Future Directions in Pervasive Display Systems for Care Homes

Andrea Baumann
Lancaster University
Lancaster, UK
a.baumann1@lancaster.ac.uk

Nigel Davies
Lancaster University
Lancaster, UK
n.a.davies@lancaster.ac.uk

In our everyday life, technology has become ubiquitous. From smartphones that serve as personal assistants, communication devices and entertainment hubs to smartwatches that track health metrics; individuals are constantly connected to a digital ecosystem. Moreover, public spaces are adorned with interactive displays, digital billboards, and information kiosks, offering instant access to news, advertisements, and public services. At the same time, our society is ageing. Over the past 40 years, the number of individuals in England aged 65 and over increased by 52%. Currently, those aged 65 and above comprise 18% of the population [3].

Previous research by Sas et al. [5], for example, studied the domestication and value of a wall sized public display for individuals in residential care. Based on those findings we have developed Mnemosyne, a reminiscence system that enables care home staff and family members to share pictures and videos personal to residents that can then be used to facilitate reminiscence. Mnemosyne itself consists of a *Content Sharing subsystem* which comprises a browser-based application that handles the upload of content, and a *Content Presentation subsystem* that utilises a client-server architecture-based open-source pervasive display network to schedule and present content onto "thick client" displays installed in residents' bedrooms. All displays are running the Yarely digital signage player by Clinch et al. [2] (see figure 1). A full description and evaluation of Mnemosyne can be found in [1].

A key remaining challenge is to ensure that the content selected to be shown best meets the desires of the residents. To address this challenge we identify two areas of future research: firstly, the creation of an input device that allows users with different levels of cognitive impairment to interact with Mnemosyne's content and, secondly, automated content selection. Designing a user input device for Mnemosyne presents significant challenges including catering for age-related decline in vision, cognition (such as dementia), and dexterity. Addressing these challenges requires careful consideration of user interface simplicity and accessibility. For instance, research has shown that even a three-button user interface can be confusing for individuals with dementia, with simpler interfaces, such as one-button or no-button, being more effective [4]. Additionally, systems requiring external involvement may not be sustainable, especially in busy care settings. An example user interface model that can be tailored to fit the ability of individuals with varying stages of dementia is "Sentic" [6], which highlights the importance of designing intuitive and user-friendly interfaces to support older adults' independence and well-being.

For residents with advanced dementia even the most simple input device may prove too demanding and such residents may require systems such as Mnemosyne to support automatic content personalisation based on factors such as individuals' proximity to the system, time of day, or residents' mood. For instance, if residents respond positively to certain content when presented in the morning, the system could automatically schedule that item for future morning sessions. However, the successful implementation of automatic personalisation also relies on the presence of a designated feedback mechanism. This feedback element must capture the impact of each individual content item on residents while considering factors such as time, mood, and whether the content is viewed alone or with caregivers present. Designing such a feedback modality presents its own set of challenges and requires careful consideration to ensure maximum efficiency while minimising the workload on caregivers.

In this talk we will provide an overview of our experiences with display systems in care settings and the future challenges of supporting both user-driven and automatic content selection.

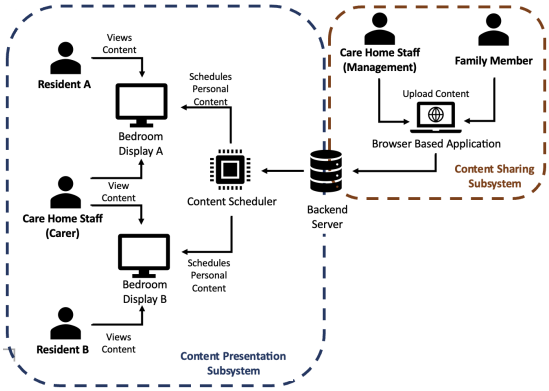

Figure 1: The Mnemosyne system architecture.

REFERENCES

[1] Andrea Baumann, Peter Shaw, Ludwig Trotter, Sarah Clinch, and Nigel Davies. 2024. Mnemosyne-Supporting Reminiscence for Individuals with Dementia in Residential Care Settings. In *Proceedings of the 2024 CHI Conference on Human Factors in Computing Systems*.

[2] Sarah Clinch, Nigel Davies, Adrian Friday, and Graham Clinch. 2013. Yarely: a software player for open pervasive display networks. In *Proceedings of the 2nd ACM International Symposium on Pervasive Displays*. 25–30.

[3] Centre for Ageing Better. 2024. Centre for Ageing Better - Action today for all our tomorrows: Our Ageing Population | The State of Ageing 2023-24. [https://t.ly/Ae9bZ].

[4] Sascha MC Rasquin, Charles Willems, S De Vlieger, RPJ Geers, and Mathijs Soede. 2007. The use of technical devices to support outdoor mobility of dementia patients. *Technology and disability* 19, 2-3 (2007), 113–120.

[5] Corina Sas, Nigel Davies, Sarah Clinch, Peter Shaw, Mateusz Mikusz, Madeleine Steeds, and Lukas Nohrer. 2020. Supporting stimulation needs in dementia care through wall-sized displays. In *Proceedings of the 2020 chi conference on human factors in computing systems*. 1–16.

[6] Myrte Thoolen, Rens Brankaert, and Yuan Lu. 2019. Sentic: A tailored interface design for people with dementia to access music. In *Companion Publication of the 2019 on Designing Interactive Systems Conference 2019 Companion*. 57–60.