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Party Thyme - An interactive, social plant with vitality monitoring

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ABSTRACT

With 8.2 million people suffering from anxiety[1] and 9 million identifying as lonely[2] each year in the UK, there can be no doubt that these are two huge issues facing the population. Plants are being used increasingly to have a positive effect on people impacted by these mental health issues[4]. Our aim with Party Thyme was to enhance this positive effect by creating a multisensory environment around the plant, monitoring the vitality of the plant through our website and creating a small social network of plant users to allow people to maintain loose touch with friends through the plant[3]. From our initial observations we concluded that 81.3% of the target audience already owned a plant, however, many remarked that they struggle to remain interested in the plant for more than a month. After constructing a prototype, we were able to validate our idea as 87.5% of users indicated they would use an interactive plant.

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KEYWORDS

plants, multi-sensory, motion detecting, vitality monitoring, mental health inference, social network

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INTRODUCTION

For a large proportion of people, 81.3% of the audience that were surveyed, plants are a part of their everyday environment; whether this be at home or at work. The aim of Party Thyme is to take this large proportion of people and increase the amount of interactions they have with their plants with the goal of improving their mental well-being over a sustained period of time. With 8.2 million people suffering from anxiety[1] and 9 million identifying as lonely each year in the UK[2], there can be no doubt that Party Thyme is addressing a very pressing issue.

From a study measuring anxiety reduction after using plants as game controllers [8], it has been shown that interactions with plants significantly reduce anxiety levels even in a short time frame. Following on from this, Party Thyme can reduce anxiety levels every time the user interacts with the plant and thus over a sustained time frame the user will experience an overall reduction in their stress levels.

Party Thyme is an interactive plant connected to a website where a user can trigger outputs on the plant from the website such as playing a song, selecting a colour for a ring of LEDs or picking a scent to be released from a diffuser. The display of the plant's vitality levels on the user's website profile make it even easier to know how healthy their plant is. Moisture levels in the soil, as well as temperature and light levels in the plant's surroundings are being tracked and will notify the user if they need adjusting.

PARTY THYME DESIGN

The key components of the Party Thyme system are illustrated by the diagram below along with the four key use cases demonstrated with different colored arrows:

1) Red - View plant vitality online
2) Green - Add friends to a user's social network
3) Purple - Add an interaction the user's or friend's plant
4) Yellow - Motion sensor triggers interaction when user enters the room

Figure 1: Initial screen used to register users.

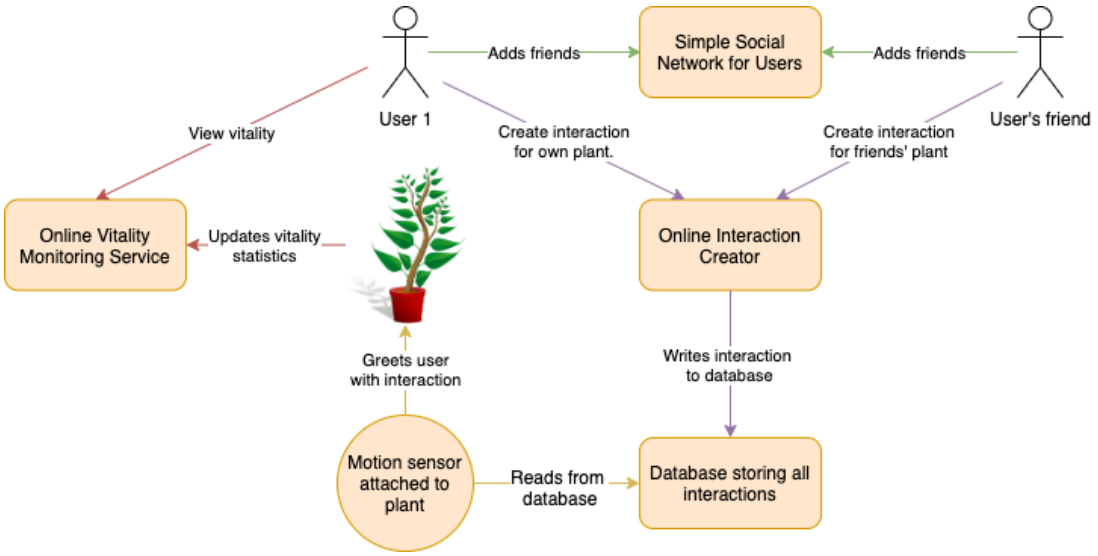

Figure 2: How the key components of Party Thyme execute the four key use cases

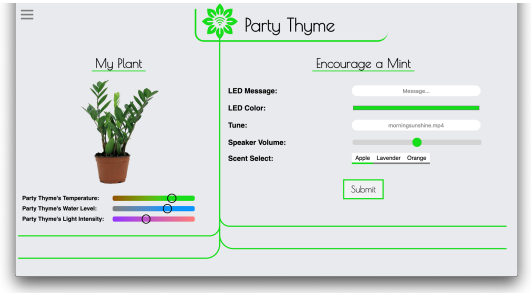

Figure 3: The index page used to set interactions and view plant vitality.

Figure 4: Simple page to add Friends to a user's social network.

All of the design features included within the Party Thyme structure have been constructed in an attempt to increase the number of interactions between the user and their plant whilst ensuring an enjoyable user friendly experience. The vision was to succeed in achieving both of these goals and thus reducing the anxiety levels and loneliness within Party Thyme's users. CSS and JavaScript were the main tools used to create an intuitive user experience where PHP and MySQL were used to manage the collection and storage of user data. From the website the user can set and trigger all of the plant output features including the LED ring, message, music choice or scent. As well as this, the plant's vitality readings which are constantly being tracked are displayed on the website for the user's profile. This can all be done from the index page which is reached after the user successfully completes registration.

The records being shown here are moisture level in the soil, light level in the room and temperature of the room. When the plant's health levels are depleting the user will be pushed a notification telling them to try and rectify this. The final feature of the website is the social network element which allows users to add friends from their profile and then view the plants of those within their network as well as sending interactions to their friends like messages or song choices.

The components being used within Party Thyme include a Raspberry Pi hosting the website which communicates with an Arduino which controls an Adafruit neopixel LED ring and an Adafruit Circuit Playground which feeds all of the vitality readings back to the Raspberry Pi. When the Raspberry Pi has read all of this data it sends it to a database which the website can then read from and update the user's profile. This set up could have been achieved with a single Arduino, however the Adafruit Circuit playground came with built in sensors, reducing the quanity of external hardware components required. The Adafruit Circuit could not replace the Arduino however, as it only facilitates single direction serial data communication.

A diagram of the final system architecture can be found in Figure 5.

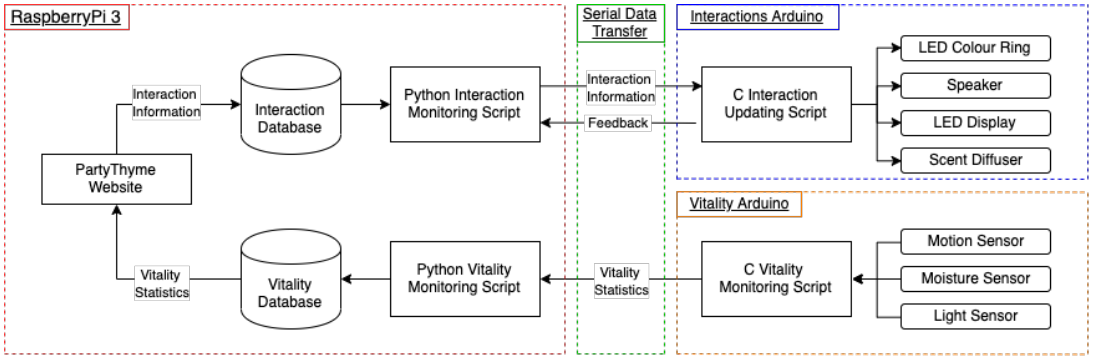

Figure 5: Diagram of the System Architecture of a Rapberry Pi 3 interacting with 2 Arduinos

RELATED WORK

The usefulness of Party Thyme in dealing with stress and anxiety is predicated on a range of assumptions, many of which have been proven by previous research. Our first and most critical assumption was that plants are an effective tool for lowering anxiety. This is validated by recent work which introduced plant-based games for anxiety reduction [8]. Participants in this study were observed to develop an "emotional attachment" to the plant which lessened their anxiety. However, for some users the game aspect of this product was shown to increase anxiety when the user lost the game, hence we decided to build a social network rather than a game around the plant.

Touchology [7] is an example of further research investigating the link between interacting with a plant and feeling a sense of calm. Touchology did receive some strong positive qualitative feedback from users with many reporting feeling "engaged". However, no quantitative results were collected

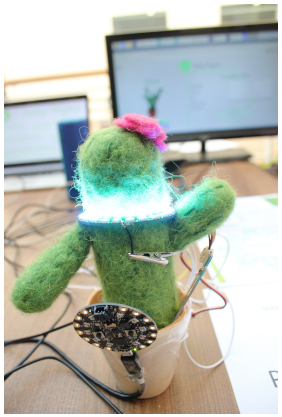

Figure 6: The Party Thyme demo used for the walkthrough

and the study was not conducted in a private setting, so further research is required to validate the assumption that Touchology is effective for relieving stress. Touchology also attempted to use light and sound to enhance the therapeutic effect on users however, included no rationale as to why this approach may be effective.

This in direct contrast to Scentery [5], which created a taxonomy based on substantial research regarding which sounds, scents and colours were found to have a calming impact on users. Scentery used this taxonomy as well as designing a novel VR experience, to create a calming multisensory environment designed at having a therapeutic effect on users. However, like Touchology the study lacked any quantitative results analysing its impact on alleviating stress and anxiety for users.

As well as assuming an interactive plant would have a consistent therapeutic impact on users, the feasibility of Party Thyme also hinged on the idea that it was possible to collect information on the health of the plant and report this information to a website. This assumption was validated by the PLEASED (PLants Employed As SEnsing Devices) research project [6]. PLEASED, demonstrated that biosensors could collect and wirelessly transmit a range of data when the plant was exposed to varying stimuli. Thorough experiments were conducted and indicated that PLEASED would continue to work even when exposed to dangerous conditions such as fire, chemicals and gasses.

PARTY THYME WALKTHROUGH

Registering on the website and adding friends proved to be very intuitive processes so we focused our walkthrough on creating a new interaction. Our walkthrough was completed with a new user who had never used the system before. The user was asked to create a new interaction on the website, which was then stored in the database. The selected color in the interaction was quickly reflected on the LED ring around the plant. To illustrate the vitality monitoring we briefly covered the light sensor and then refreshed the webpage, clearly showing the user that they could monitor the health of their plant.

EVALUATION OF PARTY THYME

An informal study was conducted investigating whether interacting with Party Thyme has a therapeutic effect. The participants were students and staff members at the University of Bristol, aged between 19 and 56. The users were informed they could select a color, song and scent to display and the selected color would be reflected on the LED ring as well as the plant's vitality updating online.

After each user was briefed on Party Thyme they spent an average of 3 minutes interacting with the plant and completed a survey, aimed at assessing the effectiveness and user satisfaction of the product. It also provided some user background, showing that 81% of them already have a natural plant. Considering only the 81% who already own a plant, 86% of them would consider having an interactive plant. Moreover, 94% of the users who don't own a natural plant responded that they

would like owning an interactive plant. Even though the prototype used during the survey did not have all the proposed features integrated, 94% of the users thought the product already has enough interactions. Also, 84% of them said they felt happier after the interaction.

Interaction frequency	Results (%)
Multiple times a day	54
Once a day	29
Once a week	9
Other	8

Table 1: How often the participants would interact with the plant

Generally feedback on the website was very positive with it being described as "highly intuitive" and "very clear".

FUTURE WORK

The latest prototype of Party Thyme is sufficient to demonstrate our concept. Although integrating extra interactions like sounds and scent would allow us to create a calming multisensory environment in a similar way to Scentery [5]. Given a greater amount of time, it would be very feasible to produce a PartyThyme which fully incorporated every feature outlined in the website. Our team's aim would be to pack all of the electronics involved within the product in the base of the plant pot. This would reduce any possible eyesores involved and health and safety issues surrounding live wires.

For future development, we are considering utilising capacitive sensing to allow users to communicate with the plant directly with touches. This could be achieved by connecting a real plant to the Arduino and use its leaves or different body parts as control buttons. Making use of plants' electrochemical signals to build interactive functionalities has been archived by several different experiments and studies, thus this is a practical development path.

CONCLUSION

This report has discussed the development of a design and a prototype for an interactive plant that has the functionalities of a multi-input multi-output system. The goal of this project was to develop the essential hardware and software in order to have a plant that could sense its surrounding to monitor its own environmental conditions and react to user inputs, which has been achieved. In addition, the model successfully fulfils its intended purpose of increasing users' happiness and encouraging interactions between users and the plant.

REFERENCES

[1] 2017. Mental health statistics: anxiety. https://www.mentalhealth.org.uk/statistics/mental-health-statistics-anxiety

[2] 2018. The facts on loneliness. https://www.campaigntoendloneliness.org/the-facts-on-loneliness/

[3] Maria Cohut. 2018. What are the health benefits of being social? https://www.medicalnewstoday.com/articles/321019

[4] Pat Hurst. 2019. Plants prescribed for anxiety and depression in new feelgood scheme. https://www.independent.co.uk/news/health/plants-prescribed-depression-anxiety-manchester-trial-a9078041.html

[5] Elle Luo and Katia Vega. 2018. Scentery: A Calming Multisensory Environment by Mixing Virtual Reality, Sound, and Scent. In *Proceedings of the 20th International Conference on Human-Computer Interaction with Mobile Devices and Services Adjunct (MobileHCI '18)*. ACM, New York, NY, USA, 158–165. https://doi.org/10.1145/3236112.3236135

[6] V. Manzella, C. Gaz, A. Vitaletti, E. Masi, L. Santopolo, S. Mancuso, D. Salazar, and J. J. de las Heras. 2013. Plants As Sensing Devices: The PLEASED Experience. In *Proceedings of the 11th ACM Conference on Embedded Networked Sensor Systems (SenSys '13)*. ACM, New York, NY, USA, Article 76, 2 pages. https://doi.org/10.1145/2517351.2517403

[7] Jinsil Hwaryoung Seo, Annie Sungkajun, and Jinkyo Suh. 2015. Touchology: Towards Interactive Plant Design for Children with Autism and Older Adults in Senior Housing. In *Proceedings of the 33rd Annual ACM Conference Extended Abstracts on Human Factors in Computing Systems (CHI EA '15)*. ACM, New York, NY, USA, 893–898. https://doi.org/10.1145/2702613.2732883

[8] Jina Huh Taiwoo Park, Tianyu Hu. 2016. Plant-based Games for Anxiety Reduction. https://dl.acm.org/ft_gateway.cfm?id=2968094&ftid=1798222&dwn=1&CFID=118299608&CFTOKEN=33888a7959fef2b3-CAF26A57-074F-E7AD-23BF57286CF729EA