARBAUX 2010) or use of out-of-home advertising surfaces, such as billboards or transit advertising surfaces, for communicating preventive behaviours on Covid-19 (MOHAMADPOUR et al. 2024) or climate change (WILSON et al. 2021) in more recent times.

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While these practices have demonstrated the use of communication-focused urban furniture for displaying critical information, they have largely remained singular instances in the everyday use of the urban media infrastructure, and a more continuous approach to display such information remains lacking. Thus, this research questions what an urban media system that spreads throughout the city through public spaces and supports the public to obtain information regularly could be like through a speculative design approach. To achieve this, a two-part study was conducted. The first part examined the current state of media infrastructure in urban public spaces through a field study conducted within a defined sample area during non-targeted dates and times to reveal the everyday use of urban displays that are part of urban media on any given day. In the second part, speculations were developed for an alternative urban media infrastructure that utilizes augmented reality (AR) technology. In this context, a discussion was conducted on AR drawing from the findings of the field study; various scenarios were then developed on possible uses of the system in public spaces, and a low-fidelity prototype was developed to explore and reflect on technical and experiential potential.

2 Examination of The Current Urban Media Practices

The first part of the research focuses on understanding the current state of everyday use of media infrastructure, specifically urban displays, focusing on two of the media infrastructure dimensions, material and content (SCHILLER 2020). Accordingly, a field study was conducted in Kadıköy, one of the centers of the city of Istanbul, on a route approximately 450 meters long that was determined based on pedestrian movement on the site. To ensure diverse media practice, the determined route encompassed various landscape typologies, including vehicular traffic, pedestrianized spaces, and transportation hubs for different modes of transportation. The field study was conducted in two stages. The first stage aimed to provide an overview of the urban display practices in terms of their material aspect and the relationship of the material aspect with urban public spaces. The second stage focused on the content dimension of what we called managed displays, a subset of urban displays defined based on the examination conducted in the first stage to reveal what was communicated to the public.

2.1 Examination of Materials of Urban Media

One of the dimensions of the media infrastructure is the material dimension (SCHILLER 2020). In the context of this research, this referred not only to the displays but also to the physical elements in the urban environment that carry some form of media or display. They were categorized and further discussed under two topics: their dedication status and the display technology they use.

Status of dedication: Field study revealed that only a portion of the content-carrying elements in urban open spaces are elements specifically incorporated into the city for this purpose, such as communication-focused urban furniture, while the rest are non-dedicated carriers that have transformed into media surfaces. Their transformation is found to happen either by direct application without any structural changes on the carrier, such as affixing print-based media or through direct inscription (e. g., graffiti), or by being appropriated through material fixtures, such as attaching digital screens. While dedicated carriers inherently managed media outlets with authorized content, the management status and the content's authorization status of non-dedicated carriers vary. For instance, while a screen attached to the façade of the ferry

terminal, a non-dedicated carrier, was found to be managed based on its content and display behaviour, a temporary barrier was identified as not managed, based on the flyposting activity which is quintessentially unauthorized and independent (BLACK & NEVILL 2009), that occurred on it.

Display technology: The study area was found to contain various display technologies, both non-digital and digital. The identified non-digital displays in the study area included print-based approaches (e. g., posters, signs); direct graphical text (e. g., graffiti); and physical objects (e. g., 3D signage). Digital displays consisted of screens varying in size, spatial arrangement, number, and configuration: for example, attached single-sided screens at eye level, stand-alone double-sided elevated screens. Two key elements determined by the display technology were identified: the medium and the presence of content. Accordingly, in cases where non-digital approaches were used, the content was limited to static images, while both static and moving images were displayed on digital screens. The second element determined by the display technology was the temporality of the content's presence. Accordingly, some content was continuously visible, while other content was visible for a specific period; this imposed a temporal condition on interaction with the content. Two scenarios were possible for non-digital displays. In the first, a single piece of content was continuously accessible without time constraints, allowing the interacting party to determine the duration of the interaction. In the second, content items were rotated in a defined order using a scrolling mechanism that limited the number of items a carrier could possess and transmit to three. Unlike non-digital displays, digital displays have the ability to make a piece of content visible/accessible for a certain period of time and to display multiple pieces of content consecutively. This can lead to the accessible content differing for those passing by the same point at different times, and also results in an interaction where the duration is not determined solely by the user.

2.2 Examination of Contents of Urban Media

The review phase of the content dimension of urban media infrastructure aimed to examine the types of content the public encounters in public spaces, particularly the presence of educational and informational content. The examination was limited to the content of managed displays. The content collection was done on the same day for all displays. Accordingly, 19 urban media elements were identified along the defined route. 4 of these were single-sided, and the 15 included two or more sides that display content. 11 of these 15 were carrying content independent from each other on each side, and 2 of the remaining were double-sided and were simultaneously carrying the same content on each side; 1 had two perpendicular sides that carried single content that spanned both sides; and 1 had 4 perpendicular sides that either displayed single content or spanned content. As the content displayed by different surfaces of these carriers was the same or connected, they were handled as a single unit. Data collection was done by recording the content of the defined displays. While the content of the static poster carriers was directly visible, for the scroll poster mechanism, their rotation was followed to record all the posters. One scroll poster mechanism was handled as a static poster, with the visible poster as it malfunctioned. To identify the content displayed on digital screens, data was collected for 10 minutes on each digital screen. Content whose start and end frames did not fall within this time frame was excluded from the dataset. Content collected from digital displays, the continuously accessible pieces of content on posters, and rotating content on scroll posters were analyzed, and 98 different pieces of content were found to be displayed via managed displays along the defined route. These contents were

categorized based on the type of information they were communicating. While the majority of the content was advertisements of products, brands, and cultural events such as theatre plays, three pieces of content were identified and categorized under public awareness as they were informing the public about criticalissues that are of public concern. Two of these contents were published by the Istanbul Metropolitan Municipality and focused on preventing water waste. One of them carried the text (translated from Turkish) “Now is the time to use every drop carefully. Let's use our water sparingly, let's not waste it for our future.” And the other carried the text (translated from Turkish) “Every drop holds the future. Every drop you protect today will give life to tomorrow.” The last public awareness content was about the electronic waste campaign of a private company. While these contents were aiming to raise public awareness, they only contained a direct message for behaviour change, yet did not include information on the topic. One crucial issue is that because these contents were displayed on a digital screen that displays contents on rotation, the public awareness contents were not visible at all times, which was a limiting factor on the number of people who saw these contents. Two additional contents were also identified that were not part of the initial corpus due to their carriers, one permanent panel giving information about tsunami escape routes placed on the coast, and a content about blood donation displayed on the façade of a related building.

The analysis also revealed some level of relation between the content and the location. While some content, such as product advertisements, had no relation to the location, the content published by the local government regarding their activities in the city where the content was displayed defines a relation with the location. Furthermore, the tsunami escape map placed in the related location also defines a relation between content and location. Furthermore, it was observed that a digital screen located near a theater stage currently under renovation was heavily displaying content related to theater productions. While it cannot be definitively stated whether this was intentional, it still defines a relation between the location and the content.

3 Speculation on an Alternative Media Infrastructure

Speculative design “…aims to open up new perspectives on what are sometimes called wicked problems, to create spaces for discussion and debate about alternative ways of being...” (DUNNE & RABY 2013, 2). This speculative design study identifies the lack of display of critical information in urban media as the wicked problem and envisions an alternative urban media infrastructure that spreads throughout the city, is dedicated to displaying critical information, and supports regular engagements with new information. It follows, imagining alternative presents based on current technologies (AUGER 2013) approach of speculative design, but instead of focusing on using existing public display technologies that were identified on field study in new ways to imagine an alternative present, it employs AR technology, which is currently available but whose use in this context has not been sufficiently explored. During this process, it refers to findings of the field study, challenges the available technologies, and is challenged by them.

3.1 Discussions on the Use of AR

SCHILLER (2020) defined three dimensions of media infrastructure, which are materiality, content, and poetics. In the context of this research, which focuses on public space, this refers

to media practices that display public content on public displays in public space to be engaged with publicly. While the current media practices were in line with this premise, AR challenges the publicness aspect of an urban media infrastructure, in particular, its material aspect. With their widespread use in streetscape, private displays such as mobile devices, which are now a type of urban screen (McQUIRE 2009), have enabled the display of private content in public spaces. On the other hand, by supporting AR, these private displays also allowed people to view public content in public spaces, suggesting that the publicness of the displays can be challenged. However, although the content remains publicly available and the experience remains public, it is only publicly available and publicly engageable if the members of the public have ownership of a technologically capable device and the know-how to use it to engage with the content. Otherwise, this may lead to a digital divide, which refers to the gap caused between people as a result of access to new information technologies (VAN DIJK 2006).

AR also challenges the material dimension of public display practices, in terms of presence in space and physical integration to space. In current public display practices, the display is positioned within the physical environment and is constantly present. In contrast, AR changes this situation by enabling a transition from public displays to private displays, transforming it into a non-permanent inclusion in the public space while in use. Thus, while it is not a physical component of space, it is present in space. On the other hand, the type of tracking technology AR uses may also impact its presence in space and its physical integration into space. For example, while marker-based AR needs a physical marker, such as an image, to determine the placement of the digital objects, location-based AR utilizes position data, such as GPS coordinates collected from the mobile device, to display content (CHENG & TSAI 2013) without requiring any physical component integrated into a physical environment.

The physical presence in space and physical integration can be discussed from two different perspectives: as an indicating factor or as a limiting factor. Even though this physical presence does not guarantee engagement, as proven by phenomena such as the display blindness, which refers to ignoring public displays in the assumption that they carry uninteresting content (MÜLLER et al. 2009), a digital screen or a poster still indicates that some kind of information is present. So, in the case of the use of marker-based AR, the marker not only activates AR but also indicates the system. In the case of location-based AR, however, the indication may be sustained by the digital one, such as a notification stating the availability of a data point in imidiate environment. Yet the difference between these two indicators is that while the physical one also allows people who are not familiar with the system to become aware of it, the digital one is only available for those who already know about the system and use it.

The second perspective on physicality is that it is a limiting factor. In the current urban media infrastructure, the content can only be made available if the material means are in place, e. g., the content can only be displayed if a digital screen is available, or a poster can only be placed if the carrier is available. Thus, the materiality dictates where the content can be displayed. On the other hand, AR, which requires little or no physical equipment based on the type of tracking it utilizes, enables easy integration into new locations. Thus, the location of the display adapts to the needs of the content and engagement.

3.2 Possible Integration Scenarios and Prototyping

In the final stage of speculating on the use of AR to create an alternative urban media infrastructure. Accordingly, the material dimension of the infrastructure is personal devices that would display the augmented content and markers when it is the chosen tracking system. The content dimension would focus on data and information visualizations that would extend the current practice of direct messages for behaviour change without information, as identified during the field study. Lastly, while the poetics dimension, which refers to what the infrastructure signifies or means to its users (SCHILLER 2020), cannot be addressed as a scenario, the environment in which the experience would take place and the manner in which it is experienced can be. Overall, we envisioned scenarios for integrating the system into the city based on the physical properties of the space, the function of the space, and the narrative value of the space (Figure 1).

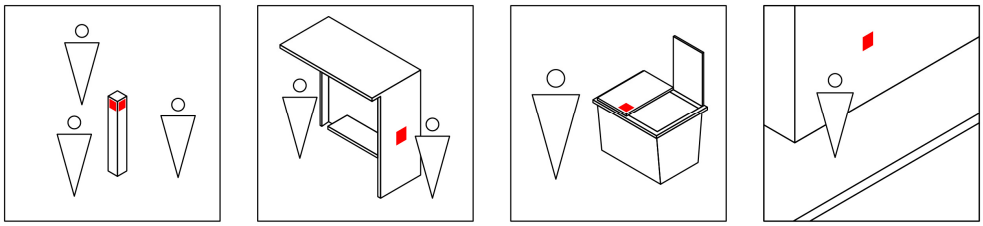


Fig. 1: Envisioned scenarios for the integration of the system into the city

Physical properties of space are a defining factor in how a display can be placed in a location as well as how it is interacted with. FISCHER & HORNECKER (2012) found that an interactive display defines different types of space around itself, one of which is interaction space, and they found that when the interaction space is small, people do not occupy the space together but wait and observe, rather than interacting, and social interaction would not occur. On the other hand, the honey-pot effect suggests that a person interacting with the display can make others get interested too (BRIGNULL & ROGERS 2003, MÜLLER et al. 2012), which a large open space can facilitate. This may also facilitate social interaction and conversation between people, which is one of the design recommendations of PARKER et al. (2020) to achieve interactive display deployments that provide value for their users. Accordingly, one integration scenario would take place in a large open space, such as a park, in a way that allows multiple people to interact with data simultaneously: *"You are sitting on a bench in the park, you saw a couple of people gathered over there pointing their phones at the same point, you go over there, open the app, and view the content. One of the people says to you -How interesting is this!"* On the other hand, it is also possible to integrate the system in small spaces such as on a street that allows short-term stops if it is necessary to display the content in a particular location even if the physical properties of space do not allow such interaction, or it is not wanted: *"You are passing through a street and see a data point sticker on a building façade, which you realized was not there last week. You think it must be new; open the app and view the content*."

Function of the space impacts the actions of people; thus, where interaction is positioned impacts the chance of opportunistic interactions (PARKER et al. 2020). For example, people tend to engage with the displays at times when they wait without anything else to do (MÜLLER et al. 2009): "*You left home for work and arrived at the bus stop, and you noticed a sticker*

bearing a data point emblem. Your bus leaves in 10 minutes. You could try out the new data point while you wait."

Physical environment can be part of the narrative and can add value to the narrative. In the field of data visualization, this relates to situated visualization, which means "visualization displayed in the relevant spatial and semantic context" (WHITE 2009, 15). *As you threw your trash into the bin, you noticed a data point sticker on the bin. Isn't this an interesting location for a data point, or perhaps some content related to waste?"* On the other hand, it is also possible to establish a local narrative, thus positioning physical environment as a place rather than space (BRESSA 2022) which has proven to enrich the knowledge of the public regarding social issues, facilitates social interaction (CLAES & VANDE MOERE 2013), and encourages public discourse on local matters (KOEMAN et al. 2015). Accordingly, such a scenario continues "*...but wait, isn't this about your building?"*

Subsequently, a low-fidelity prototype was created where a marker was used as the tracking technology for AR (Figure 2) for a scenario where space adds value to the narrative.

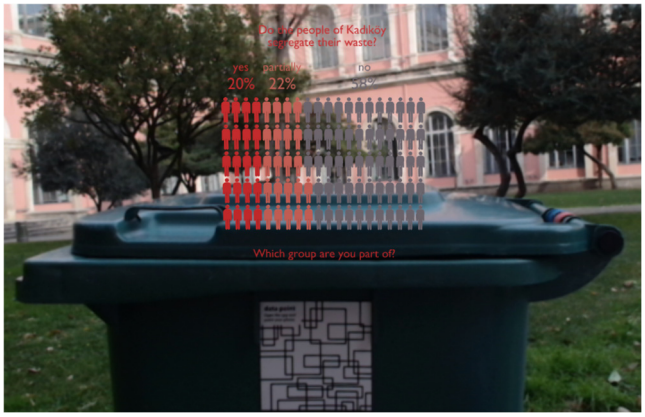


Fig. 2: AR view of the data visualization about waste segregation behaviour

The subject of the data visualization was determined as the waste sorting behaviour of people in the Kadıköy district of Istanbul, and it was imagined to be displayed on a trash can located on a street within this district. This relationship between data and physical context also would define the visualization to be a situated one (WHITE 2009). The relevant data was collected from the "DDMM Segregation of Domestic Waste in Houses by District" dataset that was published by the ISTANBUL METROPOLITAN MUNICIPALITY (2023). Data visualization was created using Blender modelling software, and AR was developed in Unity, utilizing the Vuforia SDK. The prototype was created as a proof-of-concept and exploratory study to identify potential design issues with such a system.

4 Discussion and Outlook

This two-part research is a speculative study on urban media. It first presents a brief analysis of contemporary urban media practices through field study in a sample area, and then uses

these findings to speculate on an alternative approach utilizing AR technology. One of the key points is the limited amount of content available in current urban media practices, particularly within managed public media infrastructure, and the fact that this content often lacks factual information but consists of messages aimed at influencing public behaviour. While data visualization, the proposed type of content, offers an alternative approach, it may raise issues to consider, such as the data literacy of the public. Another key issue is the physical presence of existing media outlets, which also act as the indicator of where to expect content, but the predetermined nature of these outlets acts as a limiting factor in the narrative-space relationship. This was explored through the proposed system, highlighting the potential for adapting AR to the city due to its minimal or no physical equipment needs. Overall, this study, rather than presenting a definitive design, aimed to emphasize the role of public space as a space for awareness, learning, and discussion by examining the current urban media speculating on an alternative media infrastructure.

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References

AUGER, J. (2013), Speculative Design: Crafting the Speculation. Digital Creativity, 24 (1), 11-35. doi:10.1080/14626268.2013.767276.

BARBAUX, S. (2010), Urban Furniture: A New City Life. Design Media Publishing Limited.

BLACK, I. R. & NEVILL, I. (2009), Fly-posting: An Exploration of a 'Controversial' Medium. Journal of Marketing Communications, 15 (4), 209-226. doi:10.1080/13527260802091022.

BRESSA, N., KORSGAARD, H., TABARD, A., HOUBEN, S. & VERMEULEN, J. (2022). What's the Situation with Situated Visualization? A Survey and Perspectives on Situatedness. IEEE Transactions on Visualization and Computer Graphics, 28 (1), 107-117. doi:10.1109/tvcg.2021.3114835.

BRIGNULL, H. & ROGERS, Y. (2003), Enticing People to Interact with Large Public Displays in Public Spaces. In: RAUTERBERG, M., MENOZZI & WESSON, J. (Eds.), On Human-Computer Interaction. IOS Press, 17-24.

CHENG, K.-H. & TSAI, C.-C. (2013), Affordances of Augmented Reality in Science Learning: Suggestions for Future Research. Journal of Science Education and Technology, 22 (4), 449-462. doi:10.1007/s10956-012-9405-9.

CLAES, S. & VANDE MOERE, A. (2013), Street Infographics: Raising Awareness of Local Issues Through a Situated Urban Visualization. Proceedings of the 2nd ACM International Symposium on Pervasive Displays, 133-138. doi:10.1145/2491568.2491597.

DUNNE, A. & RABY, F. (2013), Speculative Everything: Design, Fiction and Social Dreaming. The MIT Press.

FISCHER, P. T. & HORNECKER, E. (2012), Urban HCI: Spatial Aspects in the Design of Shared Encounters for Media Facades. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, 307-316. doi:10.1145/2207676.2207719.

ISTANBUL METROPOLITAN MUNICIPALITY (2023), DDMM Segregation of Domestic Waste in Houses by District [Dataset]. https://data.ibb.gov.tr/en/dataset/vdym-ilce-bazinda-hanelerde-evsel-atik-ayristirilma-durumlari/resource/c7035408-d12d-4754-8af3-36598e0dcf96 (13.01.2026).

KOEMAN, L., KALNIKAITÉ, V. & ROGERS, Y. (2015), "Everyone Is Talking about It!": A Distributed Approach to Urban Voting Technology and Visualisations. Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems, 3127-3136. doi:10.1145/2702123.2702263.

MCQUIRE, S., MARTIN, M. & NIEDERER, S. (2009), Introduction to the Urban Screens Reader. In: MCQUİRE, S., MARTİN, M. & NİEDERER, S. (Eds.), Urban Screen Readers. Institute of Network Cultures.

MOHAMADPOUR, F., ASKARIAN, A. & ASKARIAN, M. (2024), Picture Analysis of Billboards and Infographic Graphics Advertising COVID-19 on Promoting Preventive Behaviors and Taking Vaccination Against the Coronavirus Disease Pandemic. Scientific Reports, 14 (1), 6310. doi:10.1038/s41598-024-56758-z.

MÜLLER, J., WALTER, R., BAILLY, G., NISCHT, M. & ALT, F. (2012), Looking Glass: A Field Study on Noticing Interactivity of a Shop Window. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '12), CHI '12, 297-306. doi:10.1145/2207676.2207718.

MÜLLER, J., WILMSMANN, D., EXELER, J., BUZECK, M., SCHMIDT, A., JAY, T. & KRÜGER, A. (2009), Display Blindness: The Effect of Expectations on Attention Towards Digital Signage. In: TOKUDA, H., BEIGL, M., FRIDAY, A., BRUSH, A. J. B. & TOBE, Y. (Eds.), Pervasive Computing. Springer Berlin Heidelberg, Vol. 5538, 1-8. doi:10.1007/978-3-642-01516-8_1.

PARKER, C., TOMITSCH, M., DAVIES, N., VALKANOVA, N. & KAY, J. (2020), Foundations for Designing Public Interactive Displays that Provide Value to Users. Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems, 1-12. doi:10.1145/3313831.3376532.

SCHILLER, N. (2020), Urban Media as Infrastructure for Social Change. In: Krajina, Z. & Stevenson, D. (Eds.), The Routledge Companion to Urban Media and Communication. Routledge, 204-214.

SILLA, C. (2020), Outdoor Advertising and the Remediation of Public Space(s): Commercialization and Beyond. In: KRAJINA, Z. & STEVENSON, D. (Eds.), The Routledge Companion to Urban Media and Communication. Routledge, 76-83.

VAN DIJK, J. A. G. M. (2006), Digital Divide Research, Achievements and Shortcomings. Poetics, 34 (4-5), 221-235. doi:10.1016/j.poetic.2006.05.004.

WHITE, S. M. (2009), Interaction and Presentation Techniques for Situated Visualization [Doctoral Thesis]. Columbia University.

WILSON, R. T., LOHMEIER, J. H., LUSTICK, D. S. & CHEN, R. F. (2021), Using Transit Advertising to Improve Public Engagement with Social Issues. International Journal of Advertising, 40 (5), 783-809. doi:10.1080/02650487.2020.1807230.