MoodBand: An Illuminated Wristband

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ABSTRACT

To address the issue of apprehensiveness when trying to approach and talk to strangers, we propose MoodBand, a wearable device that can project the user's social intentions in a clear and unobtrusive manner. Our product can increase the transparency of people's intentions, encouraging conversation between strangers in places where they might not otherwise communicate, in locations such as buses, cafes and waiting rooms. MoodBand allows a user to change the colour of the band depending on their disposition towards socialising with people; green indicates willingness to start a conversation, and red means the wearer is busy and unable to talk. Our experiments involved students using the MoodBand, and results showed a positive response in how the band aids initialising conversation.

University of Bristol, Interactive devices, 2018

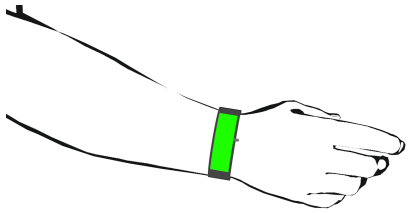

Figure 1: The default colour is green, which signifies the user is open to socialising.

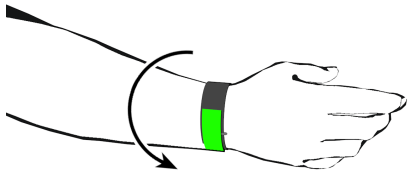

Figure 2: User flicks their wrist twice to change between colours.

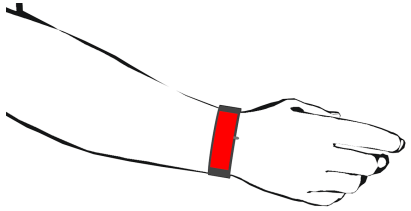

Figure 3: Red means the user is not open to socialising.

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INTRODUCTION

Previous research has shown that loneliness is a one of the most common issues for university students [1], with lonely students having a smaller social network and being affected more by mental illness. Wearable technology can be used to boost social communities in a more intimate and personal way than online communities on websites and forums, as researched in the WearCom paper [2].

Wrist-worn accessories are commonplace, and are also a familiar form for wearable technology (e.g. watches, Apple Watch, bracelets). Furthermore, they are highly visible for the wearer and the people they interact with. They have been frequently used for other similar products, such as WaterJewel [3] and CrowdLEDs [5], both for different objectives, but using a similar method of light-up, with RGB LED wristbands.

Our solution investigates the use of wearable technology with the aim to ease the initial difficulty and ambiguity in approaching people for conversation, by improving upon the aforementioned research and products. By combining a CrowdLED style wristbands with social applications described in the WearCom paper, we create MoodBand.

Although previous research covers similar applications, they either do not have a finalised product as a solution to this problem, or their product has a different objective all-together. Our product offers a combination, with an easy-to-use and intuitive solution.

Widespread adoption of MoodBand in specific locations is intended to encourage users to interact with people outside of their social sphere. One such example could be the distribution of MoodBands to lecturers in addition to students, so lecturers can wear them when sitting around the university campus to let students know if it's okay to talk to them or ask them questions. Another such example is at conference style events where there are many strangers who are looking to talk to new people.

MoodBand uses an Adafruit NeoPixel LED strip, which is attached to the band, controlled by an Arduino Nano and a Gyroscope to control the colour change, which is done by two quick flicks of the wrist. We created two versions of the product; one version is controlled by a button, and the other uses the gyroscope, to give users a variety of controls.

WALKTHROUGH

To use the wristband, first wear the wristband and press the power button to switch it on. There are two colours to choose from for the illumination of the wristband; red and green. The default colour of the wristband is green which indicates that you are open to socialising with others. Red indicates

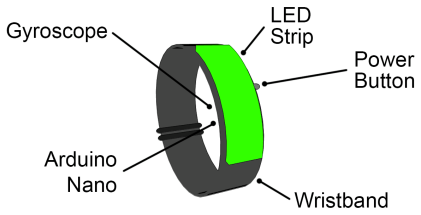

Figure 4: A labelled diagram of the MoodBand concept and all its components.

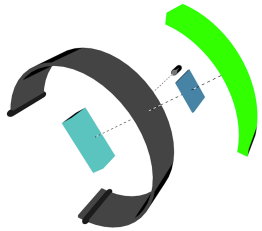

Figure 5: An exploded view of the MoodBand concept.

that you are busy, and hence, unwilling to talk. To change colour, perform 2 swift flicks of your wrist either clockwise or anti-clockwise.

RELATED WORK

Similar products

CrowdLED is a remote (DMX) controlled, silicone wristband that can be programmed to light up in crowd events such as concerts. The LED bracelets have a built-in radio signal receiver that light up in chosen colours once a signal is sent from a remote control. It can light up in various colours using RGB LEDs, different flashing patterns or speeds, and has a plug-in and play capability for less experienced users.

Related Papers

WearCom [2] presents a design methodology for wearable community application creation, using previous research done on computer-mediated communities, and expanding on it by concentrating on wearable technology and its effect on embodied, real-world human encounters.

WaterJewel [3] is a bracelet with discreetly integrated light spots that reflect the user's actual drinking behaviour via abstract light signals. Though the problem solved in the paper is unrelated to MoodBand, it has a similar solution, using light up wristbands to get across information to users.

Relationship between color and emotion, [4] is a paper that discusses the associations between colour and emotion from the perspective of college students. We used this paper as part of the evidence for choosing the colours that we did.

DESIGN

Our initial idea for this product was to use a highly visible, wearable technology. Using previous research[3], we shortlisted three form factors for the device: pendants, wristbands, and rings, and eventually decided on using a wristband. Though our current design is simplistic in nature, it can easily be expanded to suit different tastes and genders.

Our first design iteration involved two cardboard prototypes; a wristband with a slider to select between red, yellow and green. This was used to run the small user study session and obtain feedback about the concept and colours.

Our final prototype uses an LED strip that wraps around the wrist, controlled by either a button or an accelerometer which alternates the colours. The technologies used were the Adafruit NeoPixel strip for the display, an accelerometer for gesture control, and an Arduino Nano to control the logic. We used an adjustable velcro strap for the bracelet, with a plastic sheath attached to allow the NeoPixels to slide in.

Figure 6: A user wearing the MoodBand prototype.

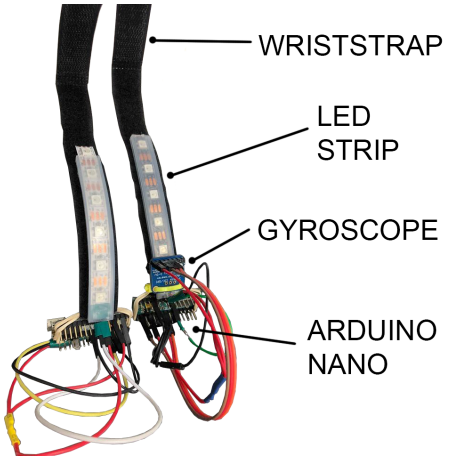

Figure 7: The MoodBand prototypes, on the right is the one that uses a gyroscope/accelerometer.

We created two MoodBands, one with the gyroscope for "wrist-flick" gesture control to change colour, and the other for switching colour using a button. Both were used in the demo in order to get more in depth, hands-on feedback from users on how they prefer to interact with the device.

The control logic is implemented using the Arduino IDE, with the external Adafruit libraries for powering the LED strip and showing the correct colours. The gyroscope and the button are connected to the Arduino Nano. The button is connected to ground (to stop current impulse fluctuation when the button is not pressed) via a resistance; the resistance is there to prevent short circuiting when the button is pressed. For gesture control, we get real time output from the accelerometer X, Y, Z axes and corresponding accelerations, then we threshold these at some value (for each axis). We check if the accelerometer input is over this threshold twice in a short time window, which counts as a flick. We found this threshold and time window by recording different wrist motions, and picking one that whose motion signature would be different enough from everyday movements in order to be able to capture it with high accuracy, ending up with two rapid wrist rotations (supinations). The button and gesture switching is then used to trigger the colour change of the LED strip.

EVALUATION

We conducted three studies. Prior to each study we asked each participant to fill out data permission slips with the necessary preliminary compliance questions.

Study 1: Cardboard prototype

The first was an informal study involving seven students from the University of Bristol of mixed genders, all of which were aged between 19 and 25. In this study we presented our cardboard prototype to garner feedback on the mechanics of the wristband. An introduction to the device was given, stating the purpose of the device as well as the colour definitions. We then gave a hands on experience of the device using two cardboard prototypes that the two participants would use. The cardboard colour slider would initially be set to red for each participant. One of the participants was then requested to change there slider to either yellow or green. We then asked each participant what the meaning of their wristband colour was and how they would approach the other participant based on their wristband to ensure they understood the usage of the device. We offered questions to probe their opinion on the features of the device. Without being told prior, participants unanimously understood the expected scenario in which the device would be useful, being where people are around others that they do not know e.g. during a freshers event. The wristband containing three colours (red, yellow, green) as per our initial design was deemed excessive according to five out of seven participants, with yellow being unanimously considered an unnecessary colour, despite receiving an explanation of the use case of the colour prior to the study. All seven participants were concerned about the potential for the gestures to be incorrectly detected when the user flicks the wrist.

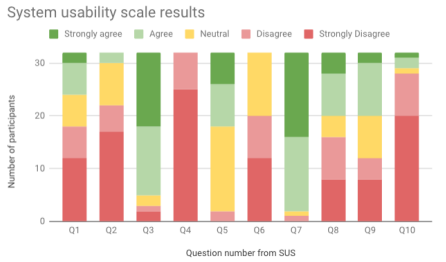

Figure 8: The results of the SUS questionnaire. The test was done on 32 users.

Questions asked pre-user study:

- Do you feel comfortable approaching a stranger and talking to them?
- Would you use a device that lets strangers know if you're open to conversation or not?
- Would you like it if strangers wore a device that let you know if they're open to conversation or not?

Questions asked post-user study:

- Did knowing other people's intention make it easier for you to approach them and talk to them?
- Did you feel comfortable wearing the wristband and showing your intentions of socialising to strangers?

In response to this small study result, we understood that this is a device that could potentially be used among the population given our sample, however the mechanics of the MoodBand still needs to be improved. The first thing we did was remove yellow as a colour option, leaving the now binary option of red and green. Secondly, even though it was a concern about a potential problem with the design than a current problem with the design, was to focus our efforts on ensuring that the wristband colour will change with respect to the a flick of the users wrist beyond a reasonable doubt.

Study 2: System Usability Scale questionnaire

For MoodBand's second iteration we used a System Usability Scale (SUS)[6] survey to give a subjective assessment of usability through the evaluation of effectiveness, efficiency, and satisfaction. The SUS scale consists of ten statements, each of which the participant rates their level of agreement out of five. MoodBand scored 70% on the SUS scale, which is considered above average. We did not collect any user identifying information, to facilitate honest answers by the interviewee as they otherwise may feel imposed to give positive feedback regardless of the device quality. This was done by demonstrating and letting the users use the product, then asking them to fill out the SUS survey on Google Forms discreetly.

The results, as show in figure 8 indicate that many users would use the wristband frequently, and that users found the wristband simple to use. Some users felt that the hardware would be cumbersome to use. As the only technically and physically demanding part of the wristband is the double flick of the wrist, improving the wrist flicking motion is vital. As the wrist flick sensitivity is collaborated for the primary developer, a collaboration onboarding process can be used to facilitate the degree and strength of each users wrist flicking preferences.

Study 3: User study

A final user study was conducted, in a more natural environment as our product is intended to be used with a large group of people. We created 10 cardboard pairs of red and green bands and distributed them among 10 students. Each student chose which colour band to wear and they were then left to interact with other users for an hour, as we observed them.

We asked a set of questions before and after the test. Our aim for this user study was to find how comfortable the users were using a conceptual version of our product, and to see if it improved their interactions with other users. We targeted students that seemed to be working individually, so any interaction caused thanks to the band would not be with friend or acquaintances that they are sitting near.

Our results were quite varied across the users. Some found the band useful in interacting with new people, whereas others felt the band was somewhat awkward to wear, or that it didn't really help them overcome their apprehensiveness to talk to others. We did find that most of the students went

TEAM WEIGHTINGS

Tudor Petrescu - 20%
Aatina Punjabi - 20%
Ibrahim Qasim - 20%
Veyndan Stuart - 20%
Eleni Stylianou - 20%

out of their way to interact with other band wearers and were able to make conversation, using the band as a topic itself.

FUTURE WORK

To further develop the social nature of the product, a vibration motor and Bluetooth transmitter and receiver can be added to the device so that the wristband vibrates when registered friends are near you, or when someone in the vicinity switches from green to red. This would increase the scope of the device, as the device no longer has to be used purely in a space with unknown people, but can be used to keep in touch with your current friends. It could also store basic contact details (e.g. phone number, Facebook, Instagram), allowing users to share these details with others by tapping their bands.

A gamification aspect can be added, such as keeping up a streak of socialising with your friends. The LEDs can dim if it has been a long time since you've met up with friends, so to keep the LEDs as bright as possible, meet up with friends and tap bands regularly, ensuring frequent contact.

Gesture recognition can be further customised for every user, by adding a calibration mode. Using this, the wristband can recognize the variety of wrist-flick movements for different users, allowing for more accurate gesture control, and potential expansion of the number of gestures.

CONCLUSION

MoodBand is an illuminated wristband designed to encourage individuals to socialise more by making their disposition towards socialising clearer. There are a variety of ways to extend the use of the wristbands; they could be used as part of a social network or have a gamified aspect.

The results from the multiple studies conducted show a clear positive reception to the idea. The positive feedback focuses on the potential of the design for improving socialisation between both introverted and extroverted individuals as well as in large groups. The main points for improvement are creating a more subtle look to use as an accessory, and the gesture recognition. Despite this, it is clear that MoodBand could help weave the threads in the social fabric.

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