Spacefinder: Fostering Impromptu In-Person Social Interactions for College Students

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University students often face challenges in forming meaningful in-person social connections with their peers, despite a clear need for engagement and interaction within their communities. These issues play a critical role in the learning process and substantially impact mental health, making it important to design systems that better facilitate these types of social interactions among students. Our project, "Spacefinder," is a real-time visualization tool that communicates the present attendance and topic of spontaneously created events on campus by leveraging a Discord server to display the information. Our approach seeks to encourage physical participation in group activities by creating low-stakes "drop-in-drop-out" environments that can be set up and torn down at a moment's notice, while also accurately capturing the remaining event time based on attendee input.

1 Introduction

In-person social interaction plays a vital role in the lives of university students, influencing both their academic success and well-being. Studies have shown that meaningful in-person social interactions help reduce stress, enhance learning, and foster a sense of belonging in educational environments [8, 12, 19]. However, many students struggle to build and maintain connections, leading to feelings of loneliness and isolation [2]. Recent research has highlighted several challenges in promoting physical socialization among students. For example, lack of social exchanges and supportive interactions have been linked to increased stress levels and physical health symptoms among university students [5].

Many advancements have been introduced with the hope of creating and maintaining social interaction, however, a substantial number of them seek to replace in-person interactions with digital experiences instead. Technologies designed for social interaction can sometimes create a paradox where digital engagement replaces meaningful face-to-face communication, further deepening social isolation [12]. For instance, the Covid-19 pandemic accelerated the use

of remote working and education tools; even though these aim at fostering interaction and connection, many users reported exhaustion from long screen time and online interactions.[17]

In response to these challenges, this study aims to collect guiding principles from campus student stakeholders for a system that would best encourage in-person social interactions and foster environments that support forming new relationships. In doing so, we have identified three key themes that are important to students – impromptu, low-stakes environments, strengthening of existing community bonds, and real-time attendance metrics. With these themes, we have built an artifact contribution that seeks to accommodate these principles, which we have named "Spacefinder."

2 Background and Related Work

2.1 Mental Well-being Among College Students

University students often face significant challenges in forming and maintaining in-person social relations, which can have a negative impact on their emotional well-being and academic performance. Research indicates that the transition from high school to university is a period marked by increased independence and individualization, often leading to social and emotional loneliness. Emotional loneliness arises from the lack of close, intimate relationships, while social loneliness results from the absence of a broad network of social bonds. Existing research points out that the most common mental health issues among college students include depression, anxiety, stress and loneliness [1, 17]. Social and emotional loneliness is a notable problem when transitioning from high school to university [3] due to increased independence and individualization [16]. Emotional loneliness arises from the lack of close, intimate and face-to-face relationships, while social loneliness results from the absence of a broad network of social bonds [2, 11]. These forms of loneliness are prevalent among many university students and have been associated with increased risks of depression, anxiety, and general morbidity [1, 2, 15].

Moreover, negative social exchanges and stress related to social interactions can exacerbate these issues. Studies have found that students who experience frequent negative interactions with their peers are more likely to report physical health symptoms and higher stress levels, which can further hinder their academic performance [5, 14]. Addressing these challenges is crucial to improving students' mental health and overall university experience [4].

2.2 Impact of In-person Social Interaction

In-person social interaction has been widely recognized as a critical factor in enhancing student learning and well-being. Participation in self-organized and self-interested physical activities such as walking and playing sports with peers could positively influence the psychological well-being of students [9, 10]. Besides leisure gathering, students reported that face-to-face interactions in interactive learning environments significantly improved their knowledge acquisition, critical thinking, and problem solving skills [8] [7]. Beyond formal class settings, students also actively engage in impromptu co-learning and finish assignments after course in library or other open study space in the campus, which also improve both of their academic and psychological status.

Furthermore, research has shown that social activities act as stress buffers, with students who have high levels of social support exhibiting better health outcomes under stress than those with lower levels of support [6, 13, 18]. This emphasizes the importance of creating environments that encourage social engagement and reduce barriers to student interaction, both inside and outside of the classroom.

3 User Study and Formative Methods

To understand the needs and preferences of in-person social interaction among students and connect with our stake-holders, we conducted a user study consisting of two main parts: a questionnaire survey and in-person interviews. This first round of interviews was conducted on a varied candidate pool of students at the University of Minnesota. We attempted to question a wide range of individuals from different backgrounds and with different ethnicities, but with the shared nature of being a university student the data was more centralized than expected.

For the study, we devised a procedure to make data collection consistent. Since we sent some interview requests digitally, we wanted to make sure that students had the opportunity to engage in the entire process, and first asked if they had 30 minutes to give us their thoughts about in-person social interaction. If they were free, we then prompted the interviewee to sign a consent form requesting their consent to participate in the study, emphasizing our motivation, the procedure, potential risks, confidentiality, and the voluntary nature of the interview. The student was given the option to decline participation in the study, in which case they were told that they were not obligated to continue.

If they agreed to participate and signed the consent form, they were then asked to fill out the questionnaire, which collected some preliminary information about the student, such as whether or not the student commuted to campus, and how often they participated in in-person social events on campus. Each question was structured as a discrete choice – either true or false, or on a scale from 1 to 10. The questionnaire was designed to probe students' demographics, and habits without being too detailed.

We then proceeded to record an audio transcript of the ensuing conversation, labeling the files with anonymized references to the student in question. The interviews asked for detailed experiences with campus social interactions, specific challenges in forming spontaneous connections, preferences for social space arrangements, cultural and linguistic considerations, and suggestions for improving the organization and gathering of people for in-person events. These questions were open-ended, and allowed us to gain qualitative feedback as opposed to the quantitative data collected by the questionnaire. Along the way, the student was encouraged to ask questions and propose ideas for a hardware system that might help enable them to participate in events on campus.

To analyze the qualitative data collected from the interviews, we employed an open coding methodology, wherein we looked through the transcribed interview data, highlighting specific phrases or key terms that we considered to be significant. We then clustered similar open codes in order to find potential themes hidden throughout the data.

4 Design Implications

Our analysis revealed several major themes that informed our final design:

4.1 Strengthening Existing Campus Community Ties

Participants emphasized that such a system for in-person interaction should ideally strengthen the bond shared by students first and foremost. Rather than being a generic socialization device that does not factor in the needs and unique attributes of students, survey respondents emphasized that it would be best to capitalize on the shared student status by keeping the device tied to student identification. As P6 explained, "If [the notification is sent to] my class cohort, I'd be more inclined."

For instance, some respondents explicitly stated that they would like such a system to be accessible with student verification only: "Yeah, it should be tied to student status. I wouldn't want anyone outside of school knowing that I'm at the activity, it would feel like a privacy violation but also might make it really awkward" (P8).

One interviewee stated that having common interests increased their willingness to participate: "I think an app where you can choose activities of interest and get grouped with others who have similar interests. That way, people with common interests would be matched, instead of those with no correlation" (P7). Shared interest also seemed to be much more valuable to solo participants: "Depends on the event. If it's organized by a group I know, like affinity groups, I'd be more comfortable. Otherwise, I'd want to find someone to go with me" (P4).

4.2 Drop-in-drop-out Impromptu Organization

Many students stated that they would be more comfortable using a system for meeting new people in person if it were structured in a way that would foster a relaxed, low-stakes environment. For instance, P10 mentioned that "I wouldn't want it to feel like anything hard-coded like a business meeting. I'd feel intimidated if I had like an obligation to be there the whole time."

We also discovered that most students preferred a system that felt spontaneous, desiring real-time notification channels that could be acted on a moment's notice: "If it's sent in a group chat...I'd be more inclined. If someone messages me, I'd also be inclined" (P6). Several participants expressed their desire to be able to join gatherings even if they had not voiced their intent beforehand (e.g. through an RSVP mechanism), indicating their predilection for impromptu in-person social interaction.

Although spontaneity was desired, the desired level of spontaneity remained open-ended among participants. RSVPs that stretched days in advance were generally disliked as they brought to mind high-stakes meetings, but shorter timespans were appealing to most. When asked about the possibility about a "two or three hour advance notice," most stated that they would consider attending more.

4.3 Real-time Attendance Visualization

We found that attendance information would be crucial for encouraging participation in such a system. Several participants displayed reluctance in joining a gathering if they did not know the current size of the group present at the activity, and expressed the need for key information about the event: "Not much to improve, unless there's a system to see how many people are going. An RSVP form showing expected attendance would help" (P7).

The importance of real-time updates was particularly emphasized for small group interactions, since attendance significantly impacts the participation rate. P4 states: "It helps with social anxiety to know the expected size."

Coupled with the theme 4.2, a system that enables real-time metrics of real-world spaces should also feel spontaneous, further strengthening the importance of these two key insights when combined. Students stated that such a system should provide an easy way to know the remaining time left in an activity, so that they would know whether or not to take the time to head to the event.

5 Identified Designs

5.1 LED Background Info Display

As mentioned in section 4.1, one main theme interviewees voiced was the desire for a strengthening of campus community bonds. In an effort to help accommodate this, the first design that we devised attempted to help students initiate conversation with fellow students. Students of the same campus are part of the same shared community, but might still have trouble interacting with those that they have never met before.

Our design allowed students attending an in-person event to easily display their preferences after scanning their university ID card. At the event, a table with embedded LEDs would be present, with each LED coupled to a card reader. After scanning their card, a student would be able to indicate the background info that they'd like to share with others, such as hobbies, interests, and fields of study, with each possibility assigned a separate LED color. This would mean that even if they are uncomfortable initiating conversation , others with similar hobbies may engage them to learn more. A storyboard of this design and its intended interaction is depicted in Figure 1.
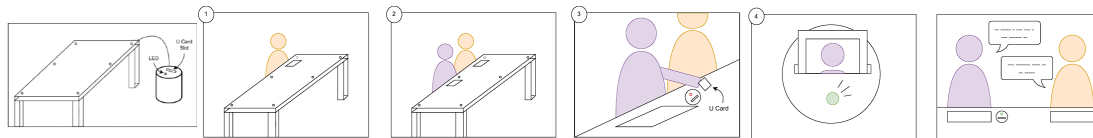

Fig. 1. Storyboard of the LED Background Info Display. Above, User 2 shares their background info by scanning their University ID card. User 1 strikes up a conversation with User 2 because they both have the same hobbies.

5.2 Spacefinder Hub

Another design that we constructed attempted to address all of the key themes at once. This design would involve a physical hardware "hub" device placed at any location on campus in which a student would like to initiate an activity, inviting other students to join them. Each student that attends the event would be prompted to scan their University ID card and operate a dial attached to the hub in order to display the remaining amount of time that they'd like to stay. Students would then be able to see the status of the event in real-time using an online service. A storyboard use-case of this system is visible in Figure 2.
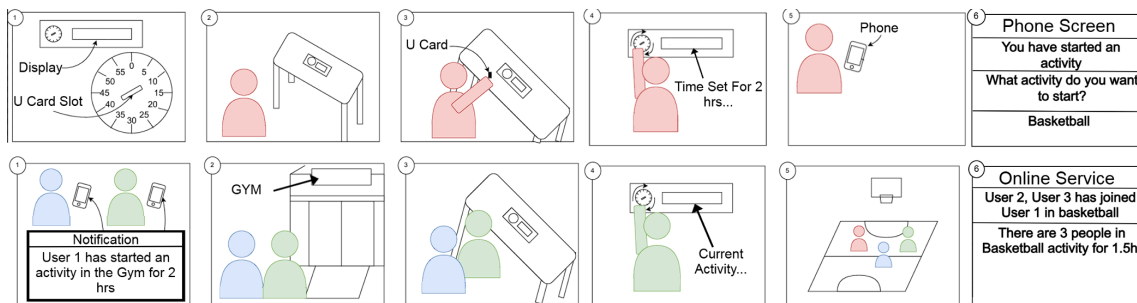

Fig. 2. Storyboard of the Spacefinder Hub. Above, User 1 approaches the device placed at the basketball courts, setting a time for two hours and starting a basketball activity. User 2 and User 3 receive a notification corresponding to the start of the activity. User 2 and User 3 join the activity and this information is also displayed.

With such a system, we intended to make the action of checking the status of spaces simple and low-effort enough so that a majority of university students would be able to use it, ensuring a large population pool and boosted attendance for activities.

6 Stakeholder Check

After an initial user study, but before committing to a final product, we requested additional feedback from our users on the proposed designs to ensure that such a design would be beneficial to all stakeholders.

We asked the original set of interviewees if they were willing to share their thoughts and feedback on the designs mentioned in sections 5.1 and 5.2, showing the storyboard to them. Once we had received their consent, we engaged in a back-and-forth dialogue to understand their qualms and concerns.

6.1 LED Background Info Display Feedback

When interviewees were asked about the storyboard design sketch and whether or not they would use such a system, most did not like sharing info via an LED. They believed it to be a tedious and time-consuming way to understand other users' info: "I would have to spend time to memorize or look up what LED colors represent what. In my opinion, it would also be awkward to be looking at my phone to see what hobbies or interests are mapped to what colors. Like I would be looking at my phone or screen for two minutes after they sit down and then try to strike up a conversation" (P4).

Some participants did not take issue with understanding the LED color mapping, but instead expressed concern with the limited amount of distinguishable colors to represent disparate hobbies and interests at a glance: "I think mapping colors to others' backgrounds is nice, but I think a problem is the amount of colors you can accurately show to represent people's information"(P6). This indicated that it was unlikely to be feasible to attempt to convey complex and varied information about students' hobbies and interests. Thus, due to issues brought up by our stakeholders regarding the ease of use and limitation on displaying information, we decided not to pursue this design.

6.2 Spacefinder Hub Feedback

When participants were asked about the potential use of the use case design sketch and if they would utilize such a system, we received a variety of feedback regarding the hardware of the system. One participant mentioned how they liked the fact that a user could only create an activity if they were next to the system: "I like how it is kinda analog where you can't start an activity or register online. You need to be at the location to register and start an activity, and have to turn the dial to indicate how long you are planning to stay there. The display is only there to show if you did everything correct"(P6). The stakeholders thought this was a good way to address the potential issue of individuals creating an activity without the intention of partaking in it.

Another stakeholder brought up a point about conversation facilitation in a manner that we had not previously considered when initially designing the system: "Having information about the activity being shared is nice and I think it helps bring people with similar interests together. But what if the people just do an activity and don't talk to each other at all? Like can this thing also help initiate conversations?"(P1) By having the system be multi-purpose for users who like more hands-on activity and users who do not. It can target a wider audience. Targeting the issue.

Based on the feedback we received from stakeholders, we decided to continue forward with the Spacefinder Hub design, incorporating slight modifications based on user feedback, such as options for ice-breaking activities for those who want to strengthen community ties.

7 Proposed Design

Our system facilitates impromptu in-person campus events through the integration of a portable physical hardware device (comprised of a Raspberry Pi with a touch display and an attached rotary dial) with a digital notification system (through Discord). To see how the system may be utilized to promote in-person social activity on campuses, we will walk through individual student use-cases.

7.1 Physical Interface

When a student wants to organize an impromptu social gathering, they can initiate an activity through the physical "Spacefinder Hub" interface. A three-dimensional model of the interface can be seen in Figure 3.
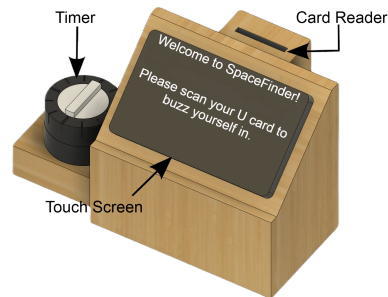
Fig. 3. Physical Spacefinder Hub Device

The physical model functions as a centralized interaction hub, and may be strategically positioned in campus social spaces to facilitate spontaneous gatherings. Users may conveniently carry the system along with them, as the entire product is very lightweight and compact, fitting easily in a backpack.

To initiate an activity, the student must merely follow the on-screen directions in order to set up the event and information about the activity topic. When signing in to the event, every student (including the student who initiated the event) scans their university ID card on an included card reader in the back of the display. They are then instructed to input the amount of time that they intend to stay at the event on an included rotary dial timer, which allows others to accurately gauge the remaining event duration before arriving. Additionally, if the student wants the event to take place a short time in the future, they may optionally begin the event via commands to a Discord bot present in the Discord server mentioned below.

7.2 Digital Interface

When other students wish to attend an event on campus, all they have to do is join the Spacefinder Discord server. This server is conveniently placed in the Student Hub section on Discord, meaning that any student with a verified "edu" email may organically find it, and that usage of the system is restricted to the preexisting campus community. The appearance and layout of the Discord interface is visible in Figure 4.

Once in the server, students may view the state of an event by examining the dynamically-created channel associated with that space. These space channels are created when new events are initialized, and are destroyed 24 hours after they end. They contain information about the current attendance of a space, as well as the remaining duration of the event. This allows students to view ongoing events at a glance as long as they have Discord already. This real-time attendance visualization intends to spur spontaneous and impromptu gatherings.

Students may also interact with the Discord bot in order to RSVP to events in advance. Usage of the bot is explained clearly in a central info channel, and a "bot-commands" channel serves to allow users to interface with the mechanism. The Discord bot functions as an notification system that distributes event information to potential participants. It delivers information about ongoing and upcoming activities while maintaining user privacy and preference settings.

Fig. 4. Digital Spacefinder Discord Server

When students arrive at an event in person and scan their ID card, their Discord account is optionally associated with their ID so that a notification may be sent to the corresponding space. This is done through a one-time setup process on the physical hardware device, wherein a user pairs their Discord account by either selecting their username from the RSVP list or inputting it manually. Then, every time the user registers at an event, their username is automatically displayed in the Discord server.

Our design emphasizes adaptability and user choice, allowing students to engage with the system in ways that align with their preferences and comfort levels. The seamless integration between digital and physical interfaces creates a flexible ecosystem that supports diverse interaction patterns while maintaining security and ease of use.

7.3 Stakeholder Feedback

The Spacefinder Hub design received positive responses from participants, as it directly addressed the themes of spontaneity and real-time visualization. Participants appreciated the simplicity and ease of use, particularly the ability to set and display event information quickly. One respondent noted, "I think this is something I would use. It makes organizing something on campus really easy, especially if it's just a casual activity... I agree that it would be cool to have these in the dining halls" (P12). Another participant highlighted the usefulness of knowing how long others plan to stay at the event: "It helps to know if people are going to be there for a while so I can decide if it's worth showing up" (P13). However, concerns were raised about the potential for misuse or vandalism of physical hubs while students were away.

7.4 Conclusion

The insights gained from our user study and feedback sessions significantly influenced the design and refinement of Spacefinder. By prioritizing user needs, including low-stakes participation, drop-in-drop-out functionality, real-time visibility of event details, and a focus on strengthening campus community ties, we aimed to create a system that fosters meaningful social interactions among university students. Moving forward, we will continue testing and iterating on the Spacefinder Hub to ensure it meets the evolving needs of its stakeholders and effectively supports its mission to enhance in-person engagement on campus.

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