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RadioMe: Adaptive Radio with Music Intervention and Reminder System for People with Dementia in Their Own Home

Patrizia Di Campli San Vito
Xiaochen Yang
James Ross
Gözel Shakeri
Stephen Brewster
Patrizia.DiCampliSanVito@glasgow.ac.uk
Xiaochen.Yang@glasgow.ac.uk
2251463R@student.gla.ac.uk
Goezel.Shakeri@glasgow.ac.uk
Stephen.Brewster@glasgow.ac.uk
University of Glasgow
Glasgow, United Kingdom

Satvik Venkatesh
satvik.venkatesh@l-acoustics.com
L-Acoustics
London, United Kingdom

Alex Street
Jörg Fachner
Paul Fernie
Leonardo Muller-Rodriguez
Ming Hung Hsu
Helen Odell-Miller
alex.street@aru.ac.uk
jorg.fachner@aru.ac.uk
paul.fernie@aru.ac.uk
leonardo.muller@aru.ac.uk
ming-hung.hsu@aru.ac.uk
Helen.Odell-Miller@aru.ac.uk
Anglia Ruskin University
Cambridge, United Kingdom

Hari Shaji
Paulo Itaborai
Nicolas Farina
Sube Banerjee
Alexis Kirke
Eduardo Miranda
hari.shaji@plymouth.ac.uk
paulo.itaborai@plymouth.ac.uk
nicolas.farina@plymouth.ac.uk
sube.banerjee@plymouth.ac.uk
alexis.kirke@plymouth.ac.uk
eduardo.miranda@plymouth.ac.uk
University of Plymouth
Plymouth, United Kingdom

ABSTRACT

The population of the world is continuously growing older, leading to more people with dementia who need support while living in their own home. Our RadioMe system was designed to adapt a live radio stream with reminders and music intervention for agitation mitigation for people with dementia living in their own home. In this demonstration we present our prototype, with features to record reminders and schedule them to be played during the live radio stream and a music intervention system when agitation is detected.

CCS CONCEPTS

• **Applied computing → Health care information systems**.

KEYWORDS

1 INTRODUCTION

As the world is dealing with an increasingly ageing population, illnesses that predominantly concern older adults are on the rise as well, such as dementia. There is a need to support people with dementia in their home and ensure they can live independently or with family for longer as to not overburden care homes further. People with dementia experience a decrease in brain functioning

which usually leads to *forgetting things or recent events*, *losing track of time* or having *difficulties performing familiar tasks*[1], and reminder and/or monitoring systems have shown a real potential to improve the lives of people with dementia in their daily activities. Reminder systems often mimic commercial digital calendars and monitoring systems usually are used to inform carers about the current state of the person with dementia, so they can take measures to mitigate them [1, 6]. Systems that combine reminders and monitoring for automated mitigation of distressing emotional states of the person with dementia have been less explored, even though some mitigation strategies could be automated. One of those techniques that has been used successfully to decrease agitation and increase engagement with activities of daily living was music therapy [2, 9, 10]. As older adults often listen to the radio, both for entertainment and to increase their well-being [7, 8], this could be used as a basis for active engagement with people with dementia, to both provide a platform on which to present reminders and music interventions.

The RadioMe project set out with an interdisciplinary team to build a system that would improve the lives of people with dementia in their own homes. Over the course of the project so far, researchers in the fields of music therapy, dementia research, music computation, machine learning and human computer interaction have worked together to design an adaptive radio system, capable of providing reminders during the live radio stream and providing music interventions to mitigate agitation in people with dementia. The RadioMe prototype itself has not been presented or discussed in detail in previous publications, but some parts used in the prototype have been published (especially the models used [4, 11, 12]) and the overall project has been discussed in posters and workshops at several conferences [3, 5].
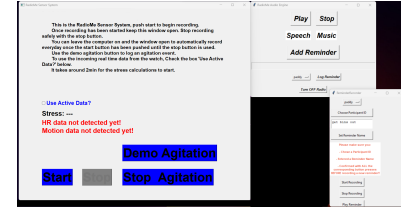
2 RADIOME PROTOTYPE

The RadioMe prototype was designed to being used while actively listening to the radio and combines reminder presentation as well as music intervention when detecting agitation in people with dementia. Figure 1 shows the the system laptop and connected smartwatch as well as the interface of the prototype. Agitation will automatically be mitigated with calming music, integrated into a live radio stream. This calming music for each individual was determined with experts in music therapy sessions, providing a playlist of calming music for each user specifically, which can easily be integrated into the system by our music therapists.

2.1 Music Intervention

The live radio stream is being recorded via the internet and played through our system, where the content of the stream is constantly analysed and segmented into music and speech [11, 12] to allow for seamless integration of our content. Agitation is detected with a machine learning model based on physiological data [4] collected in real-time through a smartwatch app and sent to the laptop via WiFi. The system algorithm constantly analyses the last minute of physiological data every 10s to determine if the participant is agitated or not and feeds the result into the system. For demonstration purposes, the use of active data is optional and an agitation

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[1]https://www.who.int/news-room/fact-sheets/detail/dementia (accessed 07/02/2024)

(a) RadioMe Prototype System Setup: the system runs on a laptop to which a smartwatch sends heart rate and motion sensor data.

(b) Screenshot of the RadioMe Prototype User Interface: three windows controlling the agitation detection, the live radio steam and remixing and recording of reminders for the system.

Figure 1: RadioMe Prototype System Setup and User Interface.

response can be triggered manually by pressing a button on the interface (*Demo Agitation*). Once the system detects agitation, a remixing process is initiated which slowly fades out the live radio content and starts playing the calming music. The current participant can be chosen in the system and the music will be collected out of their individualised playlist. Once the song is finished, the system will automatically play the live radio content until another agitation event occurs. For this demonstration, one participant will have been set up with their playlist, of which the songs will have been shortened to under 1.5min, allowing for continuous presentation of the music intervention. The smartwatch will be given to several participants during the presentation, but the use of live data will be minimised for more control over the system behaviour, so we can show all aspects of the system.

2.2 Reminder System

Reminders can be directly recorded within our system and scheduled through a Google calendar, see Figure 2. The name of the recording has to fit the name entered into the Google calendar (highlighted in red) and the name of the participant in the recording window and the radio window have to match (highlighted in green) to ensure the correct reminders are played for each participant. During the demonstration, we would have participants record their own reminders and then schedule them in the calendar. Our system is set up to regularly check for any new reminders in the calendar and will start finding an appropriate time within the live radio stream from 5min before the reminder start time. The presentation time can vary depending on the content of the radio stream, as our system is set up to not interrupt speech unless a long enough break is detected to allow for seamless integration. The content of the radio is then overlayed with the recorded reminder content.

3 DISCUSSION AND CONCLUSION

The RadioMe prototype is designed to support people with dementia in their home, using a medium that older adults regularly use already: the radio. Our system adapts the live radio stream and provides easy ways to record and schedule reminders and to support
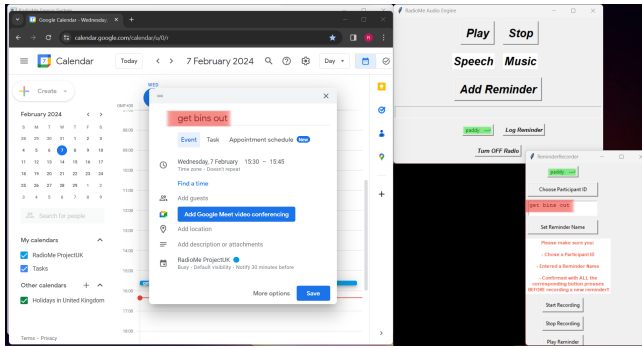
Figure 2: Reminder Entry process: reminders can be recorded within the system and scheduled via Google calendar.

people with dementia in stressful situations by playing their preferred, calming music. This is still work in progress, but this working prototype allows us to gain feedback on the different aspects of our system, focus user feedback and collect preferences from people with dementia and their carers, and through the demonstration at conferences, from other researchers. The RadioMe system has the potential to improve the lives of people with dementia and their carers significantly and this prototype provides an important step towards this goal.

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A FLOOR-PLAN OF DEMO SETUP

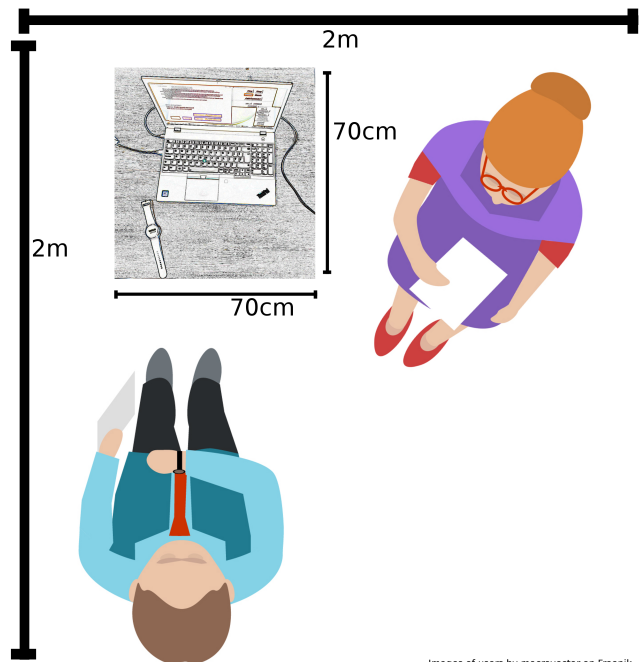Images of users by macrovector on Freepik

Figure 3: Setup of demonstration: small table of minimum 70cm x 70cm is needed for laptop and potential loudspeakers, as well as some space around of approximately 2m x 2cm (including the table).