Emoverse: Reflective Emotional Interaction Platform

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1 INTRODUCTION

Academic stress is a commonly known factor that adversely affects the mental well-being of university students [2]. To combat this pressing issue, our group is interested in exploring a way to mitigate a mental health crisis in our community. As a form of social support, sharing emotions is a prevalent practice with various individual motives (e.g. venting, seeking support) and tangible beneficial effects [3]. In other words, promoting emotion sharing among college students may be the key to addressing this nation-wide mental health concern. As previous studies have revealed that asynchronous communication and computer-mediated communication are promising facilitators of social support, we propose building an interactive emotional sharing platform that uses augmented reality (AR) to alleviate negative emotions that lead to mental health problems within the student community.

2 RELATED WORKS

2.1 Social Support for Mitigating Stress

Prior literature has demonstrated a reinforcing relationship between social support and positive mental health [12]. Several attempts have been made to help facilitate social support between individuals. For example, a systematic review of asynchronous telepsychiatry reveals that the elimination of real-time communication does not necessarily compromise the quality of care perceived by patients and could improve the efficiency of the process, suggesting that delayed support should be further investigated [8]. Additionally, multiple studies demonstrate that anonymous computer-mediated communication (CMC) can alleviate mental health symptoms such as anxiety [7].

2.2 AR for Mental Health Treatment

One hypothesis we make is that virtual forms of social support can parallel, if not exceed, the benefits of emotional exchanges in person. This is based on prior findings that digital interventions can significantly impact mental health, offering new avenues for connectivity and support [1]. A previous study presents a compelling case for the efficacy of asynchronous social support facilitated through a web-based application, highlighting the unique potential of digital platforms to foster emotional sharing and support in an anonymous environment [6]. Similarly, AR has been shown to seamlessly integrate into mental health treatment plans, revealing the untapped potential of AR to create immersive, supportive environments [9].

Furthermore, synchronous and asynchronous communication technologies can foster a sense of connectedness among users [11]. Although not directly related to AR, digital interventions can leverage physiological data to facilitate emotional connectivity [5]. There is also a proven need for innovative mental health solutions that target academic stress among college students [2].

Building on these foundational studies, Emoverse seeks to bridge the existing literature gap by using AR as a medium to promote social support among college students. While previous research has affirmed the effectiveness of digital and AR interventions in mental health, there remains a notable paucity of exploration of AR's capacity to facilitate emotional sharing and support. Emoverse aims to create a virtual environment where emotions can be externalized and shared, fostering a sense of community and support among users.

3 HIGH-LEVEL SYSTEM DESIGN

Imagine if our emotions could manifest as situated objects, accessible for interaction by others. We aim to develop an AR-based system that offers a user experience consisting of six steps (Figure 1):

3.1 User Login/Registration

Users can create an account anonymously on our platform. All personal information will not be visible to others, except for a unique ID that they can name to represent themselves in the Emoverse community.

3.2 Emotion Creation

Users can externalize their current emotion by creating an AR object representing their emotion, accompanied by a short text describing specific feelings.

3.3 Emotion Placement and Settings

Users can place or conceal their emotions anywhere in their vicinity in AR.

3.4 User Interactions with Emotions

Subsequently, fellow users stumbling upon these emotions can engage with them, eliciting the embedded emotions through four types of actions: touching, poking, patting or pinching. They have the option to respond to these emotions by sending supportive messages or expressing similar sentiments, all of which are logged within the object, forming a comprehensive thread of interactions and reactions since its inception.

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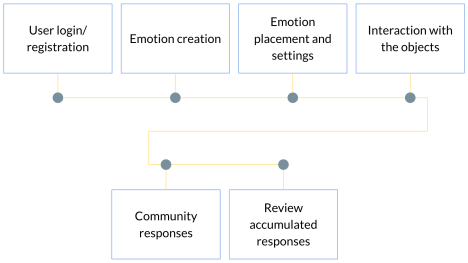

Figure 1: System Structure

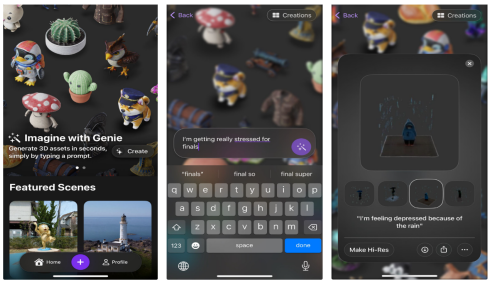

Figure 2: Generate an AR emotion with a prompt in Luma

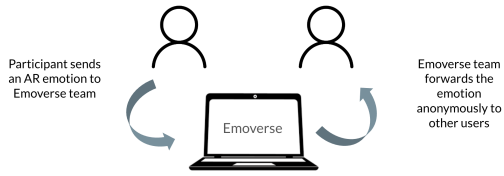

Figure 3: Participants receive emotions created by others

3.5 Accumulated Community Responses

The system allows users to periodically revisit the object within the app to review the evolving thread of interactions. As more contributions accumulate, the object transforms into a communal emotional journey, offering support and empathy to all involved.

3.6 End of Emotion Sharing

Emotion sharing ends 24 hours after each creation, but all users participated in the communal emotional journey are able to revisit the emotion at anytime in the future.

4 USER STUDY

4.1 Study Design

Given what we know about asynchronous support and AR used in mental health care services, how can we devise a system in AR that effectively promotes and facilitates social support in the form of emotion sharing among university students?

To better inform the system design, we conducted a user study to understand if externalizing emotions and allowing asynchronous communication of emotions will significantly increase general moods and perceived social support and reduce stress and anxiety symptoms among participants. We also aim to assess the the effectiveness of AR in externalizing and expressing emotions.

4.1.1 Pre-experiment Questionnaire: Standardized mental health surveys were administered to participants right before engaging with the wizard-of-oz experiment. These surveys measure the level of negative mood, perceived support, stress and anxiety in the last two weeks to provide a quantitative measure of the participants' mental well-being prior to the experiment. The following measures were used for negative mood, perceived support, stress, and anxiety assessments:

- Negative moods - Mood and Feelings Questionnaire (MFQ)
- Perceived support - Multidimensional Scale of Perceived Social support (MSPSS)
- Stress - Perceived Stress Questionnaire (PSQ)
- Anxiety - Generalized Anxiety Disorder 7 (GAD-7)

4.1.2 Wizard-of-oz Experiment: For the experiment, we conducted a wizard-of-oz evaluation to test the usefulness of asynchronous support and in mitigating stress and anxiety, and AR in emotion representation.

- Step 1: We ask the participant to create AR objects representing their emotions with the Luma app, which generates AR objects based on text input (Figure 2).
- Step 2: The participant emails the created emotions to the Emoverse team. We then forward the emotions anonymously to other participants, asking them to respond to these emotions showing empathy and support (Figure 3).
- Step 3: Participants respond to the emotions by replying to the emails the Emoverse team forwarded in Step 2. The team than forwards the responses anonymously to the creator of the emotion (Figure 4). As responses accumulate, each emotion will form a thread of replies from the participants.
- Step 4: We gather feedback on the emotional interactions in Step 2 and 3 through subsequent interviews, focusing on participants' experiences, perceived effectiveness of the support received and AR's role in externalizing emotions.

4.1.3 Post-experiment Questionnaire: The same measures from the pre-experiment questionnaire were used to assess any changes within 24 hours (experiment period) for each participant.

4.1.4 Post-experiment Interview: The post-study interviews conducted with participants were comprehensive, designed to gather in-depth feedback starting with familiarity and past experiences with AR technology. We asked the participants about their experiences with the existing AR app in creating AR objects. The interview also explored participants' reactions to viewing and responding to emotional objects created by others. We also showed the participants the prototype of our applications and sought feedback on the app's usability and functionality.

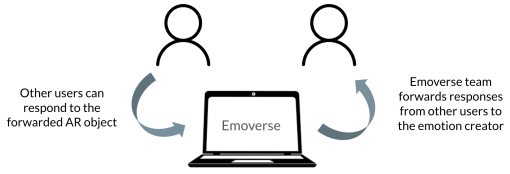

Figure 4: Participants receive others' responses to their emotions

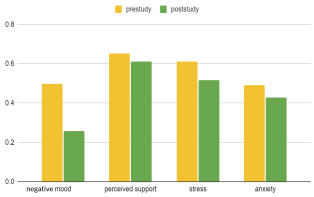

Figure 5: Quantitative Analysis of Results

	Pre-study	Post-study
Negative Mood	0.499	0.256
Perceived Support	0.652	0.61
Stress	0.611	0.518
Anxiety	0.491	0.428

Table 1: Normalized pre- and post-study results for mood, perceived support, stress, and anxiety measures

4.2 Quantitative Insights

For our pre and post study survey, we asked our participants (n=3) to fill out a survey which contained questions about their moods, perceived support, stress, and anxiety.

For all parameters, we computed raw scores using the official guideline for each of the measures. We then calculated the average and normalized results on a scale of 0-1 for all participants before and after interacting with Emoverse. The results are as described in Figure 5.

We have noticed a downward trend in all the parameters after our study indicating that Emoverse has had a positive impact in reducing stress, anxiety and boosting the mental health of the participants. Complete normalized results are shown in Table 1.

We believe that the decrease in perceived support reflects the type of questions used in the MSPSS measure. Since the questions primarily target personal support received from family, friends, and partners, they may not very well capture other kind of support, such as the one participants experienced during the study. In fact, our results suggest that despite little to no change in the level of perceived support, participants experienced improved moods and reduced stress and anxiety over the course of the study.

4.3 Qualitative Insights

After the study had been completed, the participants were also asked to participate in a short interview consisting of questions pertaining to their general familiarity with AR applications, their experiences in this study, and finally their feedback on the initial prototype.

4.3.1 Familiarity with AR. All participants reported already being somewhat familiar with AR technologies through applications such as Pokemon Go, Snapchat filters, and measurement features on Apple and Amazon products. Most participants found AR to be a "cool" tool that increased immersion but felt dissatisfied by its frequent inaccuracies (e.g., object size). One participant stated that it was a "hassle" to find a good surface placement and angle.

4.3.2 Study Experiences. Participants experienced positive feelings when receiving support. Our findings confirmed that supportive messages from strangers were well received and promoted a sense of community. The following are some of the responses from the participants:

> "The messages are pretty heartwarming and they help me feel connected to other people. I don't have a lot of people to talk to everyday so I really appreciate these small connections. I like seeing what other people think and feel around me. They make me feel less lonely."

> "This app gave me an opportunity to reach out and have these small moments with people. It's like… when you go on Reddit and you see a post, you know there is a human behind it. Same here with these AR objects."

> "I did not expect so many people to respond and I liked how kind they were. I am sure they don't know me and I understood that knowing the person is not important. Just receiving a couple of mails from people on my emotions and others sharing their problems and experiences- within minutes I got a sense of community."

Participants experienced positive feelings when they sent support. Our findings also suggested that support senders did not feel the burden of negative emotions and, in fact, felt good when connecting with and supporting other users. The following are some of the responses from the participants:

> "I'm not affected by the negative emotions. I actually feel better, not in a privileged way, just feeling good that I empathize and communicate with someone."

> "It's always a good feeling to let someone know that you are there for them and that they are not alone."

Asynchronous communication was effective. Our participants felt neutral or positive about the delay in support from other users after their AR emotions were created and sent. The sentiments were largely that the timing did not matter as long as the support was received, and some even found the asynchronous feature to be a pleasant surprise. The following are some of the responses from the participants:

> "Timestamp doesn't matter. The important thing is receiving the responses and feeling supported."

> "I kinda like the asynchronous nature because every response comes as a surprise."

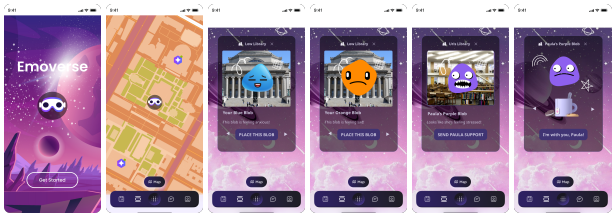

Figure 6: Screenshots of preliminary Emoverse prototype were shown to participants

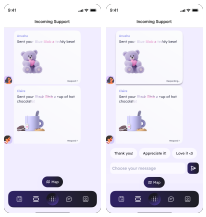

Figure 7: Updated prototype: Allow users to respond to each other

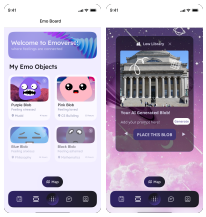

Figure 8: Updated prototype: Allow users to manage their own AR emotions on a dashboard and send personalized AR objects and texts

Descriptive texts that accompanied AR emotions were crucial. Responses from participants suggested that text-based prompts that were sent along with AR emotions were important as they helped provide context for other participants, especially when AR objects were ambiguous, and promoted a development of friendship. For example, a participant could not find the prompt and reported that he '[did not] know how to support [the other participant].' The following are some of the responses from other participants:

> "Honestly the objects shared by others were not very representative of their emotions. It was the text messages that gave me more context and were more impactful."
>
> "After seeing objects, I want to know more about the person behind it. That's why I read the prompt… I think it's important to keep the text/prompt that accompanied the AR object."

5 PROTOTYPE DESIGN

After the study had been concluded, participants were asked to review and provide feedback on the preliminary Emoverse prototype based on a selected set of screenshots of the system. The interview questions primarily targeted user expectations and needs for a fully functional mobile application. Combined with qualitative results obtained from the study, participant responses helped inform a few design solutions for the complete Emoverse prototype. More specifically, we found that Emoverse should:

- Include a descriptive text for each AR emotion.
- Include both pre-defined and customizable AR emotions as some users prefer one over the other.
- Allow users to respond to each other as some participants expressed the desire to send a simple "Thank you" message to others upon receiving their support.
- Allow users to determine the amount of time for an AR emotion to be available as users may want certain AR emotions to stay shorter or longer depending on the context.

The prototype had been updated according to the feedback above. Some of the notable feature changes include personalized texts accompanied AR emotions and support objects, incoming support messages and chat logs, and main dashboard for managing existing AR emotions. The complete Figma prototype can be accessed here.

6 FUTURE WORKS

In the future, Emoverse aims to further enhance its platform through iterative adjustments based on user feedback, ultimately leading to the development of a fully functional mobile application. Expanded user studies will provide deeper insights into the platform's efficacy and user experience, guiding ongoing improvements. Additionally, Emoverse will focus on implementing strategies to address issues of bullying and negativity within the community, ensuring a safe and supportive environment for all users. These efforts align with the project's overarching goal of leveraging augmented reality technology to promote mental well-being and foster social support among college students.

7 CONCLUSION

We initially hypothesized that externalizing emotions and receiving asynchronous support will significantly increase general moods and perceived social support and reduce stress and anxiety symptoms among participants. Our study demonstrated that, after using Emoverse for 24 hours, the participants showed a reduction in negative moods, stress, and anxiety despite slightly less or no change in their level of perceived support. These findings suggested that Emoverse has a potential as an effective buffering mechanism against undesirable mental health outcomes and warrants further investigation.

8 REFERENCES

[1] Ariel Shensa, Jaime E. Sidani, Liu yi Lin, Nicholas D. Bowman, and Brian A. Primack. 2015. Social media use and perceived emotional support among us young adults - Journal of Community Health. (November 2015). Retrieved March 26, 2024 from https://link.springer.com/article/10.1007/s10900-015-0128-8.

[2] Barbayannis G;Bandari M;Zheng X;Baquerizo H;Pecor KW; Ming X; Academic stress and mental well-being in college students: Correlations, affected groups, and covid-19. Retrieved February 28, 2024 from https://pubmed.ncbi.nlm.nih.gov/35677139/.

[3] Christelle Duprez, Véronique Christophe, Bernard Rimé, Anne Congard, and Pascal Antoine. 2014. Motives for the social sharing of an emotional experience. Journal of Social and Personal Relationships 32, 6 (September 2014), 757–787. DOI:http://dx.doi.org/10.1177/0265407514548393.

[4] Costina-Ruxandra Poetar, Nathan Bradley, and Alexandra Voinescu. 2023. Immersive virtual reality or computerized mindfulness meditation for improving mood? preliminary efficacy from a pilot randomized trial. (October 2023). Retrieved February 28, 2024 from https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2023.1157469/full.

[5] Fannie Liu, Chunjong Park, Yu Jiang Tham, Tsung-Yu Tsai, Laura Dabbish, Geoff Kaufman, and Andrés Monroy-Hernández. 2021. Significant Otter: Understanding the Role of Biosignals in Communication. In CHI Conference on Human Factors in Computing Systems (CHI '21), May 8–13, 2021, Yokohama, Japan. ACM, New York, NY, USA 15 Pages. https://doi.org/10.1145/3411764.3445200.

[6] Jari Jaanto. 2017. Weemo: Emotions with anonymous facial expressions on a social media platform. (December 2017). Retrieved March 26, 2024 from https://aaltodoc.aalto.fi/items/e7a7ba52-b66c-4891-bb41-0aab78184430.

[7] Joshua A.B. Littler, Anthony Haffey, Shannon Wake, and Helen F. Dodd. The Effect of Anonymous Computer-Mediated Communication on State Anxiety: An Experimental Study. Cyberpsychology, Behavior, and Social Networking.Dec 2020.823-828.http://doi.org/10.1089/cyber.2020.0213.

[8] Molly O'Keefe, Kelsey White, and J'Aime C. Jennings. 2019. Asynchronous telepsychiatry: A systematic review. Journal of Telemedicine and Telecare 27, 3 (July 2019), 137–145. DOI:http://dx.doi.org/10.1177/1357633x19867189.

[9] Nahal Norouzi a et al. 2022. The advantages of virtual dogs over virtual people: Using augmented reality to provide social support in stressful situations. (April 2022). Retrieved March 26, 2024 from https://www.sciencedirect.com/science/article/abs/pii/S1071581922000659?casa_token=lARurPGwOp4AAAAA%3ApD2Zc__eJNe-ErMB1_xN5CHu02_QBnqqaCxI9QChNabCFEB3rLKFlo0qnTTg5-hh0MmMkwOowtU.

[10] Shiyue Hu, Dan Cai, Xiao Chi Zhang, and Jürgen Margraf. 2020. Relationship between social support and Positive Mental Health: A three-wave longitudinal study on college students. Current Psychology 41, 10 (November 2020), 6712–6721. DOI:http://dx.doi.org/10.1007/s12144-020-01175-4.

[11] Wijnand IJsselsteijn, Joy van Baren and Froukje van Lanen. 2003. Staying in Touch Social Presence and Connectedness through Synchronous and Asynchronous Communication Media. Retrieved March 26, 2024 from https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=b7538bc52bc51b9b01013c6a3c330cd4bd9dc372.

[12] Xuan Liu, Mingtian Pan, and Jia Li. 2019. Does sharing your emotion make you feel better? an empirical investigation on the association between sharing emotions on a virtual mood wall and the relief of patients' negative emotions. Telemedicine and e-Health 25, 10 (October 2019), 987–995. DOI:http://dx.doi.org/10.1089/tmj.2017.0327.