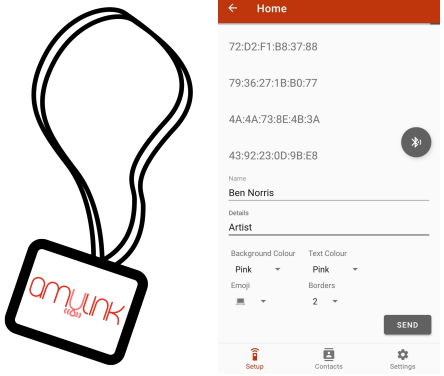

Amulink: Dynamically Displaying and Transferring Personal Information Using Bluetooth and NFC

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ABSTRACT

Current methods of networking among students can be cumbersome; having to actively search for someone on social media during a conversation, or remember many names after an event, can lead to many lost connections. We present Amulink, a system comprising of a wearable lanyard and software solutions, which facilitates interaction between students at professional and social events. Of course,

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Figure 1: Amulink configured with Name, Society and Interests

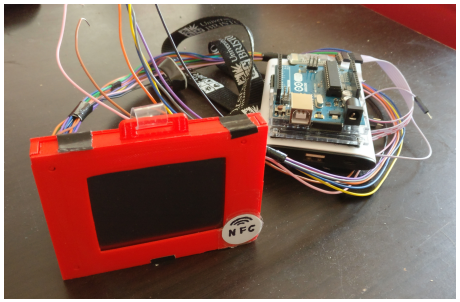

Figure 2: Amulink prototype with Arduino and portable charger

this is not just limited to students or student events but any scenario that involves meeting a lot of new people. Amulink's lanyard dynamically displays information about the wearer on a digital screen embedded in an attached case, and can transfer this information via NFC. We conducted a short study and found that many students often forget people they have met at events, who they wish they could have remembered. This work will enable more frequent and fluid information sharing, reducing the need to remember a lot of information or interact with a mobile device during a conversation.

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INTRODUCTION

When many students initially arrive at university they often have few or no friends or acquaintances. Their first year is generally filled with society, freshers and course events in which it is possible to meet new people and construct a social circle. In subsequent years, as well as building a social network they also have to start thinking about their professional network. With that comes networking and career events, alongside university talks. It is almost guaranteed that names and people will be forgotten along the way. The issue with the current technology is that it often requires you to take out your phone and awkwardly search for names on social media. We often forego this because it; can be invasive to the conversation, can be prevented due to a lack of internet connection, or can be difficult to hear all the required details in a noisy environment, opting instead to just hope we remember their details to act upon later. Although business cards could be suitable in a professional environment, we are transitioning to a paperless society, due to advancement in technology and a need to preserve the environment. This all led to the creation of this system, Amulink, that dynamically displays information about yourself at events and allows people to retrieve all your information in a single, effortless interaction.

Every event has a different context. At one, you might be wanting to exchange your LinkedIn profile, at another you might want to share your hobbies and interests. Our solution allows for information to be tailored to the needs of the individual and the social context. Alongside displaying information about the user, Amulink contains an NFC feature that transfers and stores the Amulink owner's data onto a receiving device. This asymmetric functionality means that even users without the Amulink's lanyard can benefit from it.

Our field tests show that most people can see themselves using this device in various situations such as professional networking events, conventions, conferences and formal parties. Additionally, they

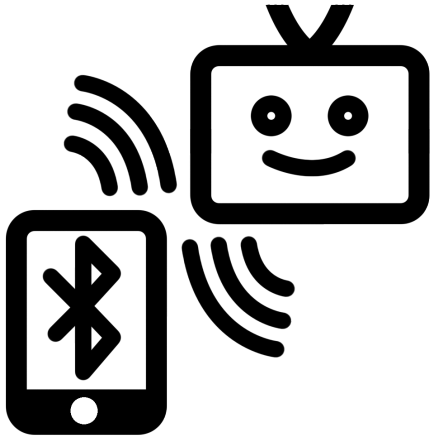

Figure 3: Communicating between the app and Amulink

Figure 4: Receiving data with NFC

show that with intuitive setup and use it is a very accessible device for people of varying technological backgrounds. Although not everyone owns an NFC enabled device, there are already 2 billion NFC enabled devices worldwide and the NFC market is set to grow 17.9% over the next decade [4]. This type of growth in the industry means that in the near future Amulink, and receiving information from an Amulink, will be accessible for the majority of people that own a smart phone.

WALKTHROUGH

Amulink is a system for sharing information between people at social and professional events. Prior to, or at the beginning of, the event the Amulink user chooses the information they wish to make available via the accompanying mobile application. When present at the event and they receive their Amulink lanyard which they can then upload the information to via Bluetooth, as shown in Figure 3. During the event, an interested person may receive this data by tapping their phone on the Amulink lanyard. This data is then stored in their Amulink account to be handled at a later date. The "tap" facilitates the transmission of the Amulink ID through near-field communication, as displayed in Figure 4. Once this basic motion is performed, the interaction has been completed.
At a later date, this person can open the app to find a summary of people they met at the event, and view the information each had provided. The preface is that the event hosts would provide the attendees with an Amulink lanyard to configure, use at the event, then return. However as the user base grows it may become more common for single users to own their own lanyard to use in any situation they see fit, allowing for further personalisation.

RELATED WORK

In this section we list the existing work that is related to ours and discuss their pros, cons, similarities and differences.

NFC for Social Interaction

MyState [3] is a proposed system for the sharing of social or contextual information on social media by allowing users to make the environment interactive, and their online presence reflective of their real-life availability. In the study by Hardy et al, they discuss the benefits of using customisable near-field communication tags to easily update an online presence, which lets interested individuals discover your social availability without potentially interrupting important plans or meetings. Amulink follows a similar principle, allowing users to express their availability and customise the data they want to share.
There are products available that bare some similarities to Amulink, but are bare-boned versions that do not utilise all of the fundamental features we include, such as a personalised display. For example, NFC lanyards are marketed to conventions and conference [1].

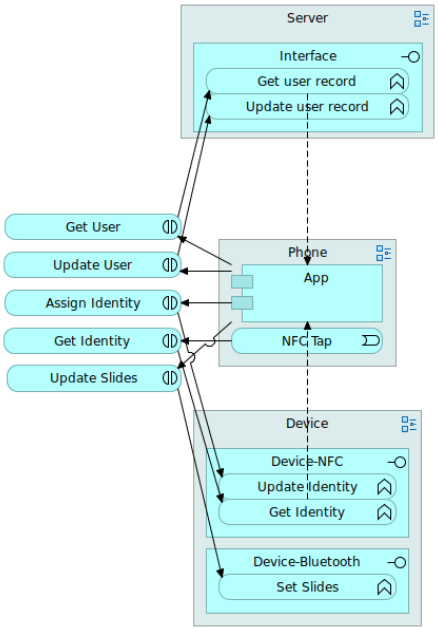

Figure 5: Architecture of Amulink interactions

Battery-free wearable displays

AlterWear [2] is an architecture to allow for battery-free wearable displays, with the intention of expanding the scope of wearable designs. In this CHI paper by Dierk et al. they present a prototype system that functions using NFC enabled electromagnetic induction to power the device and bi-stable ink as the display. The user can NFC the design of their choice onto the display and then the display can be worn independent of the device, should an animation be desired the NFC device must remain close to the display. This presents an interesting possibility for the future of Amulink, especially in regard to displays embedded in clothing, however should touch capability and multiple screens be required this technology would need to be augmented. The prototype itself shares few similarities with Amulink, but does fit a similar niche when it comes to wearable displays.

INITIAL DESIGN SURVEY

A short survey was conducted to assess the initial design for the device, a pin badge. A cardboard prototype was used to demonstrate a typical scenario when conducting the survey. The results of the survey showed that a market exists for such a device. We discovered that around 80% of the people surveyed found that they often forget who they meet at events and want to remember. Additionally, it presented a lot more use cases that we had not initially considered. The physical design was not desirable since there had to be physical interaction with the pin. Many people found that the action of touching a phone to one's lapel area felt invasive of that person's privacy. In response to this our design changed to be in the form of a lanyard that extends so that the person wearing the device can choose where the interaction occurs.

ARCHITECTURE

Our system is designed in such a way that it requires minimal interaction from both the wearer and receiver. Most of the heavy lifting will be done by Amulink's software solution which can be accessed as either an app on the receiver's device or a web based application in a browser.

Each Amulink lanyard contains an NFC tag with a unique ID which can be linked to a users profile when they sign up to the service or when changing lanyard. For a user to set up their profile and lanyard for an event they can use the companion app to submit their data. This sends display data via Bluetooth to a transceiver attached to an Arduino Uno connected to the display on the lanyard; The Arduino then displays this on the display. Simultaneously, their profile data (plus any additional data they want transferred to a receiver) is uploaded to a database and linked to their account. The information can be dynamically changed by updating the information in the app. A receiver can then hold their phone near the display to retrieve the unique ID from the embedded NFC tag, which will

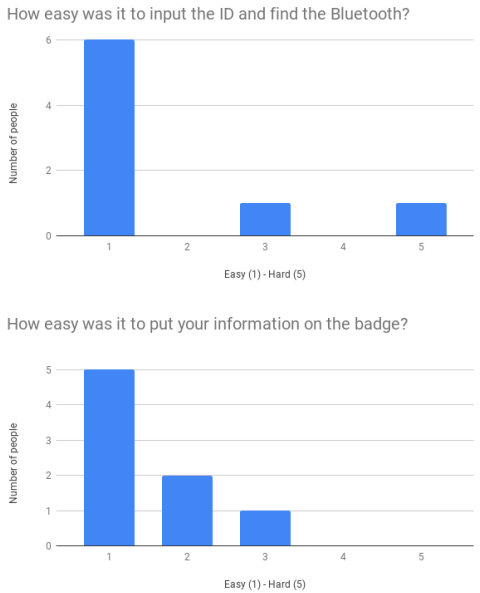

Figure 6: Amulink Setup questionnaire results

then open the companion app if installed, or the web app to add that person to the receivers contacts list.

Currently this architecture requires an external carrying case for the Arduino, Bluetooth receiver and battery pack. With access to tailored hardware we believe the size can be reduced so that the entire system will fit within the casing on the lanyard.

FORMATIVE STUDY & EVALUATION

In order to assess whether Amulink was a convenient and fluid way of information sharing, 4 pairs of participants were individually asked to complete two interactions with the device. For the first interaction, the participants were briefly introduced to the device and then given a 'quick-start guide' style information sheet, which walked through setting up the device. The focus of the assessment here was to see how intuitive the device was to set up and whether there were any bugs or confusing elements. The responses from this experiment were gathered in the form of a questionnaire, and through the use of an observer study. The second interaction involved the participants, in pairs, role playing a networking scenario. Because the participants have already been introduced to the device (including how the transfer of information works) no prompts were provided unless they explicitly asked or were visibly stuck. The purpose of this section of the study was to answer the question "Does sharing information via Amulink fit naturally into social/networking situations?". Because this part of the experiment was a lot more nuanced, the responses were gathered in the form of a short, non formal, interview, again augmented with an observer study.

The results of the questionnaire were reviewed using the graphs constructed by Google Forms. 7 out of 8 participants were able to complete the "Amulink setup" part of the task on the first try. The one failure was a result of a bug in our application, and after restarting the app they were able to complete it on the second attempt. As can be seen, the results from the short questionnaire show that 6 out of 8 people found it very easy to input their information on the device. The feedback from the more negative responses indicate that in areas with lots of Bluetooth devices it can be tricky to locate the Amulink's Bluetooth ID. A possible solution would be to have a search function for the list or to have the app automatically filter out non "Amulink" ID's.

As can be seen in figure 5, none of the participants found it "hard" to input their information onto the badge; however, in the feedback from the second part of the study it was found that most people would have preferred to have more control over the customisation of information on the badge. There were no instructions provided for the "interaction" half of the study and based on our observations it was clear that instructions were needed. Over half of the participants attempted to reach for the other persons badge without the badge being extended outwards, leading to some awkward interactions,

the action of offering the badge was not readily obvious to participants. Additionally the NFC sticker used in the prototype had a weak signal so it took some effort to get the interaction to happen. A lot of the participants mentioned that they only felt awkward about the NFC interaction because of the lack of social context and said that if they were in a real situation it would have been more natural.

All participants said that they would use the Amulink on the basis that the features from the prototype would be expanded. Additional features participants mentioned include: the ability to add voice notes at the time of the interaction, a notes section to give context for a contact, and the opportunity to add further customisation of the information that can be displayed on the badge and uploaded to their profile, including pictures, videos and having multiple slides on the badge.

It must also be noted that, while the outcomes of this study is on the whole positive, the total number of participants is quite low and further studies, especially in a more formal context, would be beneficial.

CONCLUSION

In this paper we introduced Amulink, an interactive identification system for easily sharing contact and contextual information to assist with socialising and networking. The current prototype would be too large and inconvenient to use. With less "one size fits all" hardware such as the Arduino, and smaller battery units the Amulink hardware could become small enough and light enough to use in place of a typical lanyard. User responses were on the whole very positive with many participants saying they could see themselves using it. Further research needs to be done to improve the feature set, such as, observing information exchanges in a variety of social contexts and larger scale questionnaires.

CONTRIBUTION WEIGHTS

Contributions equal across the group.

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