mobjects

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Context & Background

"... clues to how things work come from their visible structure - in particular from **affordances**, **constraints** and **mappings.**" Donald Norman "The Design of Everyday Things", 1988.

Defined By Technology

A common approach to making technology-infused art is to try and mold the technology to fit the concept of the piece. In the cases where this is possible, multiple technologies are used together to achieve the desire result. Also, there is the ability to innovate new technologies to specifically suit the piece's needs.

Mobile networking technology, as an artistic medium, introduces an even-more rigid system of constraints. Much like a sculptor weighing the properties of each material and how it will affect the look and feel of their work, each type of network has its own set of properties that informs the types interactions involved. Those key properties are identified as frequency, bandwidth, initiation cost, network ownership, and power consumption [Table 2.1]. In some situations, the project is not only informed by the properties of the networking technology, but is redefined due to its rigid constraints. This can produce interactions not desired by the artist, steering his work away from its original intent. However, if the networking technology is considered alongside the interaction design of a concept, those limitations can be used advantageously to strengthen the project.

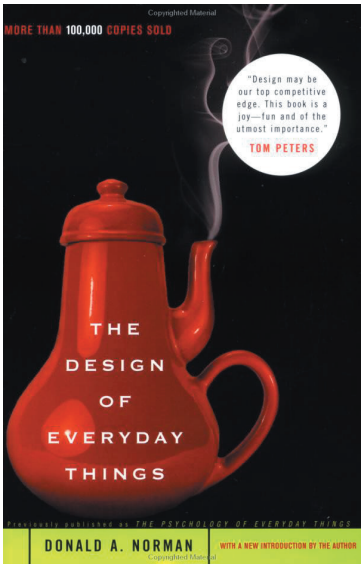

fig 2.1 - The Design of Everyday Things by Donald Norman. A life-changing perspective of design.

	range	bandwidth	initiation cost	ownership	power
RF	*personal-local*	*low*	*minimal*	*user/developer*	*low*
IR	*personal*	*very low*	*minimal*	*user/developer*	*low*
Bluetooth	*personal*	*decent*	*high*	*user/developer*	*not bad*
WiFi	*local-global*	*high*	*high*	*user/developer*	*high*
GSM	*global*	*low-decent*	*very high*	*service provider*	*high*

table 2.1 - an informal breakdown of communications properties

fig 2.2 - the Bass-Station. A WiFi ghettoblaster.

The Bass-Station

The approach of considering the network technology alongside the interaction was applied in a project I did in the spring of 2003, entitled 'The Bass-Station' [Figure 2.2]. For 'The Bass-Station', a fellow collaborator and I wanted to explore the affordances of 802.11b (WiFi) networks, particularly the limited range it provides. We created a WiFi 'boombox', where people in a local community could upload songs, build playlists, post community related information and provide a forum for discussion. The networking technology, 802.11b, has an average range is approximately 150 feet, which is subjected to the material of the walls and ceiling, and encroaching noise from other WiFi networks operating on a similar radio frequency band. Another consideration that acts upon the strength of the broadcasted signal is the size/shape of the antenna, and the amount of wattage pushed through it. This implies two other considerations: size and power. To make our network as wide-spread as possible, we had to make sure our antenna was large enough and could fit into the casing of our project. Since it was intended to be mobile, we also had to insure that there would be enough battery power to push the network signal. Normally, these are some of the last design issues one would consider when approaching a project, but they are the most crucial details since they directly relate to the effectiveness of the intended interaction.

When designing our concept, we took into consideration the limitations informed by the technology, namely the range. Because

our project was focused at location-defined communities, we used the network range to define an space where interaction could take place. This established a defined territory for interaction, much like the physical territory that defines a community. Since 'The Bass-Station' wasn't connected to the internet and was restricted to a limited space, outsiders could not receive the network signal and therefore could not participate with the interaction. As a result, the community felt that they had a private space, giving them the freedom to express themselves and trade files without the prying eyes of outsiders or network administrators.

Information Space

A locally-defined network, or 'information space', is "a way of distributing information in an environment depending on user mobility and relative location" [Redstrom et al. 1995]. The advantages of having a locally-defined network, as explored in "The Bass-Station", is that users can rely on implicit locality of their interactions with it. If another user is on the network, then they are within a distance where they can be seen, and possibly heard, by the other users on the same network. As mentioned before, WiFi networks provide approximately 150 feet of range. Lets assume this is a large enough 'information space' for approximately 30 users. What about smaller networks? When range shrinks to 10-20 feet the stress on locality is amplified creating a 'personal information space' enough for 1-3 users. From an artistic perspective, these 'personal' networks afford three types of interaction scenarios.

a) Static network to moving user. The network is located in an environment and either the user approaches it to interact with it, or the user is notified (interacted with) by the network.

b) Moving user with moving network. The user carries with them a device that creates a network. They have sole ownership over the network and are the only person able to interact with it.

c) Moving user and network to moving user and network. Two or more users carrying ‘personal’ networks move through an environment. When their networks overlap then communication between the networks can occur.

These types of interaction are of great interest to me because they also imply some sort of physical interaction as well. One of the surprising social effects of ‘The Bass-Station’ was that physical interactions were created at the same time as network interactions. When a user would upload and play a great song, people within the environment would get up and dance or sing along with the music. In the creative context, this matching of musical taste could even lead to collaboration, forming relationships in the community not previously exposed. In the interaction scenarios described above, the first two imply an interaction with a physical object that could be touch, vision or sound-based. In the third scenario, the physical interaction could be with another person. Three commercially available networking technologies that fit this type of ‘personal’ network profile are RF, Infrared and Bluetooth.

fig 2.3 - standard home garage door clicker

Radio Frequency

RF communication, or radio frequency communication, has been the prevalent form of wireless electronic communication for years. It’s found in all ranges of consumer electronics products from cordless telephone handsets to radio controlled cars. The key issues of RF in a networking model are security and bandwidth. RF can generally communicate data at rates from 9600 baud to 57600 baud. However, the higher the baud rate the more data redundancy and error checking needs to be applied to the communication protocol almost voiding any increases in speed. Since RF communication is fairly low-level, it features no built-in standard for security and requires any protocols to be implemented by the developer. There’s an artistic myth that explores this security flaw in the conventional garage door opener. By rigging a device to broadcast general codes on all RF frequencies, one is able

to drive through neighborhoods leaving a trail of open garages behind you. I'm not sure if this has been done before, but the rumor shows significant insight to the radio frequencies we take for granted.

Infrared

Infrared (IR) communication is another technology that seals some of those security holes. Since IR uses light as its carrier, it depends on line-of-sight in order to communicate. This beam cannot easily be intercepted and its short range means that the two communicating devices must be almost next to each other. Since light is not exactly the most reliable form of communication, data rates are extremely slow. Major redundancy is introduced in order to transmit even the smallest amount of data. For example, the average household remote control transmits its data 3-5 times for each key press. Those transmissions are then averaged out by the target device. If more than half of the received signals are the same then the command is executed. Until recently, this technology was choice for short-range communication between 'personal information devices' (PIDs) and mobile phones.

fig 2.4 - home remote uses IR

Bluetooth

Bluetooth is a short-range RF technology that is quickly replacing IR in the devices mentioned above. It is low power and implements a security protocol for reliable and fast communication. Any progress made with Bluetooth technology is due to its standardization, which is heavily backed by industry. The Bluetooth special interest group (SIG) features members such as Motorola, Ericsson, IBM, Nokia, Toshiba and thousands of other companies. As for range, Bluetooth comes in several class distinctions that place it from 100 to 6 feet. It is also available in several profile configurations, meaning that some devices come with preinstalled software for specific uses. This standard features have made Bluetooth a cheap and easy technology for major manufacturers to add short-range wireless communications to their products. Some of these products consider the cooperation of several devices to extend its functionality, as in the case of Bluetooth enabled mobile phone adding a Bluetooth headset, or loudspeaker.

fig 2.5 - the Sony Ericsson Bluetooth enabled Car-100

The most important effect of the migration of Bluetooth technology into mobile phones, is that it has coincided with the mobile's popularity boom. This has put a 'personal' network in the pocket of millions of people worldwide. The ubiquity of this technology creates potential for all types of interactions, some of which are already being explored in the commercial market.

fig 2.6 - the machine says: 'Feel like a nice refreshing Coke?'

Bluetooth Vending Machine

Several companies have been proposing their prototypes of the Bluetooth vending machine which is still just a 'proof-of-concept'. Using a Bluetooth enabled PDA or phone, the user would be able to purchase a Vanilla Diet Coke from their local vending machine using only virtual transactions. There is also the possibility that when walking past the machine it would ask you – 'Feel like a nice refreshing Coke?'.

Sony Ericsson Remote Control Car

To make public some of the fun uses of Bluetooth, Sony Ericsson developed a small RC car that can be controlled from a Sony Ericsson phone. 'Slightly large that the size of a matchbox', the car is charged by snapping into the bottom of the phone and using the mobile's battery as a power source.

fig 2.7 - they should at least find a nice heavy vintage enclosure.

Outside of the commercial possibilities, short-range networking technology is being explored for social uses. Last month Wired published an article on a Bluetooth social phenomenon called 'Toothing' where Londoners riding the train from the suburbs to the city send text messages to each other via Bluetooth connections to solicit sexual encounters.

"Bluetooth is short-range, so (you) know the person's near," says Jon. "But all (you) have is the message and (your) own intuition. The same with the person sending -- they don't know who they're sending it to, except for an educated guess based on the phone model (and) device name.... Obviously, when the message arrives, you get some clue from the way people in your vicinity respond: Has someone just checked their phone? Is someone looking quizzically around the carriage? Is someone trying to look for someone looking around the carriage? And so on. It's cat and mouse at first."

fig 2.8 - riding the train was never this exciting.

This is a perfect example of using short-range communications to support and create physical interactions. As the 'personal' networks overlap, a communication channel is opened between the users of the networks. This communication can be verified in the physical space by gestures such as 'checking your phone' or 'looking around quizzically'.

The mobile phone's ability for short-range communications, gives tremendous possibilities for creative exploration. When this is considered alongside the mobile's ability to communicate on a global cellular network, the possibilities increase one hundred fold. Going back to my discussion on network affordances, the combination of Bluetooth and cellular communication technologies like CDMA or GSM creates the potential for a wide range of interactions. The properties of cellular network communication afford its own limitations, most prominently bandwidth/cost and infrastructure restrictions. These networks are implemented by major industry, heavily regulated and watched, and generally expensive to communicate over. Artists have had to resort to using the protocols put in place by the industry – namely SMS - for any type of creative exploration.

SMS

fig 2.9 - the Sony Ericsson P900

SMS (Short Message System), or 'texting' as it's popularly referred to, is a small network packet restricted to 160 7-bit characters or 140 8-bit characters. These small packets make it tough to transmit significant data unless messages are concatenated. The SMS has a couple delivery models.

Server to handset.
A central server distributes messages to one or many handsets. This model is automated by a computer and controlled by a service company.

Handset to handset.
A user on the network can send another user a message. This transmission is routed through a gateway or dispatcher.

Handset to many handsets.
This is a broadcast model, where one handset can send a message to many handsets.

Here are some examples of how people have used the different SMS delivery models to create interesting projects.

Spectra-txt
Created by Peter Freedman, Spectra-txt is a 10-metre high column in the center of Middlesborough, UK. By calling a special number and sending one of six commands, the color of the sculpture can be changed from anywhere in the world.

fig 2.10 - Spectra-txt being installed in the centre of Middlesborough

fig 2.11 - Aristic photo of the shiny techno-saavy structure

"Spectra-txt will act as Middlesbrough's very own Axis Mundi, playing a pivotal role in the town's daily existence"

To participate with Spectra-txt, send one of the following commands: **blue, starvibe, xxx, boro, pearl, chromapop** to the number **07919 00 00 77**.

Dodgeball

Tapping into the social power of 'texting', Dodgeball is a way for small communities to coordinate their activities and inform their noctural adventures. By sending SMS commands to the Dodgeball server a user can either broadcast to their 'circle' which bar they're at, or make a info request like "where's the closest pacman table?". This project is a great example of how a restricted system can be used advantageously. By creating a command language, Dodgeball makes it easy for users to exchange significant information within the limited SMS system.

fig 2.12 - much like the schoolyard game, Dodgeball helps build social relationships, sometimes through public humiliation.

Dodgeball Command Examples

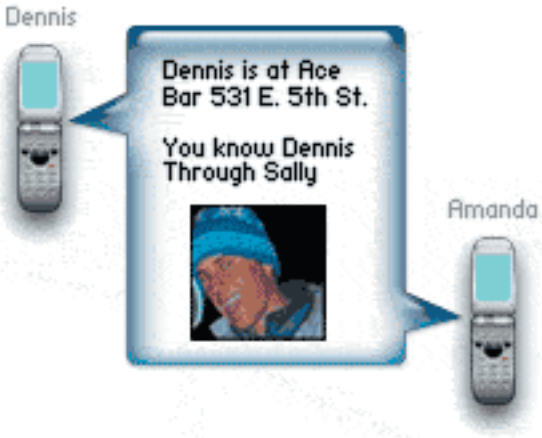

fig 2.12 - Dodgeball now uses pictures to add to the social experience.

@Luna Lounge
- broadcast your location to all your friends
- check for nearby friends-of-friends

.Luna Lounge
- check for friends-of-friends nearby (but don't tell your friends where you are)

Luna Lounge?
- return the address / cross street for Luna Lounge

Luna Lounge?pac man
- search for Ms. Pac Man (etc.) with in 10 blocks of Luna Lounge.
- try searching: margarita, models, pool tables, etc..

Luna Lounge!Kiera Knightly here and looking hot
- broadcast this message to any dodgeball user within 10 blocks of Luna Lounge

!anyone want to go to the movies?
- broadcast this message to all of your friends

goodnight
- stop receiving messages for the rest of the night

SMS has become the saving grace for all types of explorations with cellular networks. Since the cost is reasonably cheap and the framework is rigid, it has set defined boundaries for artists to bend. It is the most prevalent data exchange framework across various mobile handsets, tapping into the true power of the mobile phone as a platform for artistic creation. That power is the wide audience that can interact with SMS, which also makes it a true democratic medium.

"Now mobile telephony allows for nearly **continuous** and **ubiquitous** communication…" - Richard Ling, 2002.

Mobiles: Social Change & Exploration

In his research paper, 'Nobody sits at home and waits for the phone to ring...'[2002], Richard Ling looks at the social phenomena that widespread mobile phone usage has caused in Norway, one of the most 'connected' countries in the world. In 2003 the Norweigan Telegram Bureau published a study saying that 100% of Norweigan teenagers ages 16-19 had a mobile phone. This is by far the most extreme case of mobile phone ownership, but comparing these stats to a research survey on another country that has quickly adopted mobile phones shows that penetration in these countries is almost total.

As a compliment to Ling's research, Mizuko Ito and Okabe Daisuke investigated the quick adoption of mobile phones in Japan. Their work focuses on how the mobile phone has changed the power dynamic between adults and teens, providing teens an infrastructure to converse in a private space. Being mostly dependant on the parental home and having limited access to material resources, Japanese teens

	norway	japan
9-12 yrs	*57%*	
13-15 yrs	*95%*	*68% (12 to 19)*
16-19 yrs	*100%*	
20-24 yrs	*99%*	*82% (20 to 34)*
25-44 yrs	*93%*	
45-66 yrs	*86%*	*66% (35 to 49)*

table 2.2 - some stats of mobile ownership in two dominantly-mobile countries

fig 2.13 - Filipino citizens rising up against Estrada.

"see mobile phones as liberating and expressive personal technologies" [Ito and Okabe 2003]. These indications are important to note because they point to a particular image of the future. There's not much question as to whether the mobile phone will be completely ubiquitous in ten years, but what is interesting is to forecast how this 'liberating' technology will affect power dynamics in the social sphere.

There's the famous example of what happened in the Philippines in January of 2001. Millions of Filipinos dissatisfied with a corrupt government used SMS to organize protests, distribute popular opinion and eventually force president Joseph Estrada out of power. Howard Reingold refers to this social change in his book 'Smart Mobs'.

> *"The technologies that are beginning to make smart mobs possible are mobile communication devices and pervasive computing - inexpensive microprocessors embedded in everyday objects and environments. Already, governments have fallen, youth subcultures have blossomed from Asia to Scandinavia, new industries have been born and older industries have launched furious counterattacks."*

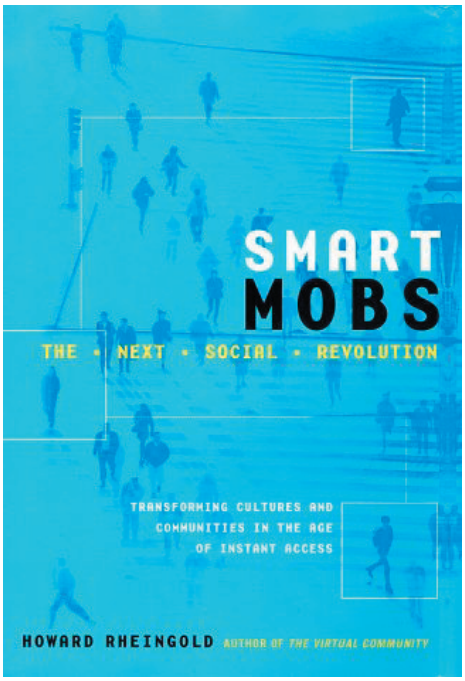

fig 2.14 - Smart Mobs by Howard Reingold.

These 'smart mobs' refers to a band of intelligent citizens, armed with immense connectivity potential. They have obtained the technology that allows them to move collectively and with rhythm. Reingold states that the impact of this technology is beneficial and destructive, but I feel it indicates something truly important. That there is a popular unifying platform that is widespread and accessible. This is the basis for a democratic medium of expression.

Platform for Exploration

When a technology challenges social identity it is met by artists to explore the power of audience and relevance within that society. The distributive power of having such a ubiquitous technology affords one the chance to create an experience for a user where they are most comfortable. Consider DVD players as a social technology. Never before has a population adopted a technology like American homes have acquired DVD players. In five years, over 30 million units have been sold making it the fastest selling consumer electronics product ever [VSDA 2002]. The DVD, much like the mobile phone and SMS, is limited as a technology but it gives potential for creative uses within its restrictive system. DVDs can be programmed to have random functionality, limited but intelligent systems, rich high-quality video and audio and yet many artists have not approached it as a platform for exploration.

fig 2.15 - DVD is a great medium. 4.7 gigabytes of available media space, and over 30 million distributed players around the USA.

The mobile phone is different from the DVD in one respect. It is connected. The distributive system of the mobile phone enables access to more art and exploration than the DVD. Much like the Internet pieces can be forwarded to other users on the network, viewed online, or downloaded locally.

Super Appliance

To the right is a Swiss Army knife, the most prominent symbol for multiple-functionality. It can cut, screw, clip, twist, snip, file and in newer models even store your precious data (see USB flash drive). It can be almost any tool you need, but unfortunately it doesn't do any of those things particularly well. This is example used by Bill Buxton in many of his public speeches compounded into a paper titled 'Less is More (More or Less)'. He uses the Swiss Army knife as a model for the modern day computer.

fig 2.16 - the SwissBit Swiss Army knife. Nail files and image files in one package.

> *"The home computer promises that it will let your children do their homework, learn and practice music and play games. It claims to let you do your accounting and correspondence, another person watch a movie, and someone else plan a vacation… [and] even though each tool may be individually manageable, their collective complexity rapidly exceeds a human's ability to cope."*

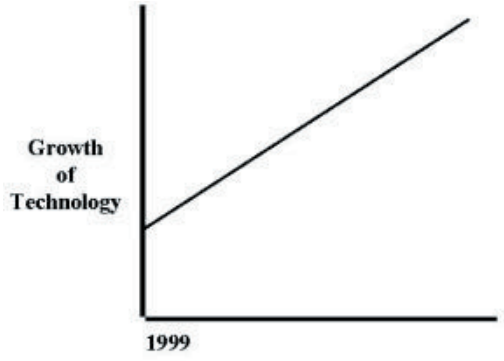

fig 2.17 - Moore's Law as stated by Moore

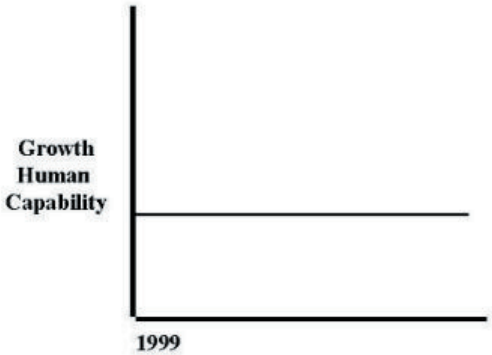

fig 2.18 - God's Law as stated by Buxton

fig 2.18 - the home computer. a super appliance for the whole family.

fig 2.19 - the portable computer. a super appliance to carry on your back.

To support his argument he proposes ‘Gods Law’ as a contrast to ‘Moore’s Law’, saying that while functionality and power of technology can double every eighteen months, a humans natural limit of capability stays the same. The home computer has become a ‘super appliance’, and the vast functionality has produced psychological affects that damper all interactions with it. Here is a personal story:

> *When I first started working it computers it was a purely creative endeavor. At the time I was a musician and sound engineer, and loved the computer as a way to quickly write music and practice my skills of capturing ‘a sound’. To compliment my music I would also use my computer to create album covers, flyers to promote shows and eventually I started making animations and web pages to showcase my music. Once I got good enough at using the tools I started getting freelance jobs to support myself. A year or so later I found myself at a full-time job as a designer / programmer. At work I used the same laptop I used at home, and found that I couldn’t use the computer to create music anymore. At the same time I became disenchanted with my job, perhaps as a result of this. Once I stopped working I found that I could again use my computer creatively.*

This personal story expresses Buxton’s argument. The psychological affects of multi-tasking between work and play on one device was that each activity disturbed the other. This is similar to the age-old warning about trying to work in the bedroom, since it’s psychologically linked to a particular activity – sleep. The same force that acts upon the functional attributes of a space applies to the psychology of an object.

feature	use
calendar	*organize your life while on the road.*
voice notes	*have a quick thought? speak it into your phone to preserve it.*
code safe	*store all your secret codes on your phone in case you forget them.*
camera (photo)	*take photos of all the embarassing moments in your life*
camera (video)	*why settle for photos when you can capture the exerpeince 12fps*
games	*nothing makes idle time pass quicker than wasting it.*
	... and much more!!

table 2.3 - some 'added value' features in the average mobile phone

In many ways, the mobile phone has turned into a 'super appliance' on it's own. The steady push of Moore's Law, along with fierce market competition has brought more and more functionality to the mobile phone that could ever be needed. I can't even recall how many times I've seen people be shown the calendar function on their mobile and heard 'my phone can do that?' Of all the mobile phones 'added value' functions [table 2.3] it can't really do any of them well, much like the Swiss Army knife. The arising problem is that with all the added functions the mobile phone becomes more and more confusing and complex to use.

fig 2.20 - the SE T610 main menu

> *"Recently my girlfriend got a new camera phone. 'It's awesome for taking quick pictures' she says, 'but I can't figure out how to send them to people!' Even worse she can't even figure out how to check her voicemail."*

When pushing the menu button of a SonyEricsson T610 a user is faced with twelve options. On a Nokia 6600 there is only an 'applications menu' with 18+ pre-installed options. Many of these phones require 3-5 clicks, or selections, before you can accomplish anything. Even on the simple Ericsson T39m, it takes four clicks before a user can start writing a text message.

fig 2.21 - the Nokia 6600 main menu. It may be in Japanese, but can you still figure out what to do?

fig 2.22 - Remember to always call your mother and grandfather to let them know you're ok.

With all this extra complexity added to the mobile phone, it is interesting to consider why the mobile phone was intended for in the first place. Originally, it was a tool to stay in touch while 'on the road', either with an office for work purposes or with 'loved ones' for security purposes. Industry has pushed the mobile to where it is today, a complex 'super appliance' obscuring its original intention underneath layers of functionality.

"Hi mom, everything is ok. Just wanted to call to let you know".

Making Devices

obscured intent

As evident in the previous sections, numerous factors have lead me towards building the ‘mobjects’. Mobile phones are an amazing platform for exploration, due to their social relevance and wide audience. People can relate to those types of interactions because they are simple and involve a technology that they’re familiar with. Also I pointed out my issues with the overwhelming complexity of modern mobile phones. Being a self-proclaimed technology critic I tend to approach consumer products with a critical eye. How does this product rate amongst competitor products? What is the value? How useful is it? Often I would take advantage of retail outlets 15-day return policy so that I could get a closer look at a technology. I could take it home, play with it for a few days as if it were mine, then return it – usually unsatisfied with the results.

fig 3.1 - the Ericsson t39m. Quality of reception should be consideration number one.

A lot of new mobile phones pack so much functionality into their designs that the price point is ridiculous, and the implementation of that functionality is mediocre at best. In the value argument, I can’t even think of one modern day mobile phone whose price balances with its value. The one that I feel comes closest is currently silent in my pocket (Ericsson t39m). There is no color screen, no camera, no frills (except Bluetooth). What it does have is a big fat antenna so I’ll always have reception to make phone calls.

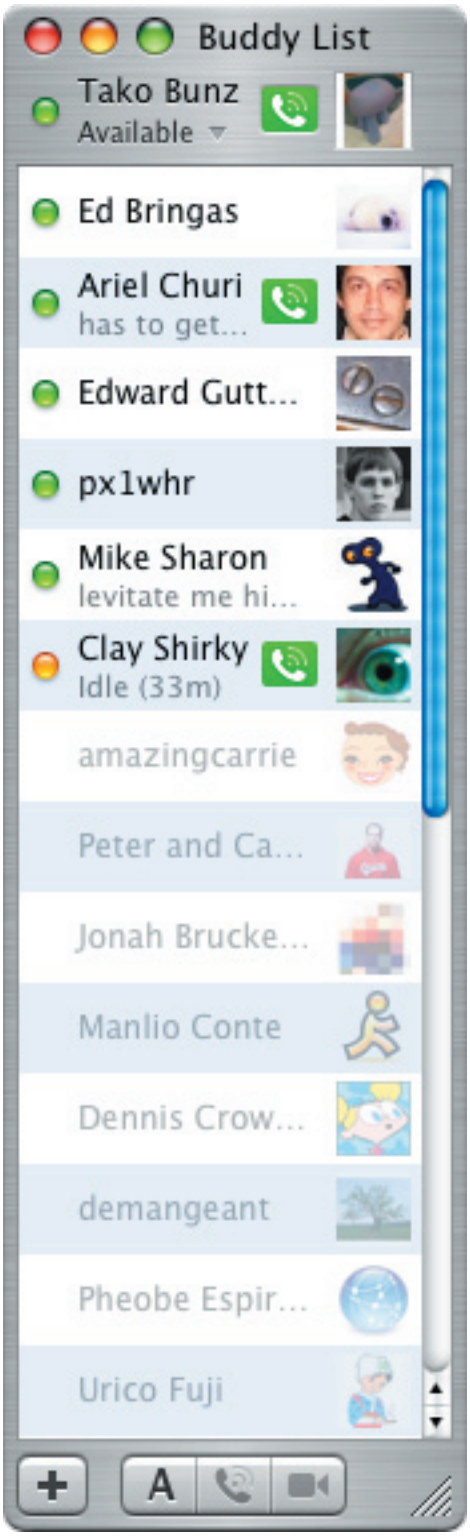

fig 3.2 - my stress-free buddy list.

Since I'm so critical about technology, my prime motivation for 'mobjects' was personal. Ever since I started using a mobile phone I've withdrawn from having personal conversation on it more and more. Every time I get on the phone I get this rushed feeling, like I want to get to the point of the conversation right away so I can hang up and go on my merry way. On the opposite side of that, I've started to use instant messaging (IM) as my main tool for personal conversation. Last year I finally got my parents using IM and now almost all of our meaningful conversations, as mediated by technology, are through a chat window. The only time we really talk on the phone is for brief 'hello, how are you's and for instrumental tasks such as reminders to call so-and-so on their birthday. I still spend a decent amount of time on my mobile phone, though almost all of the conversations I have are instrumental. Either I'm touching base with a friend to make sure we're still meeting each other at a specific time, or I'm performing some inquiry with UPS or a local retail store. Based on some of the reading I did, I drew some conclusions as to why my personal communication patterns had shifted so dramatically:

1. Increase complexity due to all the 'added value' had obscured my psychological perception of the mobile phone.

2. The task-driven communication mediated through the mobile phone had 'colored' the mobile as an instrumental device, rather than an expressive one.

Instant messaging, while part of the computer - which is itself a 'super appliance', is focused on connecting with your friends and family. The clarity of use that the IM application conveys forms a shelter for noise relating to work, school and all the other interactions in one's life that focus on performing some task. If a task needs to be accomplished, the user leaves the application and shifts their attention. It's only a change of program, but it seems to have significant

psychological affects. My main issue, as mentioned in the previous section, is that we've lost the mobile phone's original intent – to keep you in touch with friends and family. If this intent has become obscured, then what could I do to restore intimacy and personality to my mobile-mediated communication?

fig 3.3 - relationships of primary interest were parent-child, couples, and actively social circles of friends.

This question set me off in several directions. I started by considering the types of relationships that are normally mediated through mobile phones. Some of those relationships are: close relationships like those between couples and long-time friends; familial relationships, sometime dispersed globally; social relationships, like groups of school friends or co-workers; and most interestingly parental / developmental relationships. Last year I began my research with a project called 'Toy and Token'. I was investigating the parent-child relationship as mediated through communications technology. During the course of that project I spent a great deal of time considering how people communicated using technology, and exploring the potential of an emotional language. The best work I found was by Konrad Tollmar, a professor at MIT, who had been building communication devices that attempted to convey 'remote presence' – the feeling of togetherness over a distance. His work was unique because rather that just conceptualizing and constructing his devices, he actually installed them in family homes

fig 3.4 - 6th Sense, the telematic lamp by Konrad Tollmar et al.

and performed 'rapid ethnographies' to test his hypotheses. In many cases, the ethnographic research showed little to prove that these devices were successful. However, two excerpts from his paper resounded in my thoughts. One was a comment made by one of the subjects of his tests:

> *"You think a lot of about other person. More thoughts that usual… Often you have thoughts that are more direct, ask questions in a more direct matter… It feels good, in a way, the need for telephone contact isn't so big as it usually is. I can see that she comes and goes, and then I know that everything is OK." [Tollmar 2002]*

The affect that 6th Sense [fig 3.4] had on the daughter was that it made all of the communications with her mom more significant. When a call was made, the conversation was more meaningful. The interaction of wanting to 'reach out and touch' her mother was supplanted by the installed device, instead of spent on 'idle chatter'.

The second except comes from another paper where Tollmar is concluding with some future directions he'd like to pursue.

> *We believe that if we support adaptively, we could support the development of a new language in a specific communication media. We noted, for example, that some families had developed new personal code languages for beeper communication, due to that beeper allows a flexible use. Our idea is to provide a basic language that is very easy to understand, and at the same time make it possible to develop a new shared language that is based on touch, light and sound. [Tollmar 2001]*

If a restrictive language such as a pager system could be used to codify meaningful expressions, then what could I do with a similarly restrictive system? Part of the expression comes in the personalization of the language by the people who use it. Within a system with limits, the users would evolve symbols and codes that would indicate larger emotional expressions. One would believe that a large amount of data would be needed to convey a pseudo-realistic interaction in order to remotely communicate emotion, though the opposite indicated otherwise. These concepts gave me a framework to develop a style of communication that could exist in the restricted system of mobile telephony, and if designed properly could be expressive and emotional.

fig 3.5 - the beeper, a limited communication medium utilized by families to 'keep in touch'.

the mobjects

There's a common thread in the three devices that I created, not only in the form and materials, but also in the style of communication involved. For materials, I chose silicon rubber because of its aesthetic appeal and texture. The flexibility of rubber, not only inspires users to squeeze and handle the enclosure, but it's resilience and strength offers great protection to the devices inside. Another element of the form that was common amongst the devices was the use of LEDs to provide the user with visual feedback. In the case of two 'mobjects', the LEDs used were 'tri-color', capable of producing a wide range of color combinations. In the other device, the LEDs were arranged in a single-color pixel display large enough to display simple images and text. As mentioned previously, I was interested in using SMS as my system of communication. In each device I utilized Bluetooth as my short-range communication technology, which would form a relationship with the user's mobile phone. Once a connection was made the device would tell the mobile phone to notify it of any incoming SMS messages and to allow it to hand it SMS messages to transmit . This essentially turns the users mobile phone into a radio device, whose only task was to pass messages between the SMS gateway and the 'mobject'.

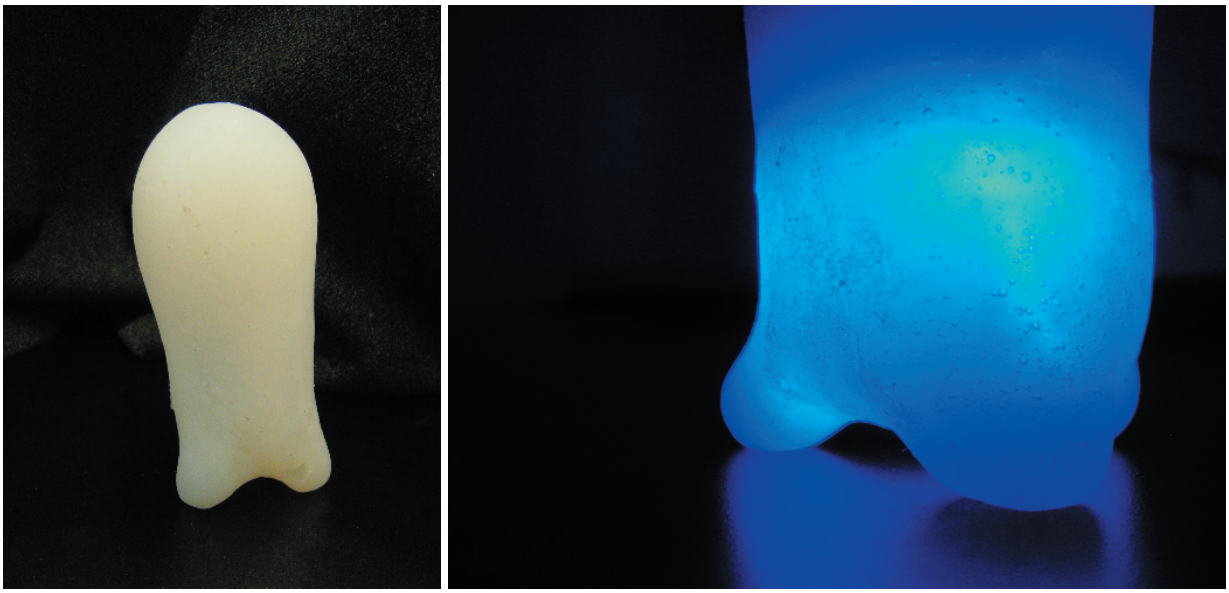

fig 3.6 - 'hugms' in both on and off states

hugms

Have you ever been separated from a friend or loved one but wished that you could give them a hug? Generally, the answer is 'of course'. We've all felt the desire for some sort of physical contact at times when it wasn't possible because of geographic separation. The goal of 'hugms' is to explore possibilities of sending a hug using mobile telephony. This expression is a common one, desired between couples and within families. This was one of the relationships that I felt was obscured by the 'task-driven' motivations of mobile phone use, so it was an important interaction to start with.

The inspiration for the design of this device came from Tollmar's papers and from a couple past projects, namely "Beans" by Kristina Andersson [fig 3.7]. In her project, 'IF-ONLY' Andersson used a similar form and interaction, mapping a squeeze to some feeling of remote presence. Her system, however, was a closed one, requiring both users to have the device. What I wanted to do was to make sure that the system I used wasn't dependant on two devices to make the interaction happen. It was important that if one device was used that an interaction could still take place, and a second device would only add to that experience.

fig 3.7 - 'Beans' designed by Kristina Andersson and friends. Part of the 'IF-ONLY' project.

'hugms' is designed in such a way as to communicate with only the users phone. In an initial set-up ritual, the user would 'pair' their phone with the device and it will remain paired with it until the set-up mode is re-initiated. The most important part of getting hugms ready for use is sending it a phone number to send the hug text to. By hug text I refer to the language that hugms uses to codify the hug you've sent into something that could be sent over a network. I'll explain how the hugms message is formatted in a moment. Once the number of the person you'd like to send the hug to has been programmed into the device, the user can go ahead and communicate. Sending a hug requires only a single simple gesture – a squeeze. The device contains sensors that can read the force applied to the object. It records the length and strength of the squeeze and then maps those values to the word 'hug'. For example, a long soft squeeze might look like this:

hhhhuuuuuuuuuuggggggg

Similarly, a longer squeeze that starts soft, then gets harder, then soft again would look like this:

hhhhuuUUUUUUUUUGGGggggg

fig 3.8 - a possible color scheme for 'hugms'.

When the person you're sending the hug to receives the message, this is the exact text that they would see. Whether or not they're familiar with the system, they can extrapolate some information from this message. The word will always convey the senders desire to hug the recipient, but a difference formatting will express the nuance of that expression. If the recipient has a hugms then this message will trigger a light sequence in the device that matches the light sequence caused in the senders device when it was squeezed. If the user doesn't have a hugms, then they can just reply to the SMS with a custom text message. The senders hugms will be notified by the incoming SMS, read who sent it, and if it matches with the number stored in it's memory then it will trigger a happy light sequence. These light sequences are set up to indicate the various states of the device to the user. I've done my best to map the color states to emotional states to make them a bit more straight-forward. To the left are some color scheme ideas that I came up with.

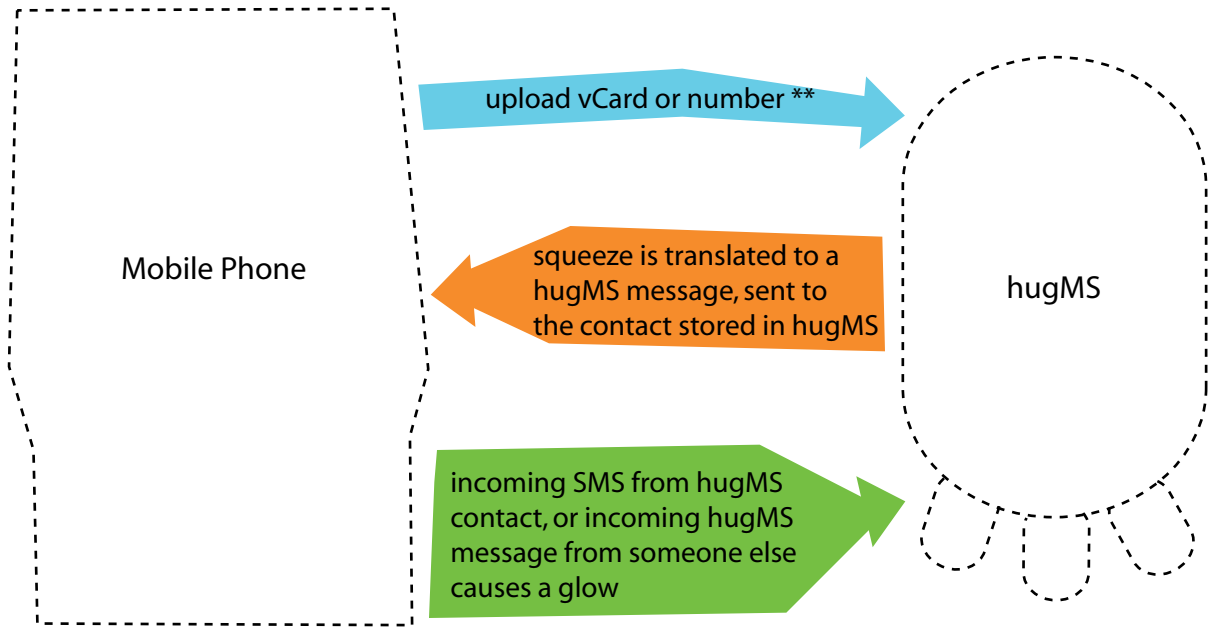

fig 3.9 - 'hugms' interaction diagram

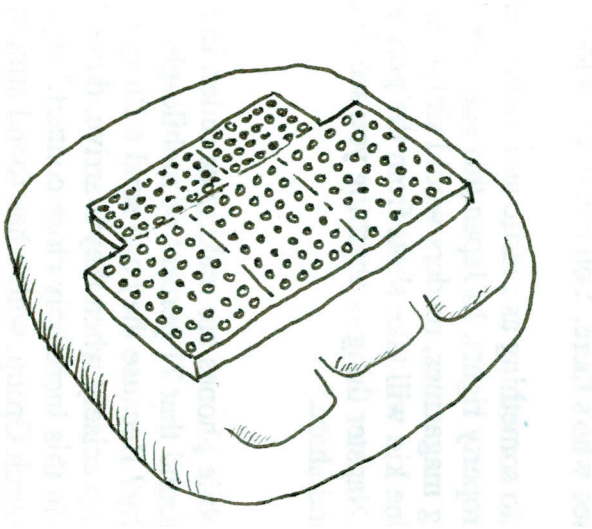

fig 3.10 - an early concept drawing of 'dot.dot.dot'

.dot.dot.dot

With 'dot.dot.dot.' I wanted to explore the social group that uses mobile phones most prevalently. Young people, from high school to college, use mobile phones to navigate their active social lives. Part of the goal was to create a device that would be fun and creative, allowing these tight social groups to collaborate for the sake of personalizing their group's communication. Using 'dot.dot.dot.', groups of friends can design animations for each other using their mobile phones. Those animations would be assigned to a friend's contact information (eg: phone number), so each animation would take some characteristic of the person whom it was assigned to. For example, if one friend is into photography then perhaps their animation would be a dancing camera. Every time that friend would call or send an SMS to the user, that animation would be displayed. Like 'hugms' I wanted to make sure that this experience didn't rely on having two devices that talked to each other, even though my ideal use would have a whole group of friends each having a device.

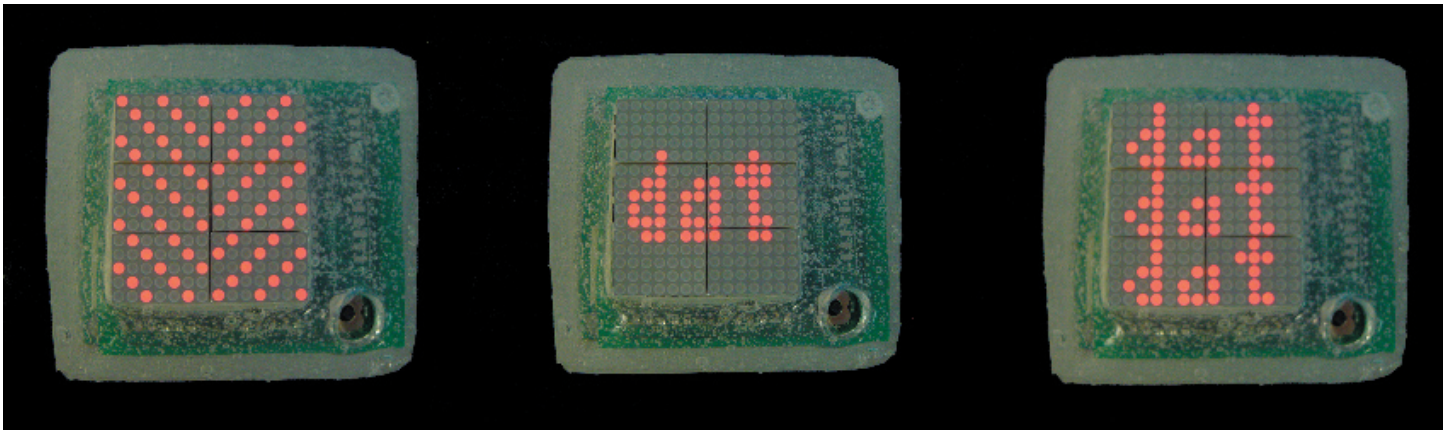

fig 3.11 - 'dot.dot.dot.' as it animates

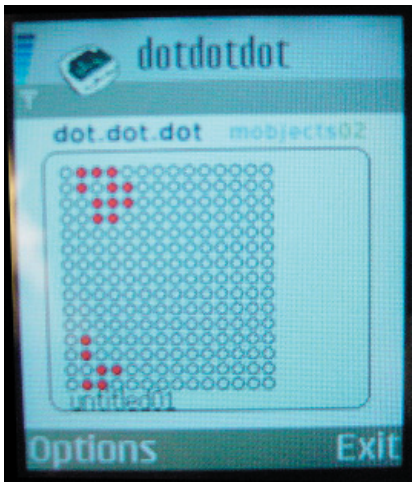

fig 3.12 - 'dot.dot.dot.' software

The system for '.dot.dot.dot' is a piece of software that exists on the users phone, and a physical device. One of the main goals of '.dot.dot.dot' is to make this interaction a visual and public one, so I designed the device as a piece of wearable technology. The user would find a place for the device, either around their neck as a necklace or attached to their backpack, that would be visible to the user and people around them. The display was comprised of six 5x7 led matrices combined together to create a 14x15 pixel display. When designing the device, I considered that many devices made for social groups lose their novelty fast. I wanted 'dot.dot.dot' to embody some flexibility of use, so that it could change it's function based on the users wants. I placed a five-way joystick under the display so that some of those uses could be completely explored on the device, without the aid of the mobile phone

for input. The combination of display and joystick unlocks the potential for many other uses than just a graphic caller id. Here are a couple of my concepts:

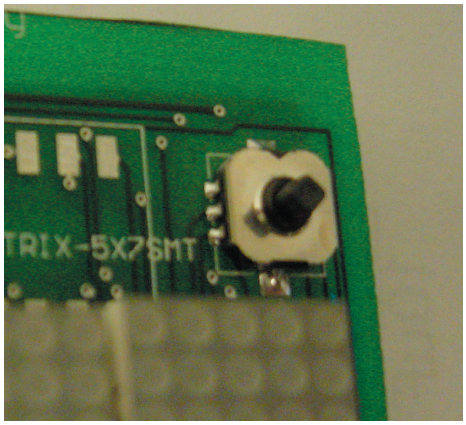

fig 3.13 - 5-way navigational joy-stick for stand alone use.

Ring-tone sequencer.
Using the dots as a metaphor to structure sound events, users could compose their own ring tones and trade them amongst their friends.

Bluetooth gaming.
Making use of the short-range communications, a game could be played between local devices. One idea is a virtual 'hot-potato' where users would try to get an image off their screen passing it on to another device connected to the Bluetooth network.

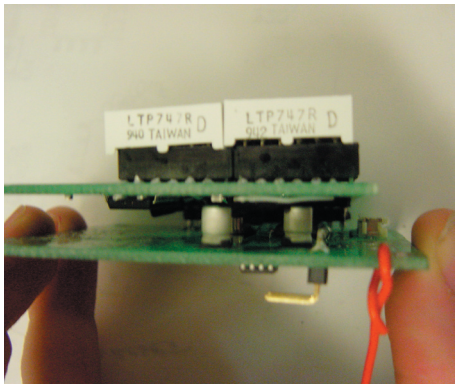

fig 3.14 - Small height and width makes the device reasonably wearable.

Video player.
Some mobile phones are starting to incorporate video recording as a function. Users would upload content to the device that would be converted to a small 2-bit video.

Ambient info display.
By signing up to an online service, the device could display information such as sports scores or favorite quotes. The possibilities are almost limitless with this application.

This functionality would work with the device's software, which exists on the users phone. I developed a Java application that allows users to design their animations, assign them to friends, and transmit them to the 'dot.dot.dot.' device. This application could also be used to select the mode of the device. I'm weary of adding too much

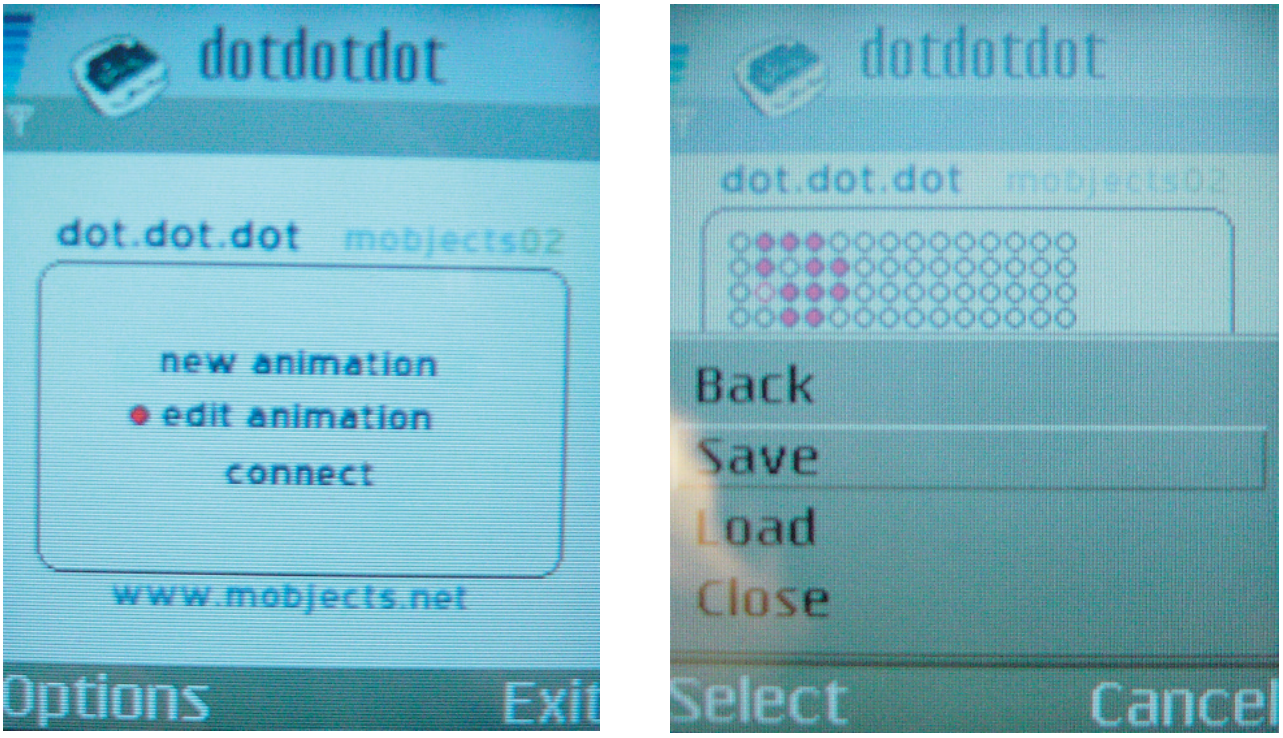

fig 3.15 - the main menu for 'dot.dot.dot.', and saving an animation.

complexity to the device, since the potential to add uses is so great. The software is designed with this same approach of simplicity. There are three options available to the user. 1) Create a new animation, 2) Edit an existing Animation, 3) Connect to the device to upload an animation. The menu items also express how the device is used, defining the three steps one would take to make it work. Currently, the software would either be distributed by CD-ROM, as packaged with the device, or downloadable via GPRS directly to the mobile phone. Ideally, I'd like the software to be embedded in the device itself, and 'pushed' to the mobile. I feel that this would make the device's overall function more cohesive. Unfortunately it adds several technical obstacles too difficult to overcome for this version.

fig 3.16 - the original 'mobi' sketch

mobi

'mobi' was the first 'mobject' to be designed, and the last one to get built. The design process started during my research for 'toy and token', where a parent and child would communicate through two devices. For the child's device, I designed a shape that generally resembled 'mobi' [fig 3.16], however it wasn't until the beginning of this project that I started to make the shape more pet-like, attempting to resemble it to some sort of creature [fig 3.17]. The technology involved in creating 'mobi' is complex. I want him to exist without an external device, embedding the mobile phone radio hardware inside him. Also I want him to 'speak'. This requires learning how to create complex waveforms dynamically from a microcontroller. These two technical feats, plus all the other work that would go into developing hardware at such a small scale, was too daunting of a task for the time involved. That's when I decided to start with a smaller simpler project and work my way up.

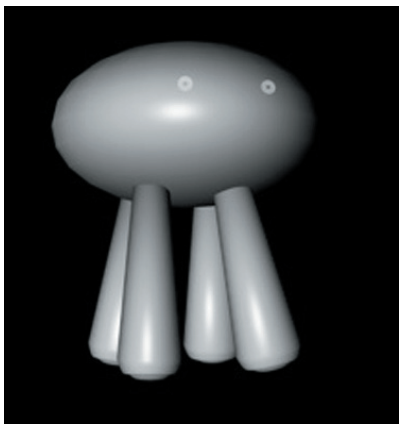

fig 3.17 - 'mobi' in his early stages as a crude 3D rendering

fig 3.18 - telematic emotional communication - for kids.

While it is still yet to be built, ‘mobi’ is the ‘mobject’ that offers the most creative potential. Tollmar’s concept of ‘telematic emotional communication’ [2001] really set me forth on wanting to create a simple platform where this idea could be explored. By building a simple interface, with a dynamic audio synthesizer, a language of sound could be used. The reason I considered a synthesizer for creating these sounds is that the small packets of data that drive the synthesizer could easily be transmitted over the limited constraints of a network. This language could be initially explored by the users, and eventually evolved into something that was unique to their communication, much like the pager codes I mentioned above. Users would have their own voice, abstract and expressive, yet uniquely tied to the handling of ‘mobi’.

Much like ‘hugms’ I would use ambient colors to indicate to the user what state ‘mobi’ is in. Again, I’d like it to exist on its own without the need of a paired device for interaction. I feel that since it’s also a toy-pet, ‘mobi’ could be used without any network functionality at all. If ‘mobi’ was glowing certain colors, then it would reflect a connected state, where interaction could occur with other ‘mobi’s, and other colors would indicate an ‘unconnected’ state. The interaction occurs by performing key gestures, mostly bending and squeezing. To turn

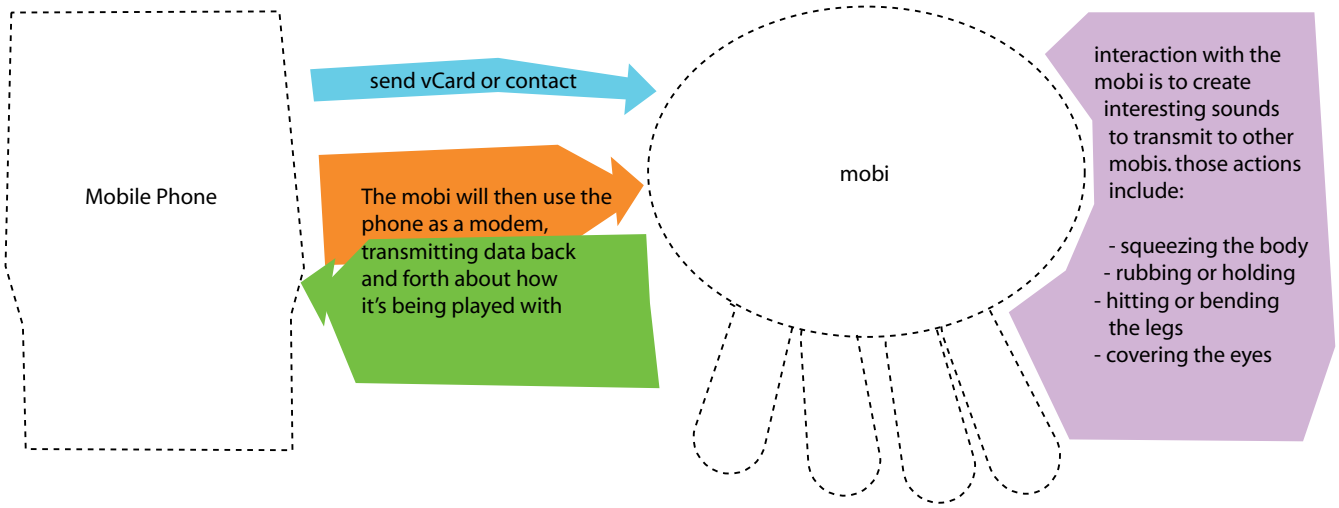

fig 3.19 - interaction diagram for ‘mobi’.

‘mobi’ on, the user squeezes his belly for five seconds. To turn him off, cover his eyes for five seconds. I designed ‘mobi’s form so that he wouldn’t really have a ‘right side up’, though I can’t help but think of those two orientations as ‘standing’ and ‘on his back’[fig 3.16]. When on his back, the user would bend ‘mobi’s legs to create sound. Because his back is curved, the sound would be modified by tilting ‘mobi’ in different directions. I assume that understand complex sound mapping relationship such as bending and tilting might be too much for younger children, so just bending can also create sound. Also by ‘hugging’ ‘mobi’ he would generate softer ambient tones that could then be played over by using the legs. The mapping of these gestures to sound is a great deal of work, and something that I’m very interested in. The sounds should suit the gesture to which its mapped so that its relationship with the action involved is obvious. For sound design, I’d like the sounds to infer that the user is controlling ‘mobi’s ‘voice’. I plan for ‘mobi’ to do some speaking for himself, to notify the user of changes in state and perhaps even entice the user to interact with him. Some of these notions take me down another path, which is programming ‘mobi’ with intelligence. This is something I haven’t spent too much time considering, and would leave this part out until sufficient user testing proved that it was desired.

‘Mobile-Mediated’ Parent/Child Relationship

As stated, the role of mobile technology in relationship between parent and child during developmental stages was one that keenly interested me. We are currently experiencing a new communication paradigm. Within a century, humans have experienced a tremendous reduction in time and effort needed to communicate over distance. Some would say that this enormous shift began with the invention of the telegraph, however by breaking down these changes in technology , and mapping them to changes in mobility, patterns emerge that indicate smaller systems at work. The one that faces us now is what I refer to as the ‘constant asynchronous/synchronous’ paradigm. This change

in communication refers to the ability to hold constant communication between two individuals on a network, both synchronously and asynchronously at the same time. This may not seem different from what is currently a norm, the ability to sit at home and chat using IM while supporting that interaction with email, but what I consider to be the unique property of 'constant asynchronous/synchronous' communication is the fact that you can do this while moving about the city/country/world. Mobile telephony already supports this type of communication. Some phones feature IM capabilities, and while 'texting' is asynchronous by definition, the speed at which those conversations take place is almost instantaneous. Some of these behavior patterns were observed in Ito's research of Japanese youths.

> *"Among close friends and couples, most youths maintained ongoing lightweight contact as they went about their daily routines, sending each other messages about their current status or thoughts…" [Ito 2003]*

The youngest generation of mobile phone users, defined by market research as the '12 and under' category, have been raised with instant messaging technology, and prefer it as the way they communicate with friends while at home. The IM window on their computer screen, and soon their mobile phone, then becomes their gate to social interaction. This is vastly different then the communication patterns of their parent's generation, not used to this rapid form of text-based communication and mostly likely never introduced to instant messaging at all. What are the effects of this? Does this create a boundary between parent and child? If a parent is not on their 'buddy list', how does this limit their relationship? Many of these thoughts came to me when I eventually introduced my parents to IM. Since the IM window represented a space devoted to expressive communication, I noticed a change in the quality of conversation we would have through this technology. The

conversation would last longer, be more jovial and embody a relaxed, casual tone. Now whenever I'm working and I see my folks pop up on IM, I'll usually click their icon and say a quick 'hello'.

These issues in the communication gap between parents and children informed my desire to build some device that would introduce both the parent and child to this style of communication during the child's developmental period (ages 1-4). The hypothesis of this interaction was that a child would no longer feel that their parent didn't exist in that IM world, once they adopted a social lifestyle as mediated through the instant messaging window. The parents would be their child's first 'buddies', in life and online. The impact of this change is, of course, yet to be seen.

conclusion

During the course of my project the largest obstacle I've had to overcome is size. Making devices small enough to be considered 'mobile' took a considerable amount of work. I had to learn how to design my own circuits for manufacture, and how to use tools for constructing those circuits using tweezers and a magnifying glass. The small size of the batteries need for the circuits was another obstacle. There's a trade-off between the amount of power that the battery could supply, a direct effect on how long the device could be used, and the physical shape of the battery. The larger the battery, the larger and heavier the device would become. There was also the size restrictions of the communication system I was using. Having to find a way to format my data so that it would work if the user had a device or didn't, took a lot of trial and error. Additionally, I had to make it small enough to fit the 140-byte package that is an SMS. Finally, and most importantly, was the size of the interaction. It takes effort to make an interaction simple and straightforward when dealing with technology. How much would be needed by the user before they could start using the device? I found that I enjoyed working within constrained systems. It enabled the 'problem solver' in me. I plan to continue exploring these types of interactions. Merging mobile and customized devices in a smart and communication-supporting way is a worthy task. Further miniaturizing the size and battery consumption of the devices is the next technical step. Other pursuits are to explore the social potentials of these devices.

How else could they be used without ruining the simplicity inherent in their design? I plan to keep exploring my thoughts by writing on these subjects, and exploring my ability by designing and developing. The next round of ‘mobjects’ will be a great challenge, and I plan to put these devices into the hands of the people for whom their intended to gain a better understanding of the concept and its effectiveness.

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