GROCS Grant Proposal

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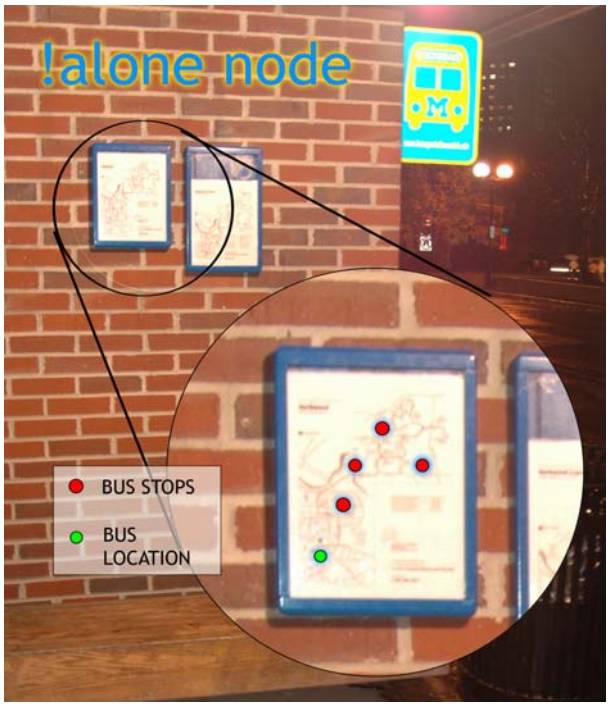
!ALONE.

Project Objective



Despite the crowded university environment, it is incredibly easy for a person to be alone. While classes, societies and activities keep us around each other, we often find ourselves reaching out to connect with someone else; to share our feelings — to be heard, and to be acknowledged. Michigan weather doesn't help either; long, cold and dark winters can be quite depressing.

The installation: !alone (read "not alone") is a university wide installation that attempts to address this problem, in the form of a large multi-player game. Specifically, we consider the UM bus network as a potential platform for deployment. Every bus stop(which can get very lonely if you're waiting for a bus at night!) on the UM Bus network is equipped with a *!alone node* — a book sized box placed either inside a bus stop housing, or mounted on the bus stop sign posts. The !alone node is outfitted with a simple sonar based motion detector allowing it to turn off when there are no commuters present, and turn on lights and sounds upon detecting the presence of a person at the bus stop. The node is meant to look exactly like the route maps currently installed at bus stops, except that they are *interactive.* The interface is designed such that each bus stop on the map has a glowing light on it, along with a touch sensitive switch. This allows the student standing on one bus stop to "poke" another bus stop by simply pressing the button on the respective bus stop. A "poke" from one bus stop to another will be visible across all bus stops in real time using the lights, and audible in the *shared audio space* of the bus stops, using a speaker embedded in the !alone node. Since the audio space is audible for a certain distance, we expect that this will attract multiple people at the same bus stop to come up to the device, and provide them with an "icebreaker" to talk to each other and collaboratively play the game against other bus stops.

The game: The objective of the game is to synchronize pokes; multiple bus stops poking each other in a rhythmic manner, in unison will cause patterns to form on the display, which can be quite entertaining. Formed patterns are detected by participating nodes, causing them to "glow" brighter. Pokes also trigger small unobtrusive sounds which contribute to the shared audio space, which is played constantly across all bus stops. Hence, any synchronous poking behavior will be audible as a musical tune, which is played by each !alone node. The audio, and the activity visualizations are shown in a engaging and attractive manner on the !alone website for the general audience, including "scores" and trends of the map over varying periods of time.

Not just fun -- A useful device: While the game provides people at bus stops with a fun way to rid their loneliness by communicating with other people who are also alone at other bus stops, it also serves as a method to deliver very useful information to the commuters. The *shared audio space* and the glowing lights on the maps are overlayed with current bus status information, allowing people to know exactly how long they will need to wait for the buses. In addition to this, the node can serve as a two way radio, allowing the user to interact with the shared audio space for fun activities such as pop trivia quizzes, puzzles, etc; all of which are played across bus stops (i.e. bus stops can "compete" to get multiple choice based questions right). Another very useful benefit is that past the bus hours, the university can route night-ride taxi cabs along specific bus stops where a person is detected to be present. Also, activity information can be recorded and analyzed for valuable insights into the nature of community activity, which would be very helpful to both the transport and urban planning authorities. (e.g. We need more buses from Bursley on Friday nights!)

A vision of collaboration: We envision our project as a small part of every student's lives; a simple unobtrusive idea that rids the loneliness in this university, and germinates the notion of collaborating as a *fun* activity in *all* parts of life, not just the bus stop. Our design and conceptualization processes are based on this vision, as are described in the following sections.

Literature Review & Motivation

Despite being co-located physically and crossing paths several times during the course of each day, students are quite disconnected from each other and there is not enough spontaneous communication. Different forms and modes of travel are central to much social life which involves a strange combination of increasing distance and intermittent co-presence [Social Networks, Travel and Talk, 5]. Amongst the different modes of travel that students employ, using the campus bus network seems to be the choice of many. Students are "forced" into lonliness when they find themselves waiting in the cold at a bus stop. We wish to employ this time to engage students in interactive learning and enable social interaction through game playing [Collaborative Games Make People Talk, 2].

Researchers have argued strongly about the importance of social capital i.e., the degree to which we know and understand one another. It has been identified how productive resources can reside not just in things and in people, but also in social relations among people [Coleman 1988; Putnam 1993, 10]. A network of people who have developed communication patterns and trust can accomplish much more than a bunch of strangers, even if the two sets of people have similar human, physical, and financial capital available. The productive capacity can be used to benefit individuals, the network as a whole, or society at large [Beyond Bowling Together: Socio Technical Capital, 8]. We anticipate that !alone will help us build a social capital around the student (and faculty) community that will result in more productive interactions and a richer experience for the students [Schools Work Better when Social Capital is high, 6].

We have considered and adapted the design recommendations specified in Designing Social Capital for A Small Town [7] since it discusses the specific things to be considered for community building around a small finite target community and the challenges it brings up. There has been a lot of recent interest in using technology for enhancing social interactions. For the specific interactions that we want to facilitate we find collaborative music building [NinJam,3] and shared display collaborative games [1] as good references.To design the interaction to be a game with an open ended and perpetual nature we have reviewed literature on Intrinsic Motivation and Extrinsic Incentives in a Repeated Game with Incomplete Contracts [4]. Recommendations from Heuristics for designing enjoyable user interfaces: Lessons from computer games [9] have been considered. We hope the usage information collected as a consequence of game participation can aid Transportation and Urban Planning as it serves as a crucial input to the planning process. [Bus Route Planning in Urban Grid Commuter Networks, 11].

Project Activity & Technical details

Technical Details: Wireless networks and embedded systems are pervasive entities in today's technologies. Modern embedded systems provide many features such as touch screens and capacitive sensor interfaces (like those in an iPod) which enrich the user experience. By building and installing wireless-capable devices we can leverage the wireless infrastructure provided by the university to connect the !alone nodes together. Our system consists of a set of nodes deployed at various bus stops across the university. A central server controls these nodes and handles communication between them. Useful services such as the UM Magic Bus, Weather updates and Michigan Radio can be easily integrated into the system. Nodes receive information from these services through the central server. A wireless router on each node enables it to communicate with the server via the university wireless network. Each node also consists of an embedded system over which our application is deployed. The nodes interact with the user through a rich set of media which include speakers, capacitive interfaces and LED displays.

Cost-effective Design: Since the !alone nodes are expected to be installed at public places, it is important to keep the cost of the device in mind to allow them to be easily replaced in the case of theft or damage. The device design was carefully thought out so that it can be built with easily available technologies and commodity hardware. Embedded systems with built-in WiFi chipsets are available for as low as 50$ [15] and can operate in extreme weather conditions [14]. These low powered devices consume between 0.2W and 2W when active [12] which allow a variety of power source options which include batteries, solar powered cells and tapping into the supply of a lamp-post. The estimated cost of each node with all its peripherals is between 50 and 100$. The system can be scaled to accommodate more nodes in the future.

!alone Node Architecture

Timeline

- **January:**
  - Research various hardware options for implementations
  - Conduct focus group surveys -- what kind of interaction do people want in a 2 way radio?
  - Build a simulation of the game on a computer
  - Initiate conversations with bus authorities, other people
- **February**
  - Test software simulation with users
  - Acquire hardware for pilot
  - Build software infrastructure for shared audio space, website, visualization
  - Follow up talks with Transportation
- **March**
  - Hardware assembly starts, build first 3 nodes
  - Design for game interface finalized, deployed
  - Start laboratory testing of nodes interacting
  - Follow up talks with Transportation
- **April**
  - Finalize talks with Transportation
  - Deploy first Pilot : Pierpont, CC Little, South Campus

Interdisciplinary Perspectives

Project needs: The project clearly requires knowledge from a wide array of disciplines. We first look into works in behavioral psychology to identify various problems that affect a social environment such as our university. We then consider the various sociological approaches used in developing community behavior and incorporate this knowledge into the design of our collaborative game, the basis of which we have already described. We also intend to perform surveys to identify the moods and needs of the lonely commuting student, which will help us in deciding the kind of content we intend to provide in addition to the game. The next challenge lies in the design of the user interface for the game, where we attempt to maximize the ease of use of our game, without

confusing the user and making it attractive and engaging to use. We then use various levels of electronics knowledge to build our !alone node. This requires research into effectively constructing robust devices for public use. Once the device is built, we then tie up the game and the device using a software infrastructure that we need to build, and then present this to the website audience using a rich, multimedia-based interface. We also look into analysing the information that we glean from activity across bus stops to contribute to the urban planning of the transit system.

Team members: Given the large set of challenges, we have assembled a team with diverse sets of backgrounds and experiences. We are confident that our skills and backgrounds combined are the perfect combination to help us conquer with the challenges at hand. We briefly introduce the current team members:

As a first year graduate student in the School of Information, **Sameer Halai**'s key interests lie in the area of technology mediated community building. He was born and brought up in Mumbai, which is one of the most crowded cities in the world, and is yet considered one of the most unfriendly places to live in. In his undergraduate years, Sameer worked with various web-based community initiatives, bringing together students across different disciplines and providing them with effective channels to communicate and collaborate. His current academic focus is on Computer Supported Cooperative Work and Incentive Centered Design. Sameer focuses on the behavioral and interaction design aspects in our project.

A resident of Abu Dhabi, **Nikhil Rao** is a graduate student and the resident hardware guru for our project, and has had a lot of experience with low-level electronic devices such as those used in our project. Before coming to Ann Arbor this year, he worked on a Google "Summer of Code" project, building networks on very small scale architecture devices. Nikhil is currently working with the Industrial Operations Engineering department as a research assistant in the Ergonomics Laboratory, where he works with tactile and auditory sensors.

Arnab Nandi has always been a fan of public transport, spending over 2 hours everyday busing between from his home and college in Delhi, and recently Ann Arbor. As a PhD pre-candidate in the Computer Science department, he is interested in data mining and user interfaces. Arnab is interested in extracting and visualizing the dynamics of users as they interact within the !alone system. In his undergraduate years, he has interned at MIT's Media Lab Asia, work on building language-independent conversational interfaces for farmers, using text-to-speech, iconography and web-service technology to provide them with access to real time information from the Internet.

References

1. http://www.viktoria.se/fal/projects/collgames/
2. Collaborative Games - Make People Talk http://www.ituniv.se/program/mob/magisteruppsatser/2003/Collaborativegames.pdf
3. Realtime music collaboration. http://www.ninjam.com/index.php
4. Intrinsic Motivation and Extrinsic Incentives in a Repeated Game with Incomplete Contracts [Falk, 1998]. http://www.iew.unizh.ch/grp/fehr/paperdb/fgk.pdf
5. 'Meetingness', and thus different forms and modes of travel, are central to much social life, a life involving strange combinations of increasing distance and intermittent co-presence. The paper seeks to examine the place of travel within the emergent pattern of a 'networked sociality'.Social Networks, Travel and Talk, John Urry, British Journal of Sociology Vol. No. 54 Issue No. 2 (June 2003) pp. 155–175
6. Schools work better when Social Capital is High [Social Capital: Measurement and Consequences, Robert Putnam, page22] http://www.oecd.org/dataoecd/25/6/1825848.pdf
7. The Carlisle Community Center: Designing for Social Capital in a Small Town [John F. Patterson]http://domino.watson.ibm.com/cambridge/research.nsf/0/619729985d0a039f852569bd0067ac2f/$FILE/ccc-bit2.pdf
8. Beyond Bowling Together: SocioTechnical Capital [Paul Resnick, Chapter 29 in "HCI in the New Millenium", edited by John M. Carroll. Addison-Wesley. 2002, pages 247-272]
9. Heuristics for designing enjoyable user interfaces: Lessons from computer games [Thomas Malone, Conference on Human Factors in Computing Systems, 1982]
10. [Coleman; Putnam]
11. Bus Route Planning in Urban Grid Commuter Networks [Chien, Dimitrijevic et al, 2001, 80th Annual Meeting of Transportation Research Board]
12. CM-X270 Embedded System datasheet http://www.compulab.co.il/x270/html/x270-cm-datasheet.htm *The embedded system we plan to use to build our application*
13. An alternative - the PC104 IXP425 SMB http://www.arcom.com/pc104-ixp425-vulcan.htm *Another embedded system board we might consider using*
14. Temperature sensitivity of embedded systems http://www.compulab.co.il/all-products/html/industrial-temp.htm *More information on operating at extreme temperatures*
15. Pricing of embedded systems http://www.compulab.co.il/x270/html/x270-cm-price.htm *Information on the approximate prices of the embedded system*