

Rüüg — Long-Distance Communication

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ABSTRACT

To provide a long-distance communication device that would appeal to college students and recent graduates, the Rüüg team researched long-distance and face-to-face communication in more than 70 potential users. This research (consisting of surveys, observation, and directed storytelling) revealed the importance of body language and gestures and their communication of interest level, which encouraged comfort within the personal interactions. Rüüg is a plush rug embedded with pressure sensors which send input from walking, sitting, and short written messages to a sister Rüüg. Input from the sister “Rüügmate” is displayed with the color change of heat-sensitive dye in the plush activated by a grid of heating-element “pixels” underneath the rug. This warm, colorful display communicates presence, level of physical activity, and gesture to provide a sense of “being there” and a better understanding of availability, mood, and level of engagement. By integrating both input and display into an inviting everyday object, Rüüg provides a comfortable shared experience in which the transparent human-computer interaction is secondary to the interaction between two friends.

Author Keywords

Long-Distance Communication, Gesture, Body Language, Engagement Level, Low-Effort Communication, Heat, Color-Change, Rug/Carpet, Branding

ACM Classification

Design, Human Factors

INTRODUCTION

“You sort of take your local friends for granted, because you know you will see them soon..... While you try to schedule time to see your long distance friends.”

“I get a greater feeling of intimacy when talking to someone in person since touch is very important to me.”

“Long distance isn’t as intimate, it’s easier to be close with local friends.”

“But when you really need someone’s company no distance is bearable, just direct contact keep-in-touch can help.”

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“Closer friends are easier to keep relationships with due to distance, and unless effort is put into long distance friends, you tend to lose a connection because your lives no longer coincide.”

The Rüüg Project

Lifestyle changes such as leaving high school to go to college, leaving college to enter the working world, and being away from close friends who used to be a part of everyday life create a need for communication that addresses what becomes lost when relationships become long distance relationships. Rüüg was developed through a 4-month process to answer this need for a long-distance communication device that would allow college-aged friends to grow closer despite the distance separating them.

To discover what was lacking in current communication devices, the team researched long-distance communication and face-to-face interactions over the period of a month. The team used research methods such as surveys, directed storytelling (interviews focusing on a recent experience), and observation of analogous situations (observation of a similar interaction, location, or event) in order to discover the extent to which face-to-face and long-distance communications differed. After the first stage of research, the team created a “post-it-note” Infinity Diagram to cluster all the collected data in order to better understand the trends within the research. Next, the Rüüg team created diagram models of the research data to direct creative thinking and brainstorming. The users’ detailed needs were developed into a set of personas who became the target audience for the proposed long-distance communication devices and services.

The Rüüg team completed three rounds of rapid ideation of possible products and services to meet the personas’ (therefore the potential users’) needs. After deciding on the concept of a pressure sensitive carpet to communicate presence and gesture, the team developed scenarios of the possible uses of the carpet. These scenarios allowed the team to further study the plausibility of interpersonal interaction through the carpet over long-distances and to refine the details of the Rüüg product. After refinement through scenarios, the team took the concept back to users to test its viability and usability. The feedback from the users directed the development of the final technology, the final form, and most importantly, the interaction between friends through the Rüüg.

The team finalized the design with three deliverables: a proof-of-concept model that demonstrated function, a poster to explain the product concept on a visually appealing level, and an accompanying website to codify brand image, design the users' buying experience, and Rүүг configuration.

RESEARCH: IDENTIFYING USER NEEDS

Face-to-Face vs. Long-Distance Communication

To better understand user needs in a long-distance communication device, the Rүүг team first wanted to understand how people communicate face-to-face. The team observed college students interacting (playing, talking, enjoying each other's company) in coffee shops, in a park, on buses, and in the Carnegie Mellon University Center. Through studying these face-to-face interactions the team found that engagement level within an interaction was communicated through gesture and body language rather than through eye contact. The team also observed that a person's comfort within these interactions seemed dependent on their understanding of their friend's level of engagement within the conversation. After observation revealed that the primary determinant of successful communication was an exchange of engagement level through gesture, it became clear that there is a need for a method of communicating gesture over distance.

Problems with Long-Distance Communication

In order to understand the problems created by distance in a relationship, the Rүүг team distributed surveys and used directed-storytelling interviews to discover how people feel about long-distance communication. Many respondents commented that the lack of everyday knowledge about their friends' lives creates a sense of emotional distance that people feel inhibits them from enjoying their friends' company. There was also a common complaint that long-distance interactions take more time and energy, add stress and responsibility, and are not as much fun or as rewarding as "being there."

MEETING USER NEEDS

The results of the team's research were quite clear. There was an opportunity for a new communication device that could meet these unaddressed user-needs by showing mood and engagement level over long distances. By providing the ability to see mood and engagement level, the device should foster more comfortable and confident communication, thereby reducing stress within the interaction.

Research Data: Models and Personas

The conclusions from the research were developed into several models. The first model showed the different modes of face-to-face communication that are unconsciously produced and not communicated in current forms of long-distance communication. Another model detailed the behavior that the team observed to be necessary in creating comfortable communication and lowering stress within interactions. These models focused brainstorming and

ideation sessions, creating concepts that would help to mitigate the difficulties of long-distance communication. The common traits and needs of the respondents in the research were developed into three personas that became the target market throughout the project.

Ideation

The Rүүг team went through three rounds of ideation to study ways of meeting user needs. After each round of ideation the rough concepts were presented to college students. Their positive and negative reactions helped redirect the team's concept generation at each stage.

Initial Concept

The original conception of Rүүг was quite different than its final form. The general idea was the same—a pressure-sensitive carpet that could show availability and subtly convey body language, gesture, and engagement. This interaction would fit into time dedicated to relaxation at home and would encourage contact between friends in a non-intrusive way. Short messages could also be exchanged between friends through the carpet. The original concept had a digital projector overhead that would project the data from many different friends' rugs onto a touch-sensitive rug. The concept was similar to Instant Messaging in that the user would be able to interact with anyone who had a Rүүг carpet, and could scroll through their buddies by interacting with their rug as though it were a touch screen.

Refinement through Scenarios

In the refinement of this original concept, the team created scenarios of use with the three personas. These scenarios led to refinements throughout the design process, for example, scenario use determined that the carpet should be used only to interact with a friend and never to interact with the computer that controlled the Rүүг's technology. The team decided that navigation and configuration should be separate from the carpet's most important function—the interaction with a friend. The scenarios also pushed the team to realize the negative aspects of the digital projector—such as the cold impersonal light and warped images. This led the group to explore alternate technologies that were more tactile. With the move to less flexible but more engaging technologies, the carpet could display only one friend at a time. Scenarios were also used to refine the communication between friends at this stage. If the Rүүг was unplugged or inactive, any written messages sent by its Rүүгmate would be saved online and displayed when the Rүүг was reactivated.

CONCEPT REFINEMENT THROUGH TESTING

Concept Testing

After having developed the concept of a carpet as a communication device, the Rүүг team conducted a series of concept tests of the feasibility of several different aspects of the Rүүг.

Technology

To test the proposed alternative to a projector and carpet system, the team made a model of a Rүүg carpet with magnetic plush. This proposed technology would have the magnetic plush pile of the Rүүg react to a grid of electromagnets. Each electromagnetic ‘pixel’ in this grid could turn on or off, and would pull the plush down or release it back up. This technology would create actual footprints and body depressions in the carpet. The concept model was effective in demonstrating the magnet technology’s ability to convey physical motion in the carpet pile. Potential users considered this technology “cool but creepy,” and were concerned with the possibility of the magnets in the rug erasing their laptops, cell phones, and mp3 players. In order to address these concerns, the team changed the technology to a grid of “pixel” heating elements that would trigger a color-changing heat-sensitive dye that covers the top layer of the plush pile.

Behavior with Rugs

The team was concerned not only with how Rүүg would work, but also with how comfortable people would be in close contact with a rug. The team conducted a focus-group observation to see if college students would be able to read their own writing in the plush pile of a carpet and if they would feel comfortable sitting on a carpet in order to interact with each other. Fortunately, results were positive. A majority of college students decided to sit on the carpet that their friends were sitting on, ignoring nearby chairs. The students also enjoyed writing and making indentation patterns in a sample of plush carpeting.

Interpersonal Interaction

To determine the length of time that potential users would like to see the “imprint” of their friend on their Rүүg, the team made two animations of the same interaction. In the first animation John watches Eleanor’s footprints traverse his Rүүg as she crosses her own Rүүg. Her footprints only last a moment on John’s Rүүg. In the second animation, Eleanor’s footprints remain for some time, leaving a footprint trail across John’s Rүүg that showed the progression of her path. The feedback from this test was challenging because each user had a strong preference of one animation over the other. While some felt the first animation was better because it resembled what would happen if their friend were really in their room, others preferred the second animation because it showed a progression and told a story. The results were so mixed that it became apparent that the users would need to be able to choose how long the “imprint” lasted based on their individual preference.

System Configuration

The Rүүg team proposed an interface that could be activated using a cell phone as a remote control to adjust privacy mode, to scroll through different “rүүgmates,” and to configure the length of the imprints. To test this proposed interface with users, the process of configuring the Rүүg was mimicked with sticky note “screens” on a cell phone. A team

member acted as the cell phone’s software, changing the sticky note screens as users navigated through the mock-up interface using the cell-phone’s buttons. The navigation was not difficult, but several users were confused by the ideological clash between the portability of the cell phone and the immobility of the Rүүg. The team responded by moving this configuration to a website.

Feedback from Testing

During the concept testing many of the users responded positively to the Rүүg concept. They were enthralled with the idea of being able to “tell a story” with your own footsteps, they thought it would help them “feel close to a far-away friend,” and would be an “entertaining and fun” experience. The users tested were comfortable writing in the plush and many sat on the carpet to interact with their friends. Survey results stated that some people preferred sitting on their carpet even without the motivation of social contact. The user feedback on the cell phone navigation gave the team the information needed to redesign the configuration to be easily navigable online.

FINAL REFINEMENTS

At this point in the design process, scenarios were used to further refine the communication. The scenarios allowed the team to see that the ability to “scroll through buddies” would remove the measure of engagement in the interaction and would hinder rather than help the communication. It was decided that the Rүүg would only be able to communicate with one Rүүg mate. Scenarios also helped depict more complex interactions, such as, if the Rүүg was unplugged or inactive, any written messages sent by its Rүүgmate would be saved online and displayed when the Rүүg was reactivated. These important detail-level considerations were resolved through iterative scenarios.

RҮҮG: THE FINAL PROPOSAL

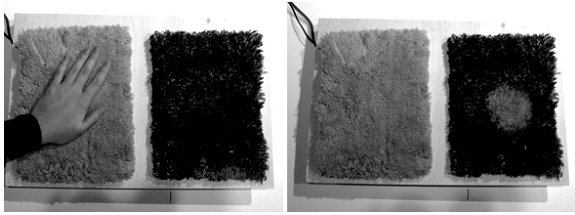
The final Rүүg product can only connect to one other Rүүg, reassuring users that their ‘Rүүgmate’ is paying attention to them, not to another friend. This reassurance reduces stress and creates a level of comfort within the communication. Also, Rүүg does not demand too much energy or attention as it conveys semi-conscious body language and gestures. Rүүg can be used more actively, however, to send messages or drawings in order to create a mutual focus between both users. By moving all preferences and controls to the website, the Rүүg becomes a friendly inviting technology whose sole purpose is communication with one close friend.

Finalized Technology*Technology proposal*

The Rүүg no longer uses the cold digital projection technology or the ghost-like magnetic impressions. Instead, the Rүүg pile is heat-sensitive and changes color when it warms. When one friend walks, sits, or writes on their Rүүg data from pressure sensors in the Rүүg is sent through a wireless internet connection to its Rүүgmate. The grid of

'pixels' underneath the Rүүgmate's Rүүg heat up the color-sensitive dye, radiating comforting warmth and creating colorful representations of footprints, body prints, or writing in the Rүүg's plush pile.

Proof of Concept Model

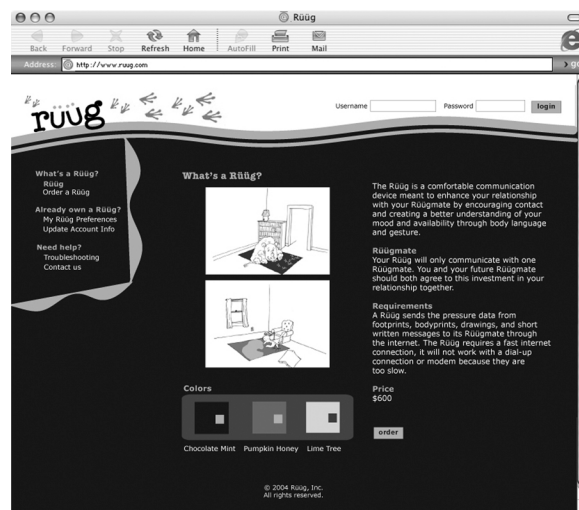


The proof of concept model includes a pressure sensitive switch under one small carpet square which activates a heating element under another carpet square dyed with color-changing heat sensitive dye.

Finalized Configuration

The initial set-up of a Rүүg is very simple. Since the Rүүgs are paired before they are delivered to the users, all the user has to do is plug in their Rүүg. When both Rүүgs are plugged in they find each other automatically through a central web database.

The configuration of the Rүүg's settings (the length of time that a written message is displayed and the length of time that a body print/ footprint is displayed) can be adjusted by the user through the website. This is the same website where the Rүүg and its Rүүgmate would have been bought originally. Great care was taken in the design of the website so that no one could spend money on a Rүүg until their future Rүүgmate had also filled out an order form. Also, before the Rүүg order form can be submitted the website explains the requirements for supporting technology: a high-speed Internet connection and either wireless Internet or a Bluetooth-enabled computer.



Branding

The website and the packaging of the Rүүg are part of an eccentric but warm, colorful, and engaging brand image. Cute and playful animal characters explain the use and the purpose of the Rүүg. The development of the logo, featuring two smiley-face ü's, was the turning point of the image of the Rүүg. The product went from being seen as a serious and strange communication device to the fun, playful, and quirky product that the Rүүg really is. This light-hearted brand image, the smiling friends within the logo, and the rhinoceros and the birdie characters re-emphasize the focus on interpersonal interaction and play. The branding helps potential consumers see that in Rүүg, the technology is less important than the interaction with a friend.

CONCLUSION: ADDRESSING USER NEEDS

Rүүg addresses user needs by providing a fun, relaxing, way to enjoy time with a close friend over long distances. The Rүүg product aids in comfortable communication by reducing stress and providing a mutual focus as a way to be assured of a friend's level of engagement. In this product, iterative concept testing was used to create an unobtrusive human-computer interaction that facilitates an interaction between two friends. The technology becomes a warm, pleasant method of bringing friends closer to each other, despite the distance between them.

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