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Master's Thesis

@mail:
Emotional communication system with life logging via email

@mail:
이메일 라이프 로깅을 이용한 감성적 커뮤니케이션 시스템

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ABSTRACT

People in now days live between tow realms- virtual and real world. Although these two realms are result of same human culture they have very different characteristics from each other. This paper especially focuses on communication culture of now days. Email is one of the major paradigm shifts of communication culture. Email technology not just brought fast communication speed. For people in now days email has become more like a habitat than an application. Today email is a medium of communication and at the same time a medium for document archiving, document delivering, task managing, scheduling or etc. Naturally email became rich source of information describing person's life comprehending traces of events and emotion. Design work presented in this paper, @mail, had tried to suggest new approach to email to express writer's emotion and make a life log with that data. This paper had overviewed various approaches to show writer's emotion in virtual test data and way of dealing with life log. Cases are categorized and analyzed to find out weakness and limitations of former approaches. The final design @mail is based on the insights found out from case studies. @mail is emotional asynchronous communication system with life logging using email as a medium. Unique point of @mail is that it used communication medium as a life log which specially developed to include emotional information inside it. @mail is composed of software system and hardware system. Custom email software had developed for @mail and special hardware for printing life log of @mail is made using electronic typewriter. Two sets of field trial-one for software, one for hardware- had done to evaluate @mail. User's feedbacks were gathered by questionnaire and interview.

KEYWORDS

Life log, informative art, information appliance, slow art, emotional life log

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1. Introduction

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1. Introduction

1.1. Background

Since technology never cease to develop, gadgets for digital recording become feasible to almost every person in this society. They got cheaper, smaller and easier to use maintaining fast computing power and large memory capacity at the same time. In these days we all live in two realms- physical environments and cyberspace (Ishii & Ulmer, 1997) - and life logging is now essential part of this culture. Life logging silently took part in human life and fulfills both functional and emotional needs.

There has been numerous tries about integration of computing technology and human life. At early stage of development of technology people are fascinated by its fastness, correctness and efficiency. After technology got matured people started to look back underneath reason of it, which is human itself. Both artists and engineers develop their own perspectives and made keywords to describe it. Mostly these approaches are focused in designing interface between technology and human society (Sterling, 2005).

One of the earliest concepts thrown in this area is 'calm technology' by Xerox PARC (Weiser & Brown, 1995). This concept emerged from the information overloaded environment. Digital gadgets started to make information fast and easy with almost no cost that human life became full of information to process. To solve out this situation calm technology observe the difference in engaging attention between high tech gadgets-looking up new in PC- and low tech methods-New York Times on a Sunday morning-. Calm technology engages both the center and the periphery of our attention (Weiser & Brown, 1995). The concept of 'ambient media' appeared almost simultaneously with calm technology. In general media which used to embody calm technology is called as ambient media. This concept is well suited in advertisement industry and gradually

established as a standard term in advertising industry now (Barnes, 1999). According to observation by M. Weiser and J. S. Brown, calm technology itself is for playing central role in a more humanly empowered twenty-first century (Barnes, 1999). The core concept 'humanly' in this concept put more weight in functionality than emotionality. One of core question was how people could capture ambient media among environment more efficiently. Workings about ubiquitous environments were simultaneously developed while adopting method and philosophy of this concept.

One can find keyword ‘humanly’ as concept of technology in more emotional point of view from academe in late 1990s. Seamless interface, tangible user interface and tangible bits are suggested by tangible media group in MIT tries to make bridge between virtual data and human being which belongs to real. Following this concept well known artifacts like I/O brush, Pinwheels, Ambient Room are suggested. Most of these works are published in paper. This study of Tangible bits is seeks to provide seamless coupling between bits and atoms (Ishii & Ulmer, 1997). Series of works included in this theme tried to give physical form to digital information that user can directly manipulate by own hands.

Figure 1 I/O brush (Ryokai, Marti, & Hiroshi, 2004),
Pinwheels, Ambient room (Andrew, Craig, & Hiroshi, 1998)

Although these artifacts are not directly involved with human emotion itself, these all tried to add more human like interpretation in digital word using their

own dialect.

Thinking of functionality there is more emotional-in other words not based on practical reason- try of making technology humanly. Ludic design (Sengers & Gaver, 2006) proposed by Gaver, W. et al. approached to this theme with bit different focus. They introduced the concept of 'Staying Open to Interpretation'. Unlike using digital information in precise and direct manner as a solution for problem in traditional HCI, their system used technology to create interactive situations without specifying their meaning in terms external to the system itself (Gaver, Bowers, Boucher, Law, Pennington, & Villar, 2006). To deploy technology at home they focused on making playful appliances - which they called 'ludic'-. Although they all uses electronic technology all works are simple to use and opened in interpretation that each user can find own poetic of artifacts. Although treating these works as a playful 'toy' is inappropriate. The significance of these works is ordinary daily products became a medium of catalyst between technology and human life in solely focused in emotional manner.

Figure 2 History table cloth, Drifting table, Key table
(Gaver, Bowers, Boucher, Law, Pennington, & Villar, 2006)

Although there are differences in each concept one common thing among these keywords are they all tried to find human in technology. Finding emotional needs in technology were not an exclusive theme for engineers. Lots of artists did their own interpretation of technology. Artistic approaches mostly show themselves in much more abstract manners. Based on the fact that art appears in subjective and

unique form to each artist, they are hard to generalize in several categories. 'Media art' is most broad category comprehending art using electronic technology for showing human emotion. This is an art genre including digital art, computer graphics, computer animation, internet art, interactive art technologies, computer robotics, art as biotechnology and even more. In general, art piece using electronic technology as an expression medium is considered as a media art. Media art is a genre resulted from intersections of art, science and technology. Still this term doesn't elucidate category enough because it is too broad. These categories are simply based on the information type used in media art piece and do nothing with concept of integrating computing technology and human life. Rather than following common category it is better to distinguish art pieces according to design philosophy underneath it.

Design philosophy like slow technology can be a one of examples which broadly includes many art works. A key issue in slow technology, as a design philosophy, is that we should use slowness in learning, understanding and presence to give people time to think and reflect (Hallnäs & Redström, 2001). The fastness of the technology made a gap between human and itself. By intentionally making technology slower using reflective technology, time technology and amplified environments art work tries to make a bridge to connect gap between them .

One can see this design concept in art pieces using various mediums. Wooden mirror by Daniel Rozin (Smoothware Design, 2008), Homographies by Rafael Lozano-Hemmer (Lozano-hemmer) can be a good example using reflective technology for making art piece. Both of them used input images to make a reflection as an output.

Figure 3 Wooden mirror (Smoothware Design, 2008),
Homophraphies (Lozano-hemmer)

Although these artworks used form factors as a main language of presenting output there also are other pieces using other medium. Sound used as an output medium in Peter Vogel's (bitforms) artwork can be one of examples. For time technology Cluster by Lincoln Schatz (Schatz) could be a good example. Using time delay this work visualizes image history of audiences. Also Wooden mirror introduce before also could be an example for amplified environment.

Figure 4 Cluster (Schatz)

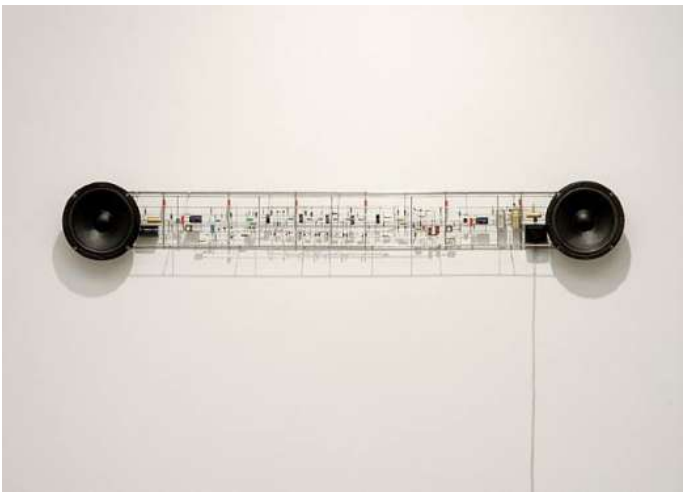

Figure 5 Duo (bitforms)

There are number of design philosophies other than slow technology. Media art as an ‘interactive art’ focuses on the principle of interactivity. The artist’s task is now the creation of the artifact: a system/context in which the recipient/interactor constructs the object of his or her experience as well as its meaning. (Grau, 2007) ‘Device art’ is a concept derived from Japanese approach to media art that works in this category involves hardware specifically designed to realize a particular concept. ‘Information arts’ is a design philosophy more centered on context of information used in media art. (Wilson, 2002)

To describe these approaches to find human within technology as a whole, this paper often uses tern ‘analog mood’. More analog way could mean more tangible, older fashioned or more physically intuitive way to do something.

1.2. Goal of design development

As mentioned at very first paragraph, many part of human culture became digitalized- in other words virtualized. It has been seen through various examples that under various philosophies various parts of our digital culture are

reinvestigated. This paper had especially interested about communication part of virtual culture. Paradigm shift of communication method brought one of the most radical changes to human culture. Computer mediated communication (CMC) shows way different characteristics compared to traditional communication methods. The gap between traditional communication technology and virtual technology is huge that there are many chances to recover ‘humanly’ aspect. Moreover this radical change happened in relatively short period of time that some user group (for instance elder generation) couldn’t follow the gap between technologies. There have been many projects which will be shown at chapter 3 to deal with emotional communication. Main issue of this design work is to develop new perspective of ‘emotional’ communication.

Another big issue of this design project implies life logging. Personal history has been researched in various scopes and various reasons. Especially using digital technology to study personal history brought many useful benefits. With development of technology such as microprocessors, memories, sensors, displays and networking over last couple of decades, the idea of archiving entire person's life become more feasible more extendable. Members of medical and legal professions could use this record to treat their clients efficiently. People can use their records for financial and retirement plan (Plaisant, Miiash, Rose, Widoff, & Shneiderman, 1996). Recording every part of meeting in company could guarantee accurate workflow. Family member can view their ancestor’s life to know them better. Even archiving every moment of person's life could be a helpful aid to patient with memory problems (Berry, et al., 2007). Whatever the reason of doing it, generally the activity of archiving one persons entire life is known as 'life logging' or 'CARPE (Capture, Archival & Retrieval of Personal Experiences)' (ACM SIGMM). Communication log of person could represent mental record of life. There had been numerous projects dealt with life logging. However comparatively approach to life logging using communication log is quite few. Moreover it turned out to be almost all life logging projects are

focusing 'how efficiently use', 'how efficiently making' or 'how efficiently organizing' the logs. If the scope of life logging is narrowed down to personal level those efficiency issues mentioned matter less. Like keeping diary, biggest motivation of making person’s log by personal level is quite private and emotional activity. Needs are significantly differ according to target user. What could be possible to make individuals to do life logging? What are important factors of life logging in personal level? This paper looks through various attempts to do these logging behaviors and tries to suggest new approach to make life log which overcomes limitations of previous ones. As mentioned this work especially focused on limitations in emotional point of view. How life logging could interpret in more emotional context? How each data of life log could convey emotional data that user could retrieve later? This paper is a record of attempt to create a working prototype of an emotional life log. Throughout design development this paper tried to look for new possibilities of life log. The final design work suggested in this paper chooses email as a life log medium which named as @mail. Unlike common email @mail has additional functions to make email as a life log with emotional value. This design development paper made email system using both software and hardware as a final product.

1.3. Design development method

Final design had developed through qualitative case studies. Case studies include not only life logging projects but also works to express emotion in digital data to comprehend the main topic. Insights and issues of life log had been picked out throughout case studies. Final design had decided while going back and forth ideation phase and research phase. Figure 6 summarizes the overall development process of @mail. To describe entire design process, design judgment of each step is described in this paper. Since the final artifact made from the development

is rather creative design than engineering design according to Löwgren's definition (Löwgren, 1995), it is inappropriate to describe using user centered design approach (Wolf, Rode, Sussman, & Kellogg, 2006). Finally field trial of software and hardware were conducted to evaluate output of design development. Questionnaires had distributed to each users and user interview had conducted to get feedback and evaluate this work.

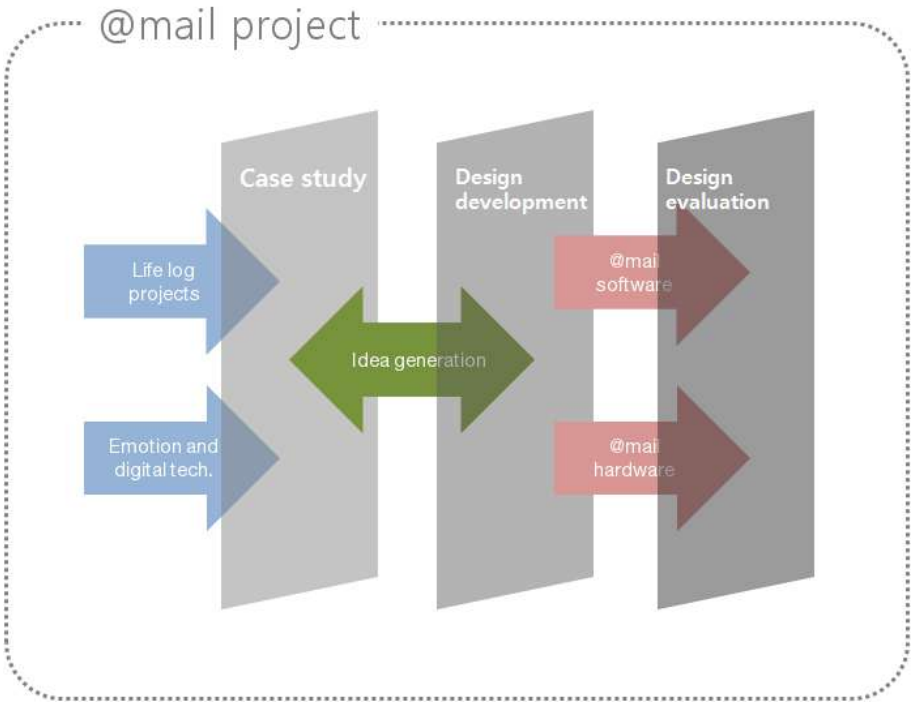

Figure 6 Design development stage

II

2. Context and definitions

2.1. Virtual communication and emotion expression
2.2. Life logging

2. Context and definitions

2.1. Virtual communication and emotion expression

2.1.1. Emotional needs in virtual environments

It is almost impossible to imagine world without internet today. Since its appearance internet changed the way people work, the way people learn and the way people communicate. Although many technologies are developed for internet communicating, large portion of current internet communication is still based on text message. Starting from email and text messenger, even most user of graphic games uses text messages to communicate with each other. Although same medium has used for communication traditional text communication and virtual text communication shows big differences. Compared to traditional communication – or man to man communication – virtual communication has unified input and output channels. As a result many internet cultures trying to overcome this limitation were appeared.

In any traditional type of data which in generally called as analog data (to make contrast with digital data) has Meta data called nuance. Consider handwritten letter compared to email. While writing a letter writer could have various emotions. He/she might have to consider carefully for next expression, or might has to get rid of certain expression as a result of the consideration. The writer could wrote down a letter is hasty manner because of his/her happiness, or could wrote down in calm manner with occasional pause because of one's sadness. All this information is melt in couple of papers. Still in now days people send hand written letter to show their respect or sincerity. Letter does not contain mere alphabet, grammar or information. It is rather an accumulation of contents, context and emotion of writer. This design work had tried to emphasize these lost contexts of writing a letter in nowadays.

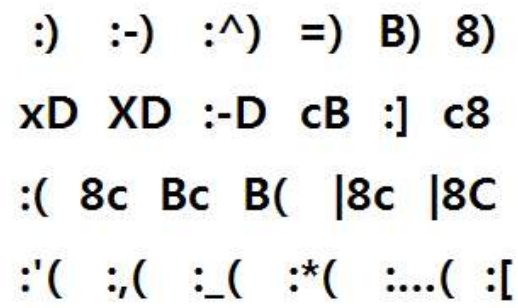

Figure 7 Text emoticons

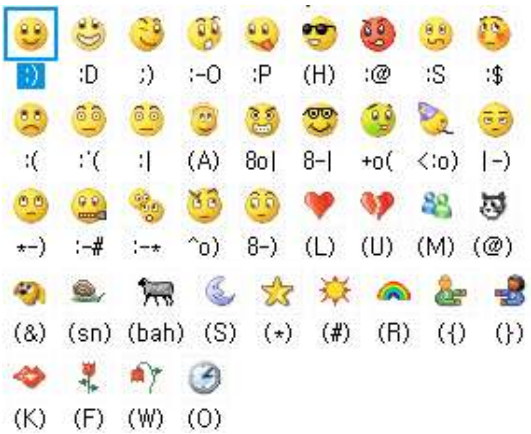

Figure 8 Graphic emoticons from MSN

There have been some tries to show additional emotional mood in text data - like emoticons (Rezabek & Cochenour, October 12). As an old adage "a picture is worth a thousand words" text characters combined to mimic pictograph icons to provide visual cue to read between lines. It appeared in early 1980s by student from Carnegie Mellon University. (Dusan Encyclopedia) Early form of emoticon is composed of only ASCII characters like figure 7. After graphic interface got popular emoticon with more pictorial type appeared. This is easy and effective way to express non-verbal information into text data and soon became popular texting culture around the world. Still this also has limitation. As the use of emoticons settle among people it became social agreement like language. To

express one's emotion properly people has to follow common rule of using it. Eventually emoticon became another type of written text. Graphical emoticon could give richer emotional information than text emoticons. However there is still convention to follow to express certain expression to communicate with other people not to mention technical efforts to use graphic among text data.

There has been other approach to show emotion in text using the form of text itself. Usually typographic experiments done by artists are shows form. These approaches are commonly called as kinetic typography (Minakuchi & Tanaka, 2005). In these tries texts are animated to attract viewer. Visual attraction is most important factor since these are mainly used in films, TV programs, video games, advertisements, etc.

Figure 9 Kinetic typography appeared in movie 'Fight club'

Figure 10 Kinetic typography work by Heebok Lee (Lee H.)

This kind of typography strongly depends on expression medium for text. Since movement of text data is key part of it, almost all of them are shown in movie clip as a final form. Making kinetic typography in this context is mostly artists' work.

After introduction of computer in editing movie clip, people started to make movement of text data in algorithmic way. Typorganism (Lee G.) is one of these. Developed using Flash text are expressed dynamically both in form and movement. The problem is in theses type of works is that although it is interesting to look at the form and context of text has no link between them. Furthermore, like Typorganism, most work needs special platform to express custom designed typography needs special software to use it.

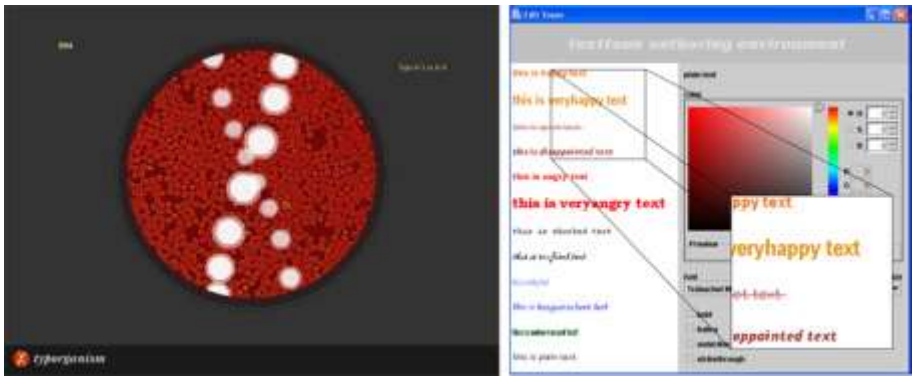

Figure 11 Typorganism (Lee G.), Textone (Kalra & Karahalios, 2005).

Similar try to overcome these problems is TextTone (Kalra & Karahalios, 2005). In this work typeface, font style (bold, italic, underlined, cancelation) and font color had predefined according to mood. There are several templates of these styles and user could apply it to express emotion. It uses AOL instant messenger as a platform. This work tried to make link between style of text and mood. Moreover many researches are done to capture mood automatically that user

doesn’t even need to do their own defining. However these tries still has fundamental problem. The reason of linking form and context is not persuasive to all users and it forces users to accept their own emotion expressing paradigm.

2.2. Life logging

2.2.1. Definitions of life logging

The idea of logging human's life can trace back to Vannevar Bush's vision of memex (Bush, 1945). In his article he foretold of future device which an individual stores all his books, records, and communications, and which is mechanized so that it may be consulted with exceeding speed and flexibility. Although he never mentioned term 'life log' directly the concept of memex became foundation of life log. From here there have been numerous projects under the theme of life log like CARPE research area. The term life log is used by people in various interests and meaning of itself differs slightly case by case. The relatively narrow definition of the term 'life log' can be found in Anita L. Allen's paper (ALLEN, 2008).

> A life-log is conceived as a form of pervasive computing consisting of a unified digital record of the totality of an individual's experiences, captured multimodally through digital sensors and stored permanently as a personal multimedia archive.

This definition is narrow in terms of the scope of life log. In this definition life log covers entire-total- life of individual. Ideal type of life logging under this definition tries to capture every moment of life to preserve ultra detailed electronic record. Life log is perfect mirror of oneself composed of information. Since life logging is done using electronic aids one can even survive as a digital ghost after death (Steinheart, 2007). Since it is impossible to record every

moment in real world, this type of life logging captures individual's life regularly- for example one photograph per 1 minute. Usually this type of life logging uses special device which capture moment automatically. My Life Bits project by Microsoft research center (Gemmell, Bell, & Lueder, 2006), audio-based personal memory aid project from MIT (Vemuri, Schmandt, Bender, Tellex, & Lassey, 2004) and life log system by Kiyoharu Aizawa (Aizawa, 2005) matches this definition of life logging. To capture human's experience totally they all developed own capturing device with special retrieving system. Due to the fact that this type of life logging requires vast amount of data space and solution for organizing data, objective for doing life log is relatively clear and practical.

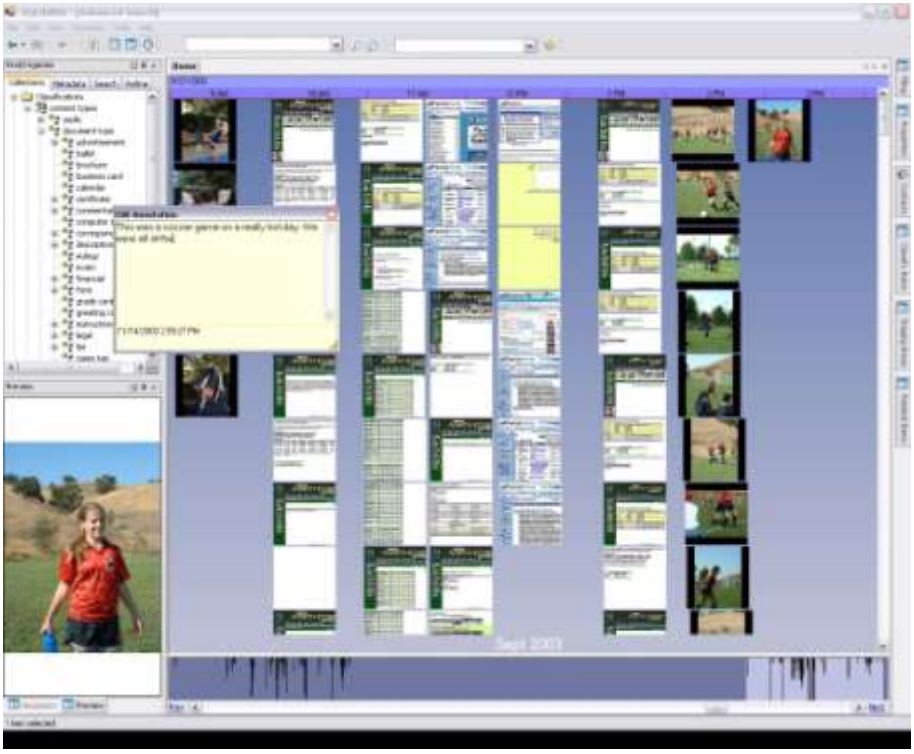

Figure 12 My Life Bits project (Gemmell, Bell, & Lueder, 2006)

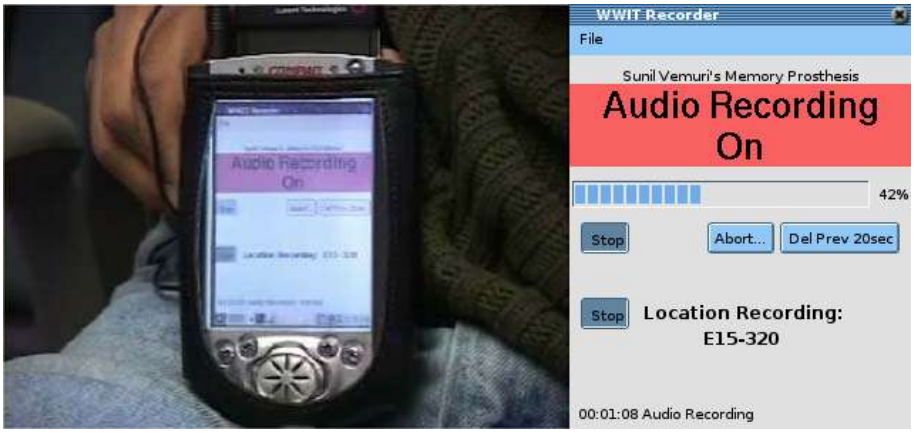

Figure 13 Audio based personal memory aid
(Vemuri, Schmandt, Bender, Tellex, & Lassey, 2004)

After more the concept of life log got popular and more people involved the concept of life log got broader. Broader sense of life log appears in the paper of C, Gurrin (et. al) which is life log is the process of digitally capturing one's life experiences (Gurrin, Smeaton, Byrne, O'Hare, Jones, & O'Connor, 2008). This definition still defines the boundary of life log as a data from 'digitally captured' thing. Considering the original interest of life log as a result of digital era it could be seen as a proper boundary since we don't want to deal with pure off line objects. Information must be transferred to digital environments to be a part of life log. Actually this definition can't limit the actual scope of life log since almost all of recording method for human life digital. People record their life using digital cameras, digital camcorders. People communicate using cell phones, messengers or emails. People plays digital games, listens to digital files and uploads their life in network space like blogs. Devices assisting digital life become more cheaper, more smaller and easier to use that more and more people starts to put their one leg in digital land. It is already natural that people 'log' their life using digital data in virtual world. This narrower definition might seem too blunt to people who follows strict definition of life log- who usually treat life log as research area. As mentioned already life log is part of our culture now days.

Life log in this context is rather familiar with most people than previous one. This is the concept which actually stays alive within culture. Nokia Life blog (Nokia) could be a good sample case of broad definition of life log. This life log type doesn't necessarily record all moment of human life. Only selective data by user appears in life log. Usually collective remembering projects could match this definition of life log.

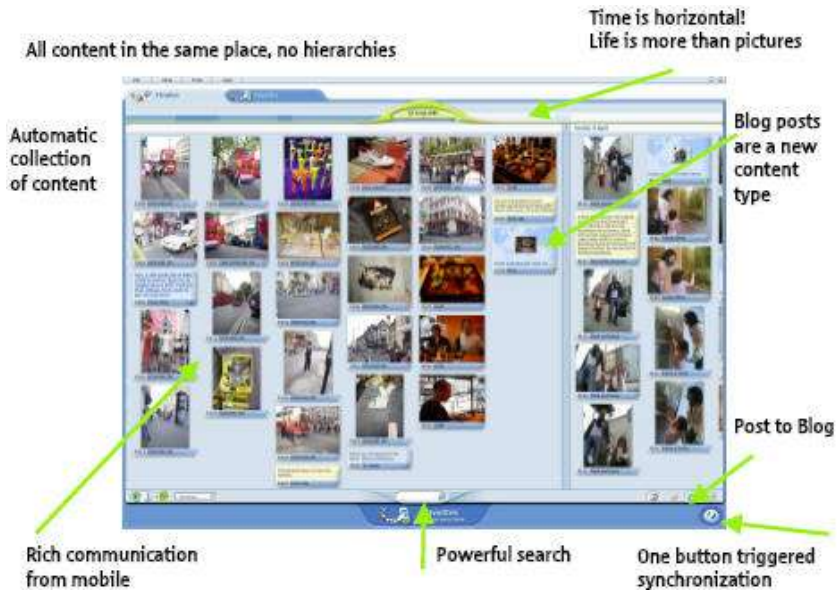

Figure 14 Screenshot image of Nokia life blog (not in service anymore)

The activity of making life log frequently expressed as life logging and people who do life logging are called as life loggers. In any spectrum of definition, it is quite clear that primary goal of life logging is to supplement the limited human memory with digital system which could complement our inability with endless data space (Vaiva & Steve, 2007).

2.1.2. Significance of life logging

So then what is the value of life log that attracts so many people? Actually life

log is useful in many ways. Medical center could use patient's life log to give proper treatment, human resource manager can use employee's log and people can track their ancestor's life log to know themselves better.

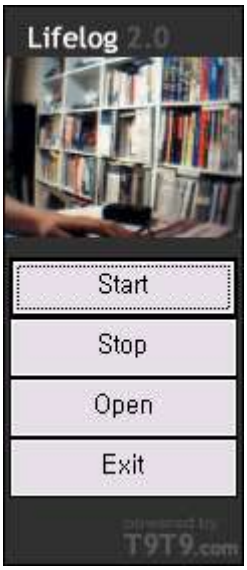

Figure 15 Life log project voluntarily initiated by individual (T9T9)

However these kinds of practical reasons couldn't fully explain voluntary life logging activity by personal level. Anita L. Allen's article (ALLEN, 2008) tries to explain reason in more personal scope.

> ... our experiences and achievements comprise our uniqueness; preserving a record of them preserves a record of us. Lifelogging feeds the inner King Tut- the side of us that rejects transience through mummification, relic and entombment. But lifelogging is also journaling, art, entertainment and communication. Innovators expect lifelogging products to emerge as serious tools for improving the quality of life. In this favor, lifelogging might encourage introspection and self-knowledge.

Human can exists as a unique individual because of memory. Thus keeping and tracking memory could be considered as a most fundamental desire of human. Three topmost needs in Maslow's hierarchy (Maslow, 1943) could not exist without memory. It is natural that people start to use digital technology as a memory aid as digital technology aid human life in many other way. Why people do life log? Why not?

2.1.3. General issues and categories of life log projects

Life log projects are one of ongoing issue of now days. Although there are some milestone projects of life log it is premature to examine overall trend yet. Lifestreams from Yale university appeared in 1996 (Freeman & Gelernter, 1996), My life bits (Gemmell, Bell, & Lueder, 2006) project appeared in late 1998 and life log technology project initiated by DARPA (DARPA) appeared in 2003. These three projects could be considered as a one of the earliest practical projects about life log. Objectives of each project vary case by case but there appear certain issues while treating life log.

The most common and both long standing issue is about organizing huge amount of life log data. Usually this issue is referred an information overload. To deal with huge amount of information many projects mimic memory structure of human. It is well known fact that it is effective to give a stimulus to retrieve information from long-term memory (Hoven & Eggen, 2006). Context based retrieval system suggested by Aizawa et. al. (Hori & Aizawa, 2003) tried to get advantage of episodic memory. Recalling the situation to access log using query like 'I talked with Kenji while walking at a shopping center in Shinjuku on a cloudy day in mid-Ma.... I want to see the video of our outing...'. To do this they had to make special hardware to capture wearer's context using various kind of sensors. Focusing on the fact that information in life log is already seen-or experienced by- user, Microsoft research team suggested personal information

retrieval system (Dumais, Cutrell, Cadiz, Jancke, Sarin, & Robbins, 2003) which provides memory cues for searching. Other then imitating human memory mechanism there also are other methods like simple time-line based retrieving system (Freeman & Gelernter, 1996).

Figure 16 Life log agent system (Hori & Aizawa, 2003)

Next biggest issue is about data. Each digital data type has own strength and weakness. Text data is compact in size and doesn't need high computing power. On the other hand movie data is enormously big compared to text data with need of higher computing power but preserves rich information. What data will be

good for life log? In most case visual data is chosen. There could be many reasons about this. Most fundamental reason could lay on the fact that mankind is visual being. It is known that in episodes experienced by humans, visual information is usually most salient. (Mayes & Roberts, 2001) Visual technology is most prevalent thus easy to use and cheap. SenseCam (Microsoft Research) project took picture every 90 seconds using fish eye lens camera. EyeBlog (Dickie, et al., 2004) project also used wearable camera to gather visual data. Audio data also plays major role in life log in various projects. Voice recognition technologies usually take part in these projects for organizing data. Data from non-visual, non-auditory sources usually can't play central role in life logging. They tend to support those two data type to give richer information. GPS log data (Krumm, 2005), heartbeat (Nozawa, Narumi, Nishimura, & Hirose, 2008), RFID data (Minamikawa, Kotsuka, Honjo, Morikawa, Nishiyama, & Ohashi, 2007) or gyro sensor data (Aizawa, 2005) could be examples. Data gathering method which usually contacts user directly differs by type of data. Does user has to use special devices all the time? Is it acceptable that user became recorder that recorder himself seldom appears in the log (Lee, Kim, & Lee, 2008)?

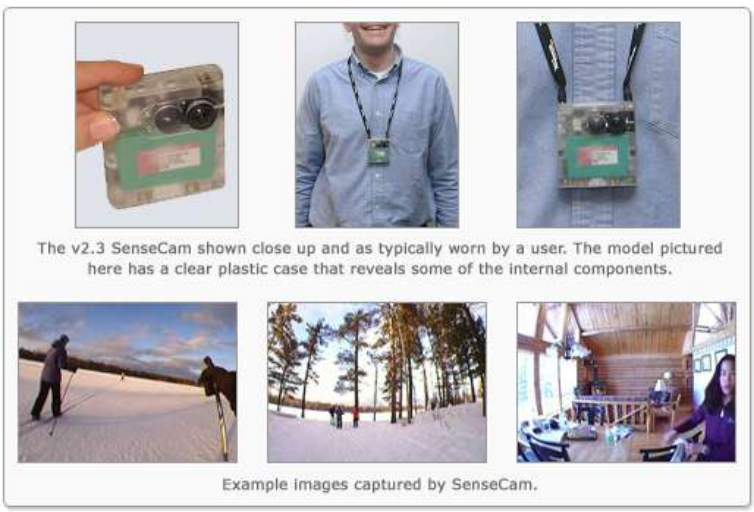

Figure 17 SenseCam project (Microsoft Research)

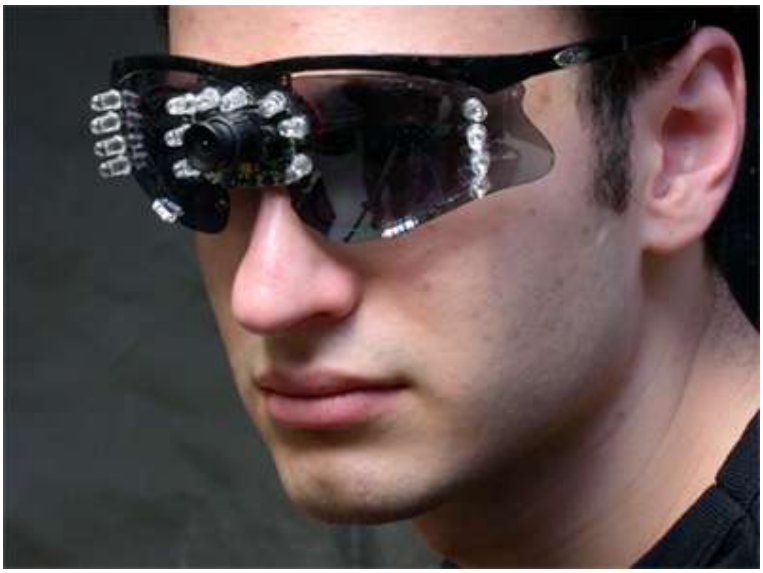

Figure 18 ECSGlasses for Eyeblog (Dickie, et al., 2004)

The application of life log also appears major issue. In some case life logging itself became goal to achieve but in the same time it could be used to support other systems. As mentioned earlier in introduction chapter, life log could be used in various ways. It is experimentally verified that life log could be used as assist memory deficiency (Berry, et al., The use of a wearable camera, SenseCam, as a pictorial diary to improve autobiographical memory in a patient with limbic encephalitis, 2007). Also there is a strong motivation for technology to support collective remembering in evidence-based care- like therapy session (Kientz & Abowd, 2006). Besides medical uses, life log as a family chronicle (Rice, Lawyer, & Skousen, 2006), memorial of historical event like war (Sas, Dix, Davies, & Friday, 2006) or assistant of working environment (Richter, 2006) could be found. Last but not least, privacy matter emerged as a major issue. Life log is deeply involved in digital technology that it even shares dark side of technology. It is quite natural that legal or ethical issues of using life log had arisen with the appearance of concept of life log. Life log can act as both sousveillance (Mann,

2005) to a person and surveillance to people around that person. Not only disclosure of private life but even spying or blackmailing using past event could be possible (ALLEN, 2008). However big the advantages gathered while using life log if this issue doesn't solve out properly it should not is in use.

Life log projects could be categorized by way of suggesting solutions according to the issue the project focused on. This paper proposes three categories based on the case studies of various life log projects. 1. System-wise approach of life log 2. Device-wise approach of life log 3. Context- wise of life log. Some projects suggest their solution which belonged in single category and some solutions are belonged to multiple categories.

Figure 19 Category of life log projects

System-wise solutions suggest solution for life logging in system structure point of view. Algorithmic solutions for effective retrieving mechanism, database system or new user interfaces suggestions could belong to this category. System-

wise approaches often come up with device-wise solution to maximize the effect. Projects in this category mostly deal with issues about information overload or issues of organizing and retrieving life log. Most projects concerning privacy issues also fall in this category.

Device-wise solutions are mostly for data gathering issues. Questions like what kind of data or what kind of recording method is most appropriate drives solutions in this category. Final result of project has special hardware device with customized use. Since developing new device needs much recourse, projects included in this category are mostly performed by research teams. Tailored system suggestions appear with final solution as mentioned above. Due to the characteristics of academic paper which has tendency of narrowing down topic to get focused, most system suggested in device-wise approaches appears with less weight. However it is obvious that system-wise approach and device-wise approaches must be balanced to make complete solution.

Final category, context-wise approach, deals with bit different level. Projects in this category ask mostly about what environment life log will be effective. They focus on new application of life log. Issues about system or device came secondary to support them. Usually this kind of approach uses pre-established system or appears as a final step of engineering solutions. Finding out suitable application of life log is primary goal of projects in this category.

Figure 19 summarizes overall structure of life log category.

2.1.4. Conclusion

Life log has great potential. If joined with larger system like ubiquitous environments the effect will be tremendous although currently there are some issues that have to be overcome. For instance environments around people will learn about them that each person can have their own tailored environment.

However current life logging projects also have many issues to get over. For example current approaches to life log is engineering biased. Almost all life log

project had specific goal to achieve. Comparatively few works are done in scope of voluntary life log. In this context memories are not about fact, however, but are about interpretations, about meaning, about how individuals define who they are (Wertsch, 2002). As mentioned before in this case fundamental needs of life logging are rather emotional side than logical reason. The keyword 'emotion' will open new chapter of life log projects.

III

3. Design development

3.1. Design background
3.2. Design development
3.3. Implementation detail description

3. Designing @mail

3.1. Design background

How to soak emotion into life log? The final proposal of this design work is new type of experimentary mail system named @mail in which @ stands for double meaning of analog and @ mark of email.

Human being can't exist just by oneself. An individual is defined by relationships with other persons. Thus history of communication is one of the most important ingredients to retrospect oneself. So are there sufficient apparatus for using communication log as a person's life log? There have been several means to preserve communication log although few, there have been almost no means to use it as a life log.

In most case communication log is piled up as a text database or audio data. Since most audio data are result of human speech which could be converted in to text data, audio data and text data of communication log are basically in same dimension. Text data is relatively small in size then other data types and could have well defined structure or semantics. Nevertheless text data are almost never treated itself as a life log medium. There are no explicit reasons of why not using text data but we can guess it through looking why most projects choose non-text data as a life log medium. However big portion text data took in our life text data is usually drier and recalling or remembering rate is lower than other medium. Design work presented in the paper tried to compliment the weakness of text data and reconfigure it as a life log medium.

As one could see from the title of the work this design work chose email as a life log medium. New email system with special functions for making emotional life log and new hardware for printing life log is designed in this work.

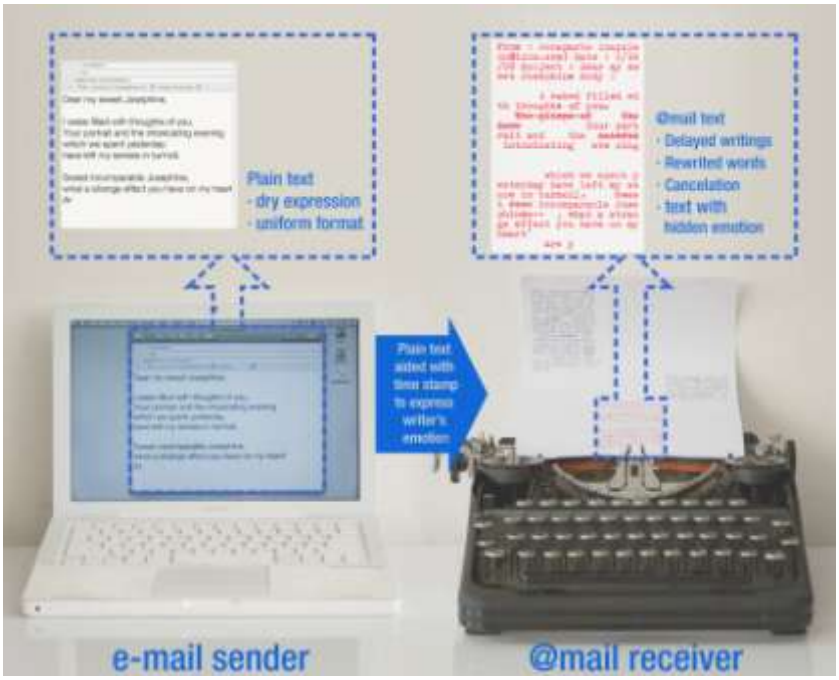

Figure 20 Overall concept structure of @mail system –in user point of view

Overall design concept of @mail is summarized in figure 20. @mail system captures user's emotion among text data and makes life log using email. User can receive and review this email both in email software and special hardware designed to print out @mail life log.

3.2. Design development

3.2.1. Email as a life log

Email is one of the most successful and popular application. Although started as asynchronous communication through internet, people started to use for additional functions (Whittaker & Sinder, April 13-18, 1996). Document delivering, personal archiving, task delegation, task tracking, scheduling are part of those additional functions. Email has become more like a habitat than an application (Ducheneaut & Bellotti, Sept./Oct. 2001) in now days. Naturally

email became rich source of information describing person's life encompassing both communication records and personal records.

As a life log email has several other advantages. As both communications log with other relationship and log of personal event email can be a life log with other person's perspective. Not like life log recorded only by first person point of view, email log can have more in depth context. Also writing something in text is not like pushing button of camera. To make an article much more efforts and time is needed thus final contents are filtered and refined outputs. By this reason email can provide selective data compared to some autonomous photographs taken by wearable device which user didn't even realized the fact that it is working. Of course these types of gathering life log could guarantee more accurate information of life. As life log in this design development isn't about dealing with recalling facts of life the amount of data doesn't guarantee richer data. The amount of data doesn't have anything to do with emotional experience while retrieving. By this reason email suits in design background of this work better than other mediums. Yet to say email represent life in selective manner spam problems must be considered. Usually spam mails have nothing to do with receiver's mental or physical status of specific moment of his/hers life. In most case it is reasonable enough to consider spam mail as garbage. Ideally email system must get rid of spam automatically that this problem doesn't need to be cared by user. Nevertheless treating spam mail is large independent field of study, so this design development simplify this problem by making user to group certain mail as a spam.

Talking about dedicated device for life logging, another main advantage of using email as a life log is that it simply doesn't need any of it. The priority function of email is not life logging. Life log naturally accumulated while leading a life. Moreover email already is a popular technology that no additional learning is required. New device with high edge technology will able to record much more information than email but is it really necessary? Again, since this project is

about recalling, finding meaning among memories it would be overdoing making new device (probably costly device which needs dedicated platform to use it). Similar to uncertainty principle in physics law user's life will be burden dealing with recording device.

3.2.2. Emotion expressing method for @mail

Since emotions are subjective experiences, or experienced from an individual point of view it is hard to make general standard. In real world what we do to catch other's emotion is guessing based on physical clues which we could observe superficially. There are certain social conventions to express emotion but each individual has their unique pattern of expressing their mood.

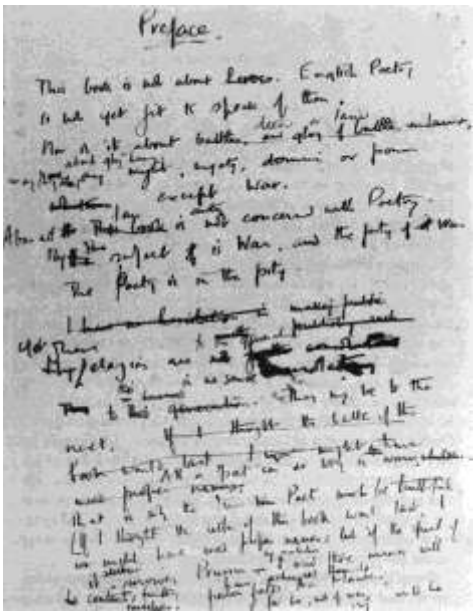

Figure 21 Sample handwritten document (Harold B. Lee library)

@mail tried to borrow this behavior. Basically @mail records information of physical activity of writer. @mail encodes this information in email systematically and decodes it to receiver in human friendly manner. Behaviors

people take while writing something are not many. Person writes, erases text and makes delay while writing. @mail catches ‘writing’, 'pause' and 'rewrite'. Following rules are defined to encode this to email that receiver could recognize.

Write:

Simple writing within acceptable amount of time considered as a continuous input. This will appear as simple sentence just same as sentences appears in normal text editors.

Pause:

If there is delay between each input more than n seconds record delay time. Re-express this information using blank input.

Text shown using normal text viewer)

Dear all, I understand you all are working hard without sleep.

Text shown using @mail text viewer)

Dear all, I understand you all are working hard. without sleep.

Rewrite:

Track all information user wrote even deleted words. Re-express this information using canceling line.

Text shown using normal text viewer)

I would like you all to enjoy the project and not to get exhausted.

Text shown using @mail text viewer)

I would like you all to enjoy the project and ~~in a good condition~~ not to get exhausted.

As @mail is based on text encoding scheme encoding contextual information has to follow restriction by it. Written text could be considered on a single time line. In this scheme it is natural to show delay by repeating predefined blank character.

Encoding scheme of rewriting is motivated from the common canceling behavior while writing. Drawing cancellation line is intuitive way of expressing rewrite. Actually, in internet environment this rewriting scheme is used by bloggers. Many bloggers use cancelation line to emphasize main contents they want to show as shown in figure 20.

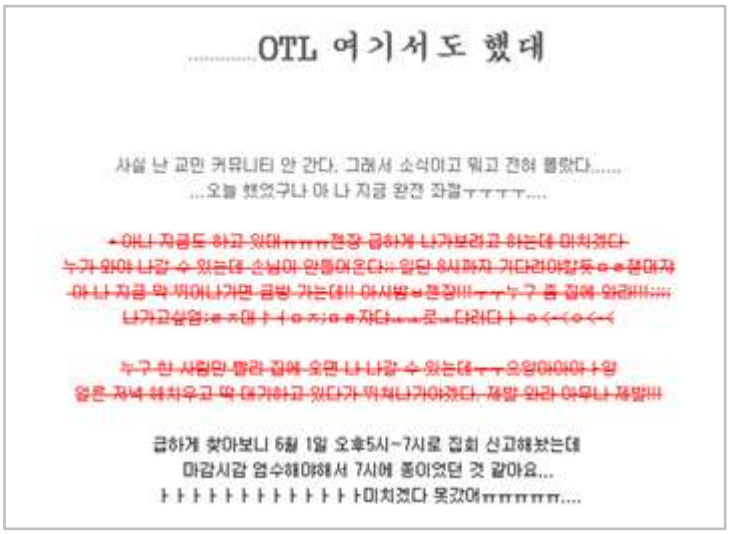

Figure 22 Emotion expression using conventional text tools by anonymous blogger

Sample paragraph applying these two rules appears as follows.

From : Raghu Kolli (raghu@kaist.ac.kr) Date : 12/5/07 Subject : id504 New deadlines Body : Dear all, I understand you all are working hard. without sleep. I would like you all to stay healthy and enjoy the project and in a good condition not to get exhausted. Therefrore, the deadlines are changed as follows : There will be no class on Monday 1210 Dec. Final presentation session : 12 December 0800 0900 hrs-12:00 hrs(combined with id713 course) FDeadline for submitting ppt file/pdf file of presentation : Monday 10 Dec, 1700 hrs. Deadline for submitting physical

> model and animation file : Saturday, 8 Dec 1700 hrs. If you have difficulties or need clear clarifications or feedback on your models or presentation content, don't hesitate to drop into my office or call me. All the best, Raghu.
>
> --Raghu
>
> Kolli, Visiting Professor Dept. of Industrial Design Korea Advanced Institute of Sci. & Tech. (KAIST) 373-1 Guseong-dong, Yuseong-gu Daejeon 305-701, South Korea +82 42 869 4590 Direct +82 10 6807 4590 Mobile raghu@kaist.ac.kr

Plain text mode-without encoding rules of @mail- of this paragraph should appear as follows.

> From : Raghu Kolli (raghu@kaist.ac.kr) Date : 12/5/07 Subject : id504 New deadlines Body : Dear all, I understand you all are working hard. without sleep. I would like you all to stay healthy and enjoy the project and not to get exhausted. Therefrore, the deadlines are changed as follows : There will be no class on Monday 10 Dec. Final presentation session : 12 December 0900 hrs-12:00 hrs(combined with id713 course) FDeadline for submitting ppt file/pdf file of presentation : Monday 10 Dec, 1700 hrs. Deadline for submitting physical model and animation file : Saturday, 8 Dec 1700 hrs. If you have difficulties or need clarifications or feedback on your models or presentation content, don't hesitate to drop into my office or call me. All the best, Raghu.
>
> --Raghu Kolli, Visiting Professor Dept. of Industrial Design Korea Advanced Institute of Sci. & Tech. (KAIST) 373-1 Guseong-dong, Yuseong-gu Daejeon 305-701, South Korea +82 42 869 4590 Direct +82 10 6807 4590 Mobile raghu@kaist.ac.kr

Writing pattern is different by every user and even differs in every occasion. Unlike emoticon there can't be single interpretation about pattern. Encoded information can be thought as physical clues between two people in face to face.

Like people guess other person's emotion via facial or gestural information receiver guess writer's emotion via encoded email. Of course it could be a wrong guess. However as long as user accept this encoding scheme as reasonable, this error fall in acceptable range.

3.2.3. Designing information structure

Information design is important part while dealing with life log. As life log consists of vast amount of data efficient navigating system is critical. Life log data is not just big but also keep grows as time goes by. The value of life log not only comes from individual data of it. As a whole, group of individual data could give information in higher dimension. Statistical data like sum, average or distribution could be examples. These give data story to tell. Point is to maximize value of life log it is important to show both individual data and data as a whole.
Powers of ten (Eams Office) is a good example of showing both local and global view which is monumental work by Eames. In this work according to height a scope of view appeared in layered manner. Also at the both side of frame number which indicates the current scope of view that a viewer can aware where he is.

Figure 23 Powers of 10 (Eams Office)

Important insight from this work is that data shows meaningful differences in each layer. This method helps viewer to get overall perspective of information.
This layered scheme of representing large data is used in many works. ecotonoha tree (NEC corp.) is an elegant example of this design scheme in interactive manner. User can upload comment using interactive web document implemented using flash. Using time as a rough clue one can both navigate among each messages in the meanwhile observing overall structure. Both two examples successfully show large amount of data by chunking data effectively to express the theme.

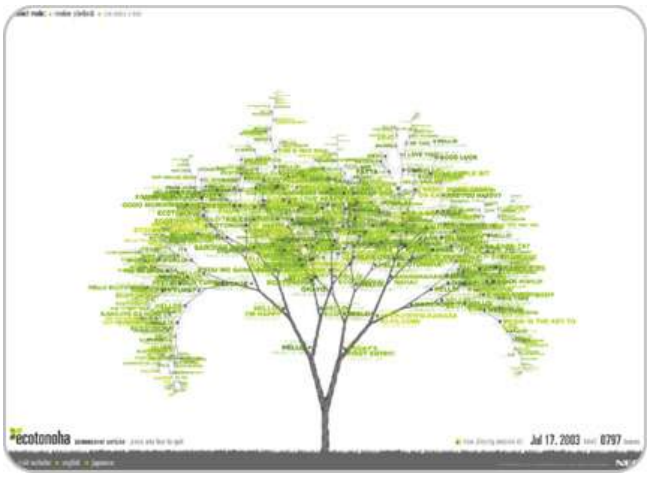

Figure 24 ecotonoha (NEC corp.)

Then what is effective way to chunk email? The most popular strategy could be grouping. According to field study people make groupings to organize emails (Ducheneaut & Bellotti, Sept./Oct. 2001) . Usually groups are appeared as a concept of folder in various email systems. Grouping criteria differs case by case. @mail uses the context of email as grouping criteria. Mail received in personal context, business context (related to work), spam and mail user sent are criteria. Usually grouping criteria in email is subjective to each user. However as a design work putting more weight in life logging, @mail simplified groups using most

superior categories. More detailed group dividing could give more specific information about a person but at the same time the visual complexity will rise that it will hard to look though life log.

To review emails in life log perspective @mail uses own information visualizing scheme. The final visualization of life log resulted from grouping criteria mentioned above. Since spam has little (in most case no) relationship with person's life this category doesn't need to appear in final visualization. As a result three groups are appeared in final life log. Final visualization could be thought on an endless line of time. @mail made three columns in this line which leftmost column stands for business group, rightmost is for personal group and middle as a sent mail group. Each email appears in sequence of time and makes unique pattern according to each user.

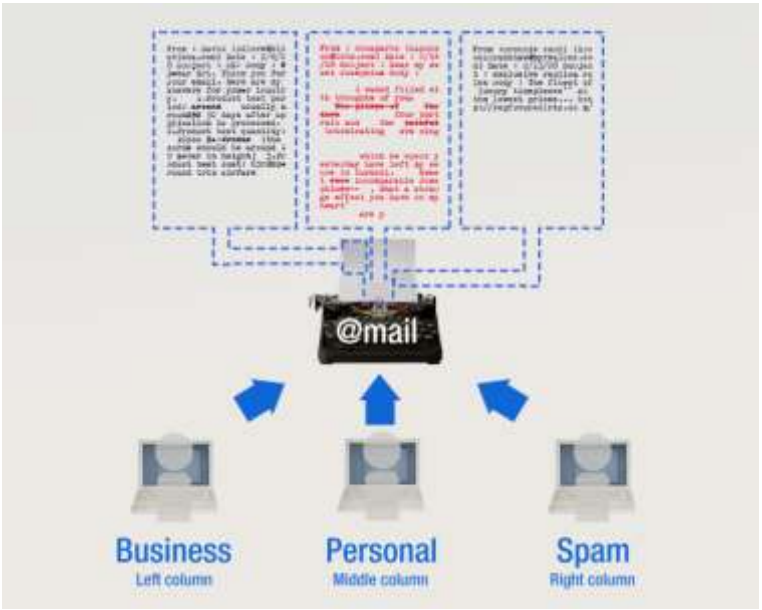

Figure 25 Three categories of @mail grouping structure

First approach of visualization looks as type A. In one time line three equal columns exist. However regarding the efficiency of using space final visualization changed like type. B.

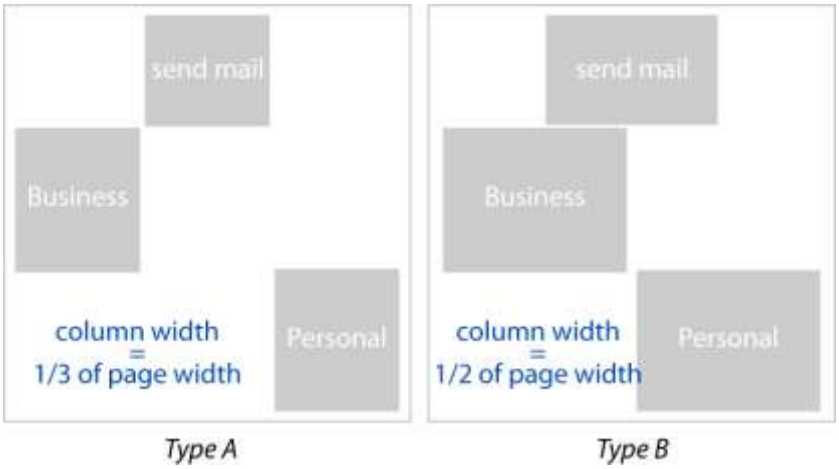

Figure 26 Two types of column layout

3.2.4. Software development

At very early stage of idea generation, @mail was hardware oriented system. Standalone hardware that receives email and sends email was initial idea. At this point software was hidden underneath of hardware and user never needs to meet software directly. After several ideations this paradigm was changed for several reasons.

@mail contains two main functions. First is to return the retrospective emotion of exchanging letters by establishing new type of email composer. Second is about visualizing personal history through emails. To present each function more effectively special hardware for @mail is designed to materialize life log. As mentioned previously @mail is implemented in Microsoft Windows platform. @mail system is totally new type of email system that it isn't compatible with conventional email system. This is reason why user can't use @mail system with other email users.

Software for @mail developed here -for now it will call as a 'composer'- is developed on the Microsoft Windows platform. Main interface of composer has almost same components as an average email system.

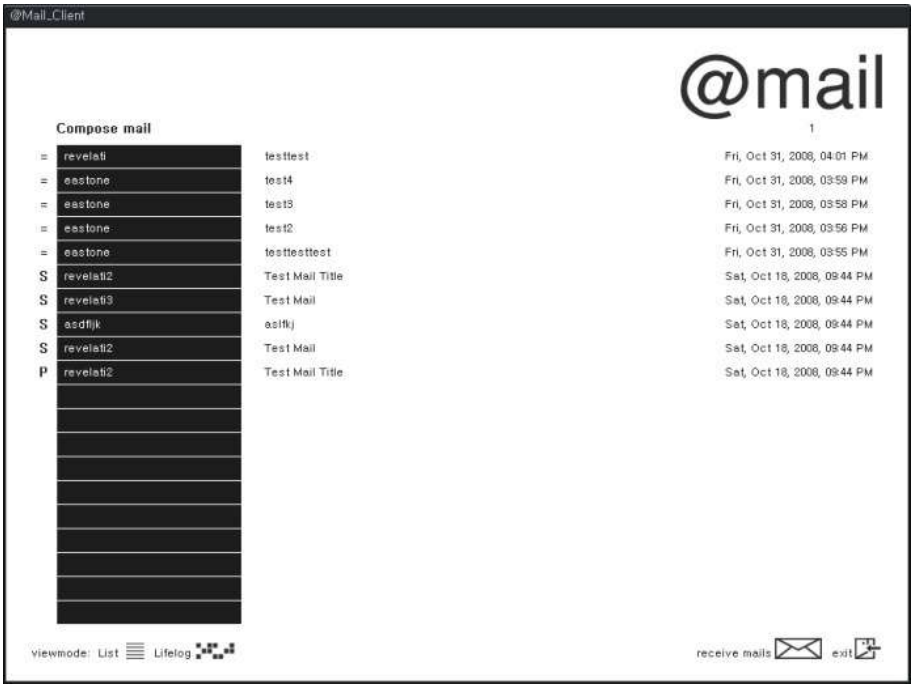

Figure 27 @mail inbox screen shot

User can make their own account using composer and exchange email with other people. Since this software is an experimentary version which does not have sufficient fund and time for development, it doesn't have convenience functions of commercial software. Also, to make user focus on main two function of @mail system is designed as minimal as possible. Only very essential functions for using email; composing and viewing email, marking group are provided. Additional functions like address book, group mailing, forwarding or other functions are not implemented in @mail. For now @mail supports communication only between people using @mail. The very first interface user

encounter to use @mail is login window. User could make ID though this window.

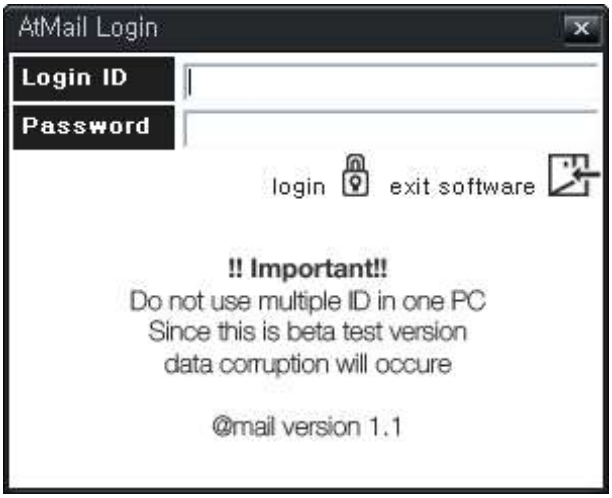

Figure 28 @mail log-in window screenshot

To fulfill function as an email and life log @mail provides two viewing modes. First is list view which function as a normal email viewing. This will called as a normal mode.

User can compose, read or mark email in this view mode. Figure 19 shows main window of this mode. Every line represents information from one email. Rightmost indicates group property of email and followings are sender's ID, title of email and received time. Group property has four types. 'B' for business group, 'P' for personal group, 'S' for spam and '=' for send mail. Separate pop-up window is used for writing and reading email. While writing, email user can decide whether to include emotional information in mail or not since in some case emotion data could make awkward situation. Also receiver could choose viewing mode between emotional mode and normal mode. In both situation emotion mode is set as a default. Checkbox to decide write or read email with emotional information is provided in both situation. In @mail reading mode user

can decide group property of email. Property information showed in rightmost column of list view is decided using this radio checks. User could change this property every time he/she reads email. In default every email received is checked as personal.

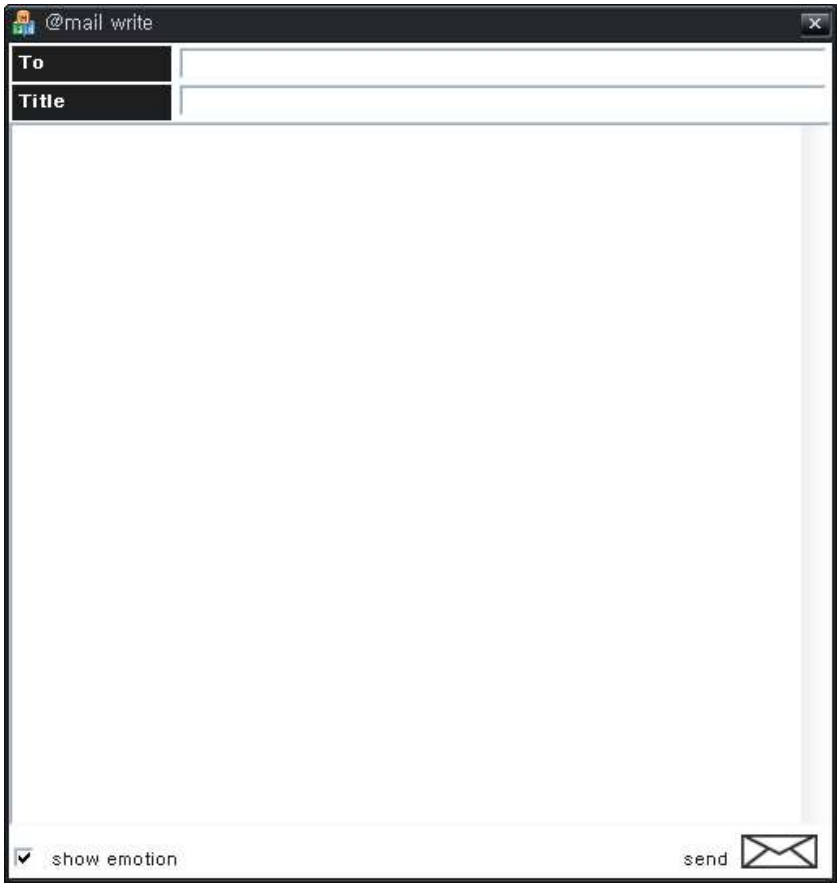

Figure 29 @mail writing dialog

Figure 30 @mail reading dialog

Second view mode, the life log view shows totally different layout compared to list view mode. This view will call as pattern view. Basic theme of this mode is to show life log visualization proposed in 3.2.3. in software platform.

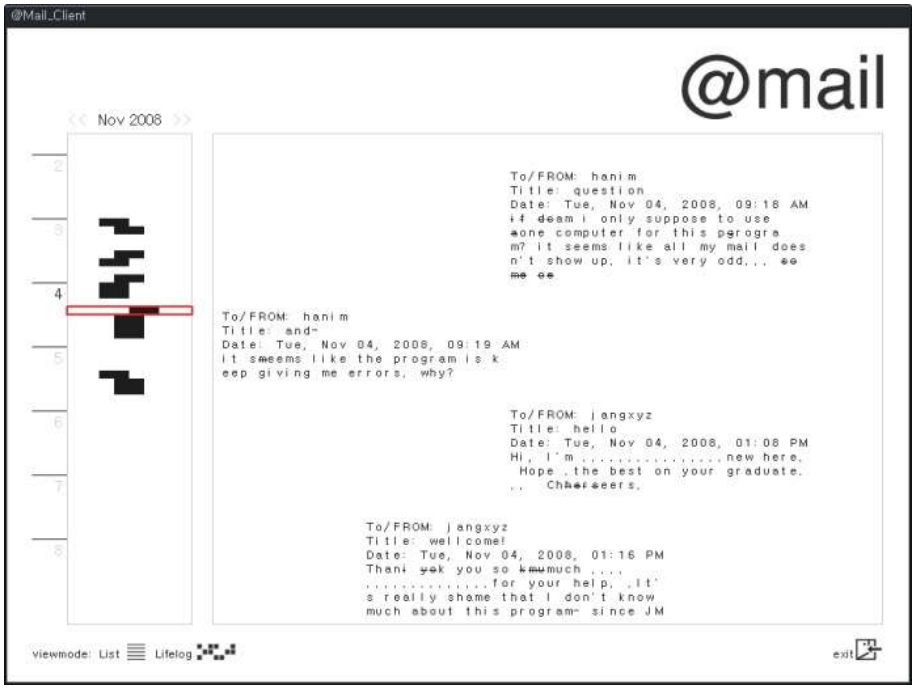

Figure 31 Life log pattern view mode

As the length of life log is too long to be navigated at once it is chopped according to time. User could choose between weekly view, monthly view and yearly view. To inform user where he/she is currently navigating mini map of life log pattern is displayed on the left side. This mini map shows approximation of actually pattern that user could roughly guess pattern. The pattern appears in here could be act as fingerprint of person's life log.

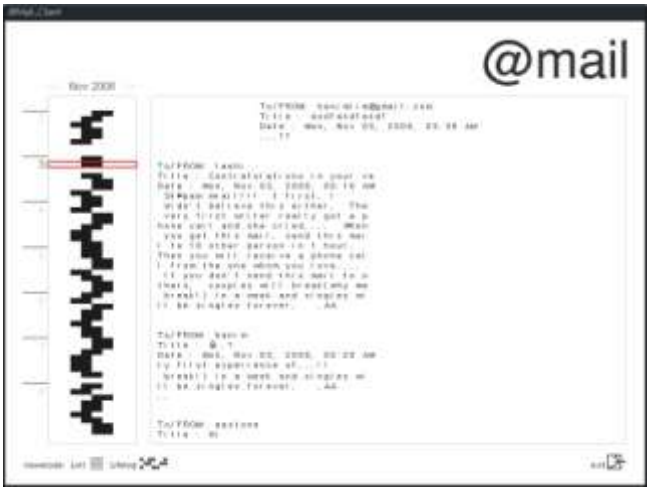

Figure 32 Life log pattern A

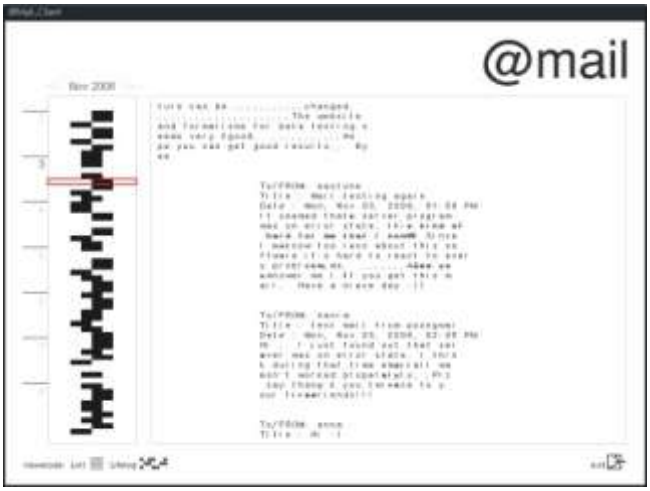

Figure 33 Life log pattern B

3.2.5. Hardware development

Hardware for @mail is basically a printer for printing life log. The act of printing digital file has symbolic meaning of making digital thing analog. The significance of hardware part lies on underlying meaning rather than functionality. Primary objective of hardware part is to deliver analog mood to

user. Simple printer might work fine but to maximize the emotional effect typewriter is used to implement printing mechanism.

Typewriter often used in many other projects for similar reason. Traditional mechanical typewriter is icon of retro mood. Although in functional point of view typewriter is less than useless because of PC many people- from DIY to media art work- uses it just to enjoy its retro mood. It is not hard to find DIY manual to hack PC keyboard to make typewriter as an input device. [1]

Figure 34 DIY example of haking PC keyboard to make typewriter keyboard

[1] One typical example of instruction for making typewriter keyboard could be found in following link. http://www.instructables.com/id/Typewriter-Computer-Keyboard/

Mostly these DIY activities are for fun. 22pop email typewriter for luddites[2] made in 2003. This thesis project was inspired by the creator's mother, who suffered great frustration with e-mail and using a computer. Using predefined email layout user could actually send email by typing hacked mechanical typewriter. The significance of this project does not lie on functionality. Translating digital culture to people who are not familiar with technology by creating analogic machine is the important fact. Although function of the hardware is exactly opposite of @mail, the reason of using mechanical typewriter is very similar.

Figure 35 22pop email typewriter for luddites

[2] Creator's original web site is currently not available. Following link provides most prevalent information about this project. http://gizmodo.com/gadgets/hard-copy/22-pop-email-typewriter-for-luddites-283124.php

Mechanical typewriter appeared in media art often act as interface of abstract data world and real world.

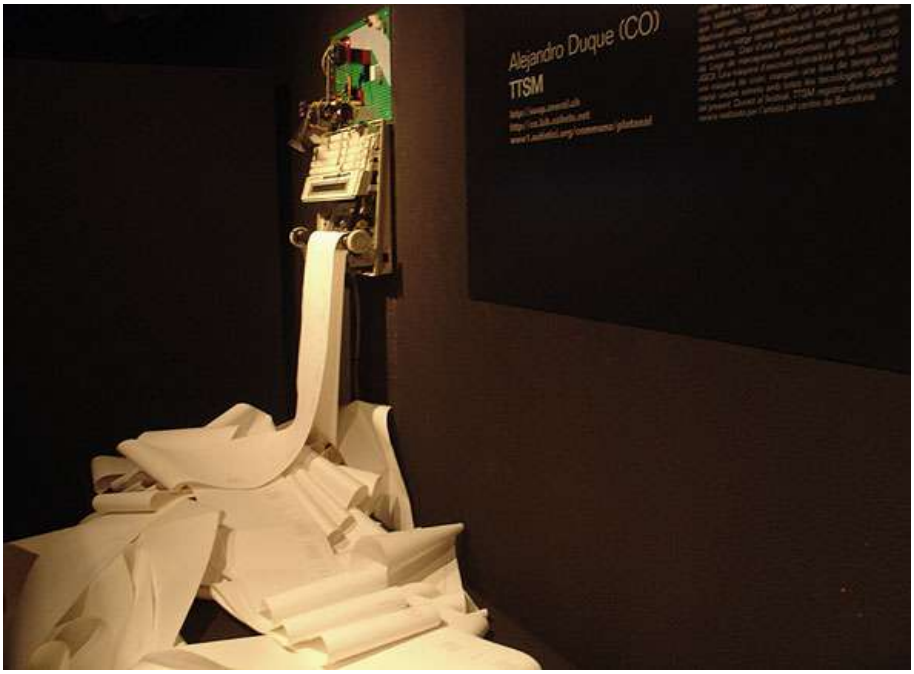

Figure 36 GPS 2 OSC in sonar (electronic music festival - barcelona)

Installation work shown in Fig. 36 uses typewriter for 're-creating a tracklog that comes from digital realms straight to the imprint of ink and paper-the old analogic way'[3]. Strictly speaking, the output of typewriter is not an analog machine. It is rather close to the concept of digital. Typed letters are standardized and appeared in strict order. However the movement of type hammer clearly shows people how each letter is printed that most people conceives it as an analog printing object.

In this design development project electronic typewriter is hacked to get input from software part of @mail. User can connect this device to their own computer

[3] http://soup.znerol.ch/en/node/64

to get their life log in their hands. At initial stage traditional mechanical typewriter is considered as a printing device. While developing hardware it is found out that too much additional devices are needed to use mechanical typewriter. Not only big the device will get but also implementing complexity rises steeply. Art work using mechanical typewriter with similar visual could be found in works by Meiwa denki (土佐 正道, 1997).

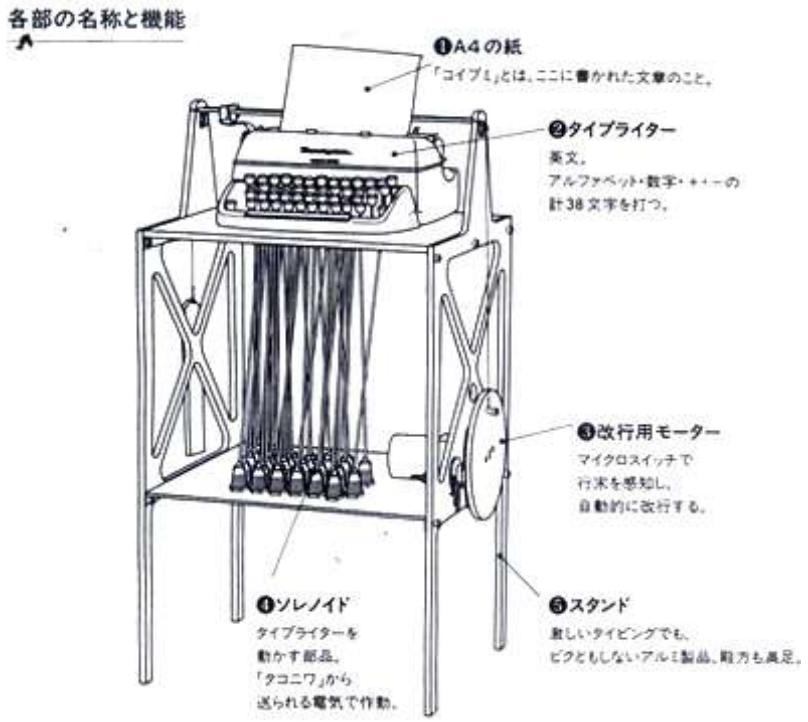

Figure 37 Koibumi by Meiwa Denki

This work Koibumi used dozens of solenoids to make a keystroke. Since mechanical typewriter needs strong impact to type letter on the paper it is hard to find appropriate actuator other than solenoids. As a result overall height of design reaches almost 1m high. To reduce all these burden @mail chose electronic typewriter which has much smaller module to make a keystroke. As shown in

Figure 38 Initial plan of @mail

figure 23, initial idea of @mail also needed big stand to make a room for controlling device like Koibumi. Not like Koibumi @mail needs to type accurate words every key needs separate actuator so actual space needed is larger than Koibumi. Typewriter has roughly more than 40 keys that @mail supposed to need 40 solenoid valves to control every key. It is almost impossible to make it in separate compact device. Another problem is length of solenoids. Length to push key to make a key stroke is almost 10cm long. Manufactured solenoids in market don’t satisfy this spec that custom made solenoids are needed and that increases manufacturing time and cost. Electronic typewriter has very compact typewriter hammer unit showing very similar visual effect compared to mechanical

typewriter which could be controlled in electronic way that in many aspects it was better choice than mechanical typewriter.

Figure 39 Original form of typewriter TQ-12A

Figure 40 Typewriter hammer module of TQ-12A

As keyboard unit in not necessary paper feeding and writing unit only appear on the @mail printer. Original casing of electronic typewriter turned out to be bulky and not familiar to people as a typewriter. (Figure 28)

Since user group of electronic typewriter was narrow and it stayed in market only brief time because of introduction of PC, few people recognized it as a typewriter. By this reason @mail gets rid of cover of typewriter and emphasize typewriter-ish mood by revealing keystroke mechanism barely. Hardware is composed of typewriter unit and paper feeding unit. The dilemma of using electronic typewriter is although it is more compact as a device it lacks strong stench of analog mood of mechanical typewriter. To overcome this dilemma @mail stand is made of wood which is most typical natural material representing warmth.

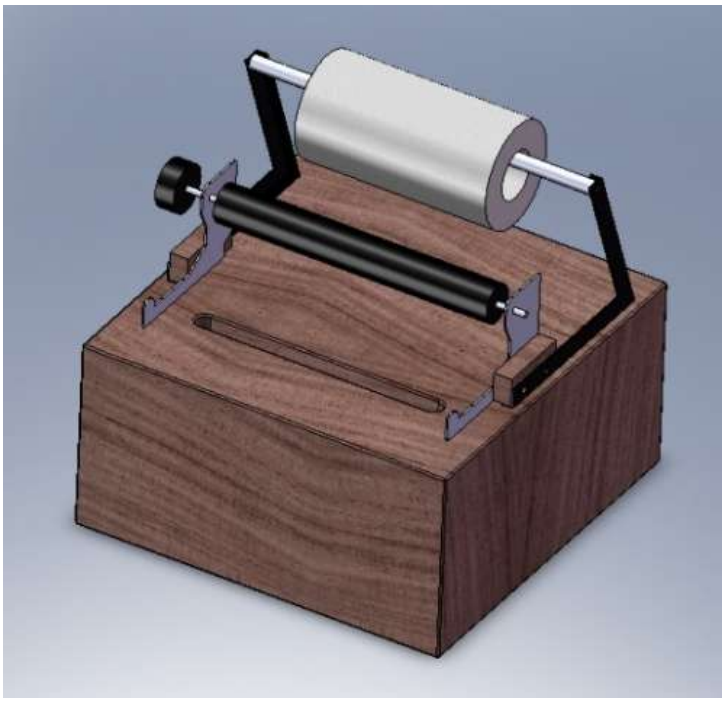

Figure 41 Rendered image of @mail system

As a conclusion overall system structure looks as follows. @mail server services multiple clients while each client could use @mail printer separately.

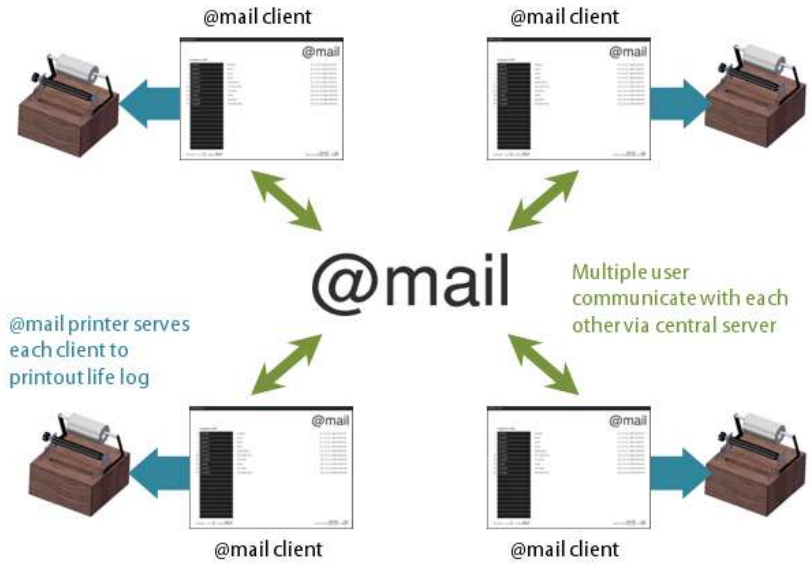

Figure 42 Overall system of @mail

3.3. Implementation detail description

@mail system is realized with help of two engineers from KAIST. Email system used for @mail is entirely custom made. @mail software system is composed of software for server and client. Basic scheme of @mail system is similar to conventional email system. Unique part is about recording user behavior while writing email. When user starts to write down text @mail editor tracks text input from user. Email is an asynchronous communication which is not simultaneous and only text data could be delivered. Tricky part was to remember deleting and rewriting behavior in right order in this restricted environment. Users don't write down text in neat sequential manner. Sometimes they add sentences in the middle of paragraph or delete sentences from anywhere. By this reason several detailed

rules about remembering and restructuring email had to be decided while developing software. When reconstructing emotion information deleted strings are appeared with cancellation line independent to deleting point of time. Sentences or words squeezed in the middle of others will appear in timely order in text with emotional information. In view mode with emotional information text from user appears sequentially according to time. Following sample sentence will help understanding.

Normal view mode:
Dear Susan. It is lovely to see you again. Saturday will good for me.
Take care.

View mode with emotional information:
Dear Susan. Saturday will good for me. Take care. It is lovely to see you again.

Although final form of email intentioned by user appears life first one, in view mode with emotional information sentences will appear as second one, which exactly follows input order from user.
Original rule of pause was simply putting blank spaces per certain amount of time. While developing it was turned out that if there is too much empty time between two sentences -in the case like user does other thing between writing email- expressing it honestly will make final form of confusing. Huge blank between each sentence might lead misunderstanding that original paragraph as a two separate paragraph.

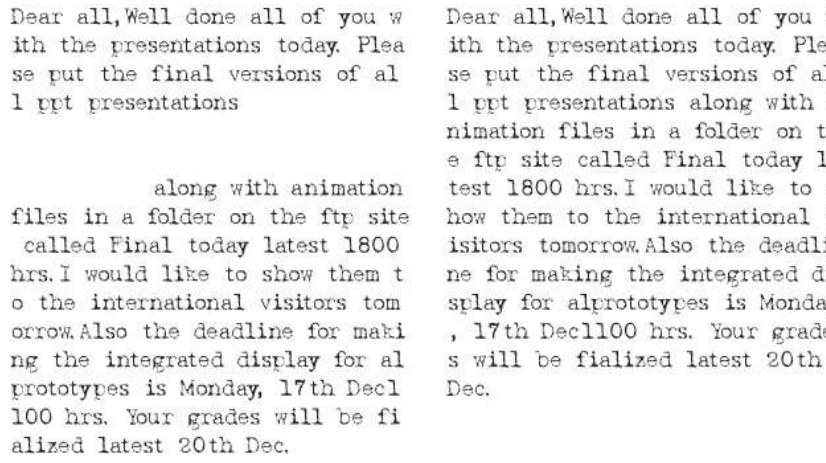

Figure 43 Same paragraph with and without blank paragraph

To deal with this problem if blank input takes more than ** characters than it will replace with '[...]'. Following is an example of this scheme.

From : Raghu Kolli (raghu@kaist.ac.kr) Date : 12/5/07 Subject : id504 New deadlines Body : Dear all, [...] I understand you all are working hard. without sleep.

Two layers of data files are recorded to track emotional information. Every step user type's data @mail composer saves plain text also with file with emotional information. Emotion tracking algorithm and structure had been keep developed through beta testing. Starting from version 1.0 version 1.4 had developed during field testing. Details of version history look as follows.

Ver. 1.1 Email- only version for user testing.
Ver. 1.2 Some bugs caused by large text data fixed.
Blank mail case solved.
Ver. 1.3 Changed internal data system of emotion files of @mail.
Ver. 1.4 Printing function added

Figure 44 Keyboard unit and typewriter hammer unit of TA12A

Electronic typewriter used in this project is model TQ12A from Samsung. It is composed of printing unit composed of type hammer and paper feeding roll, keyboard with flexible PCB composed of piezoelectric elements and central controlling circuit unit. User stroke is captured by keyboard and electronic signal is made from piezoelectric element under it. Using this signal, central unit moves appropriate typewriter hammer. To implement @mail signal patterns exchanged between keyboard unit and central controlling unit are captured and analyzed. To make typewriter to communicate with PC new custom made control unit is used. This sub system translated signals between PC and typewriter using serial communication. Arduino board (Arduio) is used as a part of sub system.

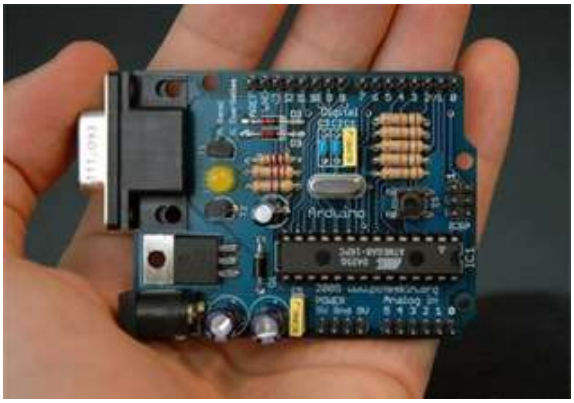

Figure 45 Aurduino board

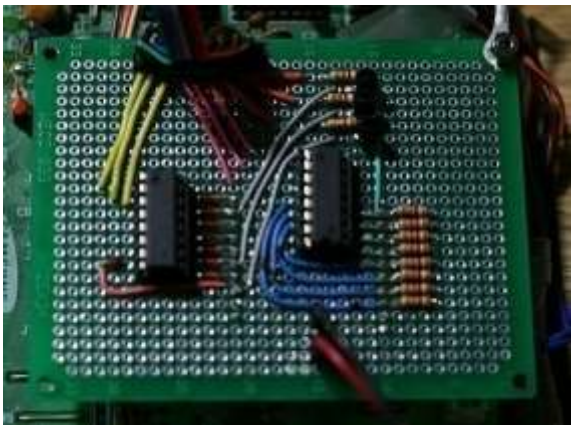

Figure 46 Custom made control board for @mail

Figure 47 Circuit board for controlling keyboard

Final form of @mail printer is composed of box stand described in chapter 3.2.4., typewriter unit and paper hanger. Life log of @mail is in vertical format paper roll is used for printing. All circuit units are hided inside the stand.

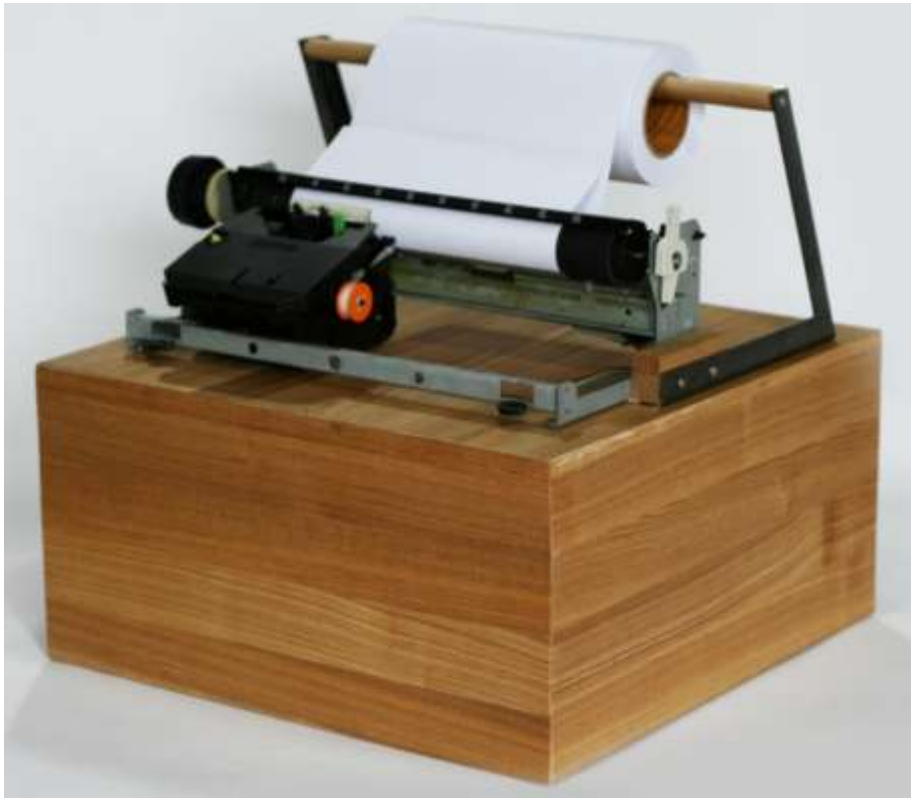

Figure 48 Working prototype of @mail hardware

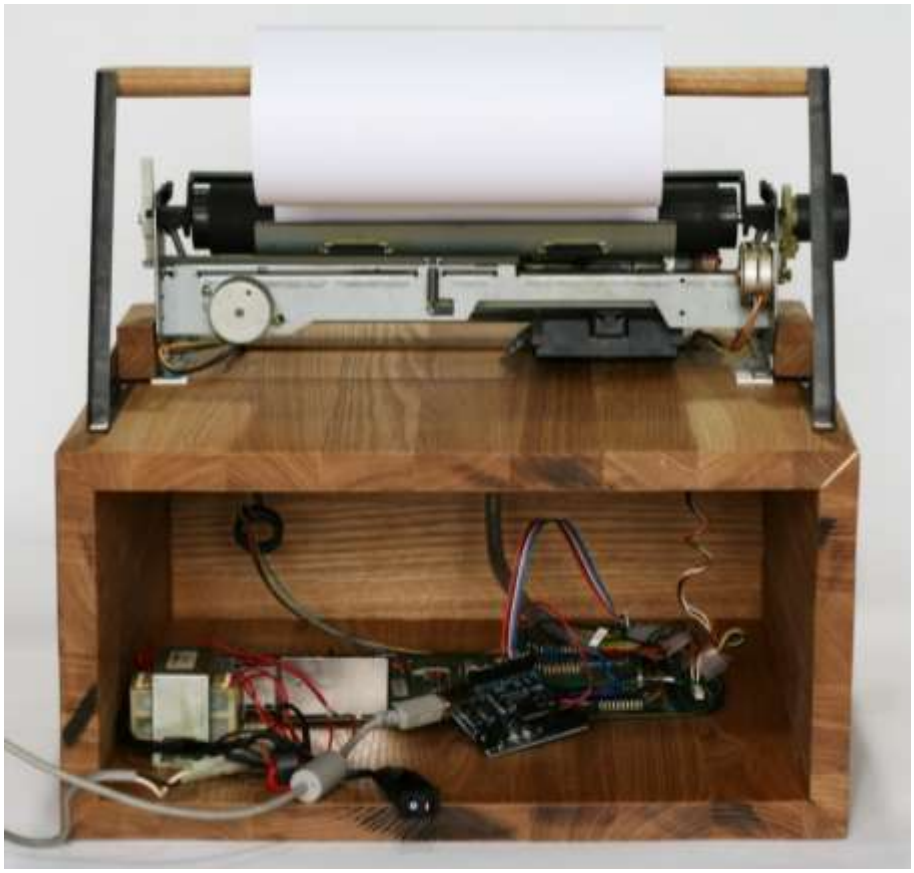

Figure 49 Back view of @mail hardware

IV

4. @mail study

4.1. Field trial using software UI
4.2. Field trial with typewriter

4. @mail study

To evaluate @mail two sets of field trial has done. First part is field test using @mail software client and second part is field test using hardware component. Simple questionnaire and interview had done to collect user reaction.

4.1. Field trial using software UI

@mail is distributed using web interface. This web page provides @mail software with user instructions. User can make their account via this web page.[4]

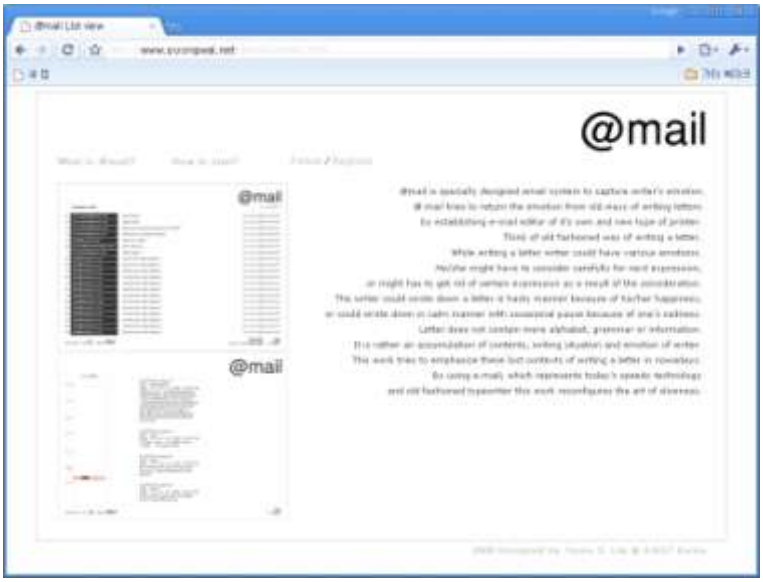

Figure 50 @mail web page screenshot

Users are asked to use @mail system at least a week with other users. After using this system more than a week, simple questionnaire is delivered to each user by email. While using @mail every user are encouraged to use Forum to give

[4] http://www.poongwai.net/@mail/whatis.html

feedback instantly. Field test started at Nov 3th and continued for a week. Since test period is short only weekly view is provided while using life log mode.
Web distribution is started after alpha test within developers. Feedbacks gathered during beta testing are used to update each version. Each version fixed problems found in previous version and updated user interface slightly. Basic concept of @mail is described in web site with step by step user manual. Users have to register for new account using ‘Register’ board on website.

	Group A	**Group B**	**Group C**
Number of participants	6	6	5
Average age	26	23	19
Group characteristics	Peer group from same university. Each member knows each other for long time. (6yr) Most members are from engineering background. Korean group.	Peer group from same university. Members from various backgrounds. American group.	Peer group from same university. Designer background. Korean group.

Table 1 Group characteristics for user testing

Usually this kind of new system needs long period- at least order of month- to evaluate properly. Since this system has developed within very limited time and resource as mentioned before, it is almost impossible to conduct perfect user evaluation with sufficient time and large amount of testers. To supplement this testers are chose carefully to get maximum user feedback. Strictly speaking user evaluation conducted for @mail is more like alpha testing than beta testing.

@mail questionnaire

1. Describe what you feel about @mail briefly.
   @mail 을 사용하면서 느낀 점을 간략히 기술 해주세요.

2. Please copy and paste two most impressive emails and describe why it is impressive.
   가장 인상에 남았던 메일 두 개를 복사해 붙여주시고 왜 그런지 설명해주세요.

3. Do you think emotional expression of @mail as useful?
   @mail 의 감성 표현 시스템이 유용하다고 생각하십니까?
   strongly agree( ) agree( ) neutral( ) disagree( ) strongly disagree( )

4. Do you think emotional expression of @mail helps understanding people?
   @mail 의 감성 표현 시스템이 상대방을 이해하는데 도움이 된다고 생각하십니까?
   strongly agree( ) agree( ) neutral( ) disagree( ) strongly disagree( )

5. Do you think emotional expression of @mail helps understanding yourself?
   @mail 의 감성 표현 시스템이 스스로를 이해하는데 도움이 된다고 생각하십니까?
   strongly agree( ) agree( ) neutral( ) disagree( ) strongly disagree( )

6. Do you think emails you received help looking back yourself?
   자신이 받아온 이메일이 스스로를 돌아보는데 도움이 되었다고 생각하십니까?
   strongly agree( ) agree( ) neutral( ) disagree( ) strongly disagree( )

7. Do you think life log view of @mail helps retrospecting your past moments?
   @mail 의 life log 모드가 지난 순간들을 돌아보는데 도움이 되었습니까?
   strongly agree( ) agree( ) neutral( ) disagree( ) strongly disagree( )

8. If possible will you use this system more?
   이 메일 시스템을 계속 사용할 의사가 있으십니까?
   strongly agree( ) agree( ) neutral( ) disagree( ) strongly disagree( )

9. If you have anything else to suggest about @mail write it here.
   @mail 에 대해서 제안하고 싶은 것이 있으시면 이곳에 기술해주세요.

Thank you for your patience. We really appreciate your help.
긴 문항 대답해주셔서 감사합니다. 실험에 참여해주셔서 감사합니다. :)

Table 2 Questionnaire contents

@mail system is made for getting user feedback about life log and emotional mail exchange is primary aim of user evaluation. As mentioned before to be focused @mail system intentionally provides limited functions. For example functions like group mailing, replying or forwarding are not implemented in @mail system. This mail system should be considered as an apparatus for testing design concept rather than final product for customers.

Users are selected and briefed about these functional constraints and asked to be focused on unique functions of @mail while using it. Beta testers are composed from three peer groups to encourage amount of communications. Basically all users' mail ID is opened in public to make complete network within all users. Three groups of beta testers are shown in table 1.

Questionnaire delivered to each user after a week of trial is composed of three descriptive questions and six questions using 5-level Likert scale. The details of questionnaire are appeared in table 2.

The result of user evaluation turned out to be in two extreme. People convinced by the concept of @mail expressed high satisfaction rate in spite of imperfection of the system. On the contrary people don't agreeing with the concept expressed highly negative reaction. The average of question 3 to 8 appears as follows but since the distribution of reaction is quite extreme this result could not be accepted as it is.

	3	**4**	**5**	**6**	**7**	**8**
Average	2.1	2.3	2.3	2.6	2.4	2.6

Table 3 Questionnaire result 3-8

User feedback from question 1 showed more insightful responds. People who showed negative attitude about @mail mainly criticized about lack of functionality. The fact that emotional view of mail was hard to recognize

intuitively caused aversion to this type of users. Since they didn't agree with the needs of emotional visualization in email, this new aspect of @mail system become tiresome but nothing. First impression of @mail is poor to these user types that they usually didn't try out @mail actively.

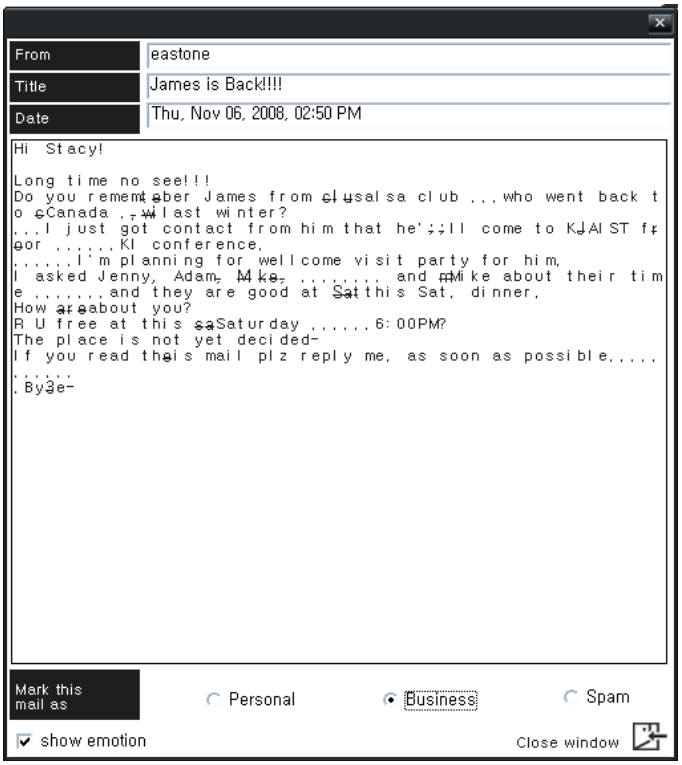

Figure 51 Sample mail with emotion information

Other major feedbacks from this user group argue about was lack of functionality compared to other mail services. They also actively report system bugs which turned out to be great helps for developing version upgrades. Some user thought emotion expressing methods using text was too dry to treat emotional issues and describe its impression as bit scary.

People showed positive attitude gave both positive and negative feedbacks. Limitation of functionality and language problem were common issues compared

to negative attitude group. Especially Korean testers had to overcome a language barrier to enjoy @mail system properly. Some users concerned that although they thought the concept of @mail is unique and good, few people will appreciate having all their errors logged and sent to their intended recipients.

Positive feedbacks are mainly about fun while exchanging emotional mail and usefulness of life log viewing function. One of users responded that showing erased contents and amount of time spend for writing each words expresses more information than expected. Especially, when if receiver knows well about sender personally, those two information and senders' personal character which receiver had been known mingles together and gives richer interpretation about mail contents. Indeed email exchanging activity appeared livelier among group A which each member are old friends of each other. This group members are know each other more than 6 years that they seemed to show lower aversion to showing emotional trace to each other. Sometimes emotion information shows copy & paste history while writing mail that richer the emotion appears (otherwise dirtier the mail appears) people accept this as a more sincere mail. Some user recalled using experience of @mail as more like 'talking' to each other than occasional email because of emotion expressing function. Although there is function to turn off emotion recording people tend to write mail in more prudence manor with that function on. Typographical error patterns distinguished each users and some user responded that she actually enjoyed finding similar error pattern among people. Also many people thought finding history of writing and deleting funny nickname during mail exchange within friends as one of most fun part using @mail.

Figure 52 Mail with correcting thinking

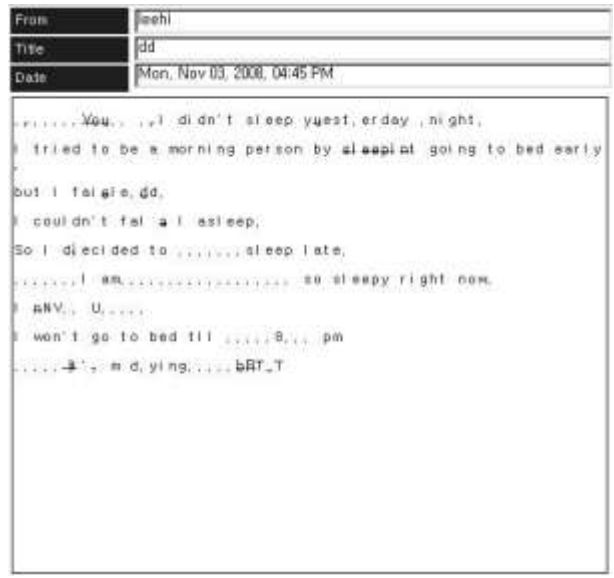

Figure 53 Mail showing writing status (sleepy)

For the life logging part, prevailing opinion was although functionality was imperfect it was great help to see one's history in big pattern in both emotionally and functionally. In general, user who used @mail more actively showed more favorable impression to life log system. Although testing period was just a week and @mail was not real email testers used for living, people liked to see short life log pattern and figuring out their activity pattern. One tester said that since there was no system to see email history like @mail does, it was fresh experience to use this function. Also time based visualizing system made him easy to track both his own history and other @mail users' history. There were also complaints about functional limitation of life log visualizing system. Current @mail system simply shows all mail history in one timeline that user's needs of grouping mails were not satisfied. One user suggested that it would be nice if there is function like viewing specific sender's pattern only. Like user could choose to see his girlfriend's mailing pattern only. As expected in developing stage many users complained about simple and limited mail grouping strategy (business, personal, spam and send).

4.2. Field trial with typewriter

Field trial for hardware was conducted for two users from beta testing. These two users were chosen because of most active mail exchanging activity they showed. Two users were asked to use print function of life log system and interviewed about their impressions about @mail printer.

Both users are impressed about design of hardware. Unique hardware form and effect using typewriter give them special experience. The word 'wonderful' or 'cool' could be best to describe their reaction. The reaction was mostly based on understanding @mail printer as an art work or some special geek tools. Tester A mentioned that relatively slow printing time compared to conventional printer

gave him time to follow printed contents simultaneously. Noisy key strokes by typewriter were irksome at first but give him more vivid feeling of amount of his life log.

Current @mail printing function prints a week amount of mails in one printing process. For tester B week amount of mails are quite large that he had to wait too long for end of printing. By this reason he suggested smaller chunk of printing unit- like days-.

Both users were curious about how they could use printed life log usefully. User A suggested personal email calendar made by printed output. Actually both users thought it was fun to see this gadget was actually working but the output was bit useless. Tester A mentioned that this hardware would be more meaningful if proper application of output material has found.

Figure 54 Printed life log

Printed life log pattern gave users more emotional sensation rather than functional persuasion. This pattern reminded them barcode or DNA pattern. Tester B was excited to see detailed email contents within global pattern. Looking at pattern was bit like looking eye spy puzzle except the fact that contents were private so only an owner could enjoy it.

V

5. Conclusion

5.1. Conclusion
5.2. Further works

5. Conclusion

5.1. Conclusion

In general terms, what all this show is that how @mail system interprets emotion in virtual data and life logging. Just accumulating pile of data can't be equal to the concept of life logging. Although definition of life log could be vary according to different scope of view there is one thing common in its spirit- record human life to give benefit to human itself. @mail system shares this spirit too. The overall significance of @mail could be stated as follows.

First, @mail system had investigated life log to respond emotional needs. In other words it approached life log in individual user's point of view.

Second, @mail system had renewed existing database as a life logging medium.

Lastly, @mail system had introduced the concept of nuance in digital text data.

As man culture became more digital every people have potential life log data. Design development issued here tried to follow that trend. In now days technological requirements for life logging is more than sufficient. New needs must be configured. Designers should flourish technological achievements with their own point of view. Life logging as a personal use- especially responding an emotional need of people- has lot more to go. It is to be hoped that this paper will contribute to that path.

5.2. Further works

Basically many convenience functions are needed to complete @mail system. Since @mail system needs unique functions compared to other email systems every detail of it has to be built up from ground level. Key concepts are maintained during development but concept itself is not enough to be useful tool

to users. For instance although simple grouping strategy doesn’t hurt key concept of categorizing life log, it turned out to be many users wanted to make their own categories. Also, it turned out to be there were several algorithmic issues that had to be handled by professional software developer. Clever and effective algorithms must be configured to capture writer’s pattern simultaneously. (Although none of beta testers noticed, there were some cases current @mail system couldn’t deal with) Current version of @mail barely implemented key functions that issues like security, efficiency or compatibility are still remained. This kind of functional immaturity will be easily overcome with sufficient development resources.

Some users want additional emotion expressing patterns other than rewrite and delay. One of the users suggested emotion expressing with changing font color. Mostly these kinds of feedbacks are resulted from previous experience of using messaging software like MSN. It is quite hard to deal with this issue. Richer the expressing method gets smaller the degree of freedom in interpreting pattern gets. This is definitely not what @mail system wants. If there are some smart algorithms which capture certain patterns of emotion automatically there could be lots of amazing functions in @mail system. For instance @mail system could automatically capture overall tone of an email and make own category to make richer life log story. Nevertheless doing this user will passively accept emotion defined by machine. Apart from a doubt about possibility of such algorithm, this neglects the concept of interpreting mail analog way. One should be very careful to define ground rules for system, especially system maintained by participation of large numbers of users. It has to be said that a week trial of this new system was not enough. Also with 17 peoples it was hard to observe enough cases. Designer could give a seed to evolve new culture but one can’t fully expect exactly what will come. Developing ground rules could be possible only after observing activity among user community. Design development recorded in this paper could be treated as a kind of working prototype of future system.

Expressing emotion – especially not intended by writer – could violate privacy issue. As concerned by one beta tester it could be possible that most people don't want to use emotion expressing function. While beta testing people showed positive attitude toward this function but will people use this function in actual emailing? Some additional filtering function could be implemented to deal with this problem. Yet it couldn't cover basic issue. To deal with this issue the original motivations of @mail has to be reconsidered. Primarily @mail was not based on functional needs of specific target user. Basically emotion expressing function of @mail stands for surplus values.

The concept of using email as a life logging medium was welcomed by many users. Similar to emotion expressing functions many users wanted more freedom organizing their own life log as mentioned in field trial part. Unlike emotion expressing function these suggestions are within range of @mail concept. Still designer have to carefully plan visualizing rules to comprehend user's desire of freedom in grouping. Number of grouping would be influence final visualization a lot. Smart algorithm has to be figured out to support it.

Lastly, just as gathered in user feedback, proper application of printed life log must be figured out. Fundamentally @mail hardware was for emphasize analog mood of @mail system. It is more like installation for emphasizing concept of @mail system than product for personal user for now. If this hardware could be synchronized with email system in real time there could be more possibilities. It is also possible that @mail hardware itself has network connection. This will significantly broaden potential of application as a product.

@mail system was an imperfect system which has lots to improve. Even though system implemented here was good enough to get user's feedback about this new concept of emotional life logging. Regarding the fact that this system responds to emotional needs which could be too subjective issue to arouse general sympathy, user evaluation of @mail showed mostly positive impressions- in other words it was quite successful than expected. However since users participated in beta test

basically accepted the fact that this system is not perfect, it is obvious that further development would be needed to satisfy user needs as a commercial mail system.
Throughout this design development life logging has been renewed in more private level. One of important facts about life logging is it should be accumulated even though user forgot about it. Practically even some mediocre email system supports life logging even though they didn't intended to do it. However if the concept of life log doesn't supported systematically, it is nothing more than piles of raw data. One of importance of @mail system is that @mail actually manifested the concept of life log to users. @mail system gave email a new name of life log. New value of email is discovered by user that from now email system could support new cultural paradigm.
New cultural paradigm @mail suggested also includes emotion expressing function. Unique point is that @mail captures unconscious activity while writing mail. As mentioned from starting point, @mail intended to revive unconscious expression melt in hand written letter in digital letter. Methods for expressing emotion are depended on designers' judgment. What @mail system defined as rules are resulted from design concept- flexibility of interpreting- it follows. Metaphor of hand written mail finalized form of emotional email. Significance of @mail is not from its details but from the spirit of it. The concept of revealing analog mood from digital existence is key point of this project. Many other methods from different metaphor or different interpretation could be possible.
@mail system presented here is a prototype representing key design concept. If further works mentioned are complimented it could be possible to serve as a commercial product.

6. 국문 요약

要 約 文

이메일 로그를 사용한 라이프 로깅을 동반한 감성적 단방향 통신 시스템

현대를 살아가는 사람들은 디지털 정보로 이루어진 가상의 세계와 현실 두 가지 세계에 걸쳐 살아간다고 할 수 있다. 이 두 가지 세계 모두 인류가 만들어 냈지만 매우 상이한 특징을 지니고 있다. 이 논문은 특별히 현대의 커뮤니케이션 문화를 초점을 맞추었다. 이메일은 커뮤니케이션 문화에서 일어난 가장 큰 패러다임의 전환이라고 볼 수 있다. 이메일은 단순히 커뮤니케이션의 속도를 빠르게 만들기만 한 것이 아니다. 현대의 사람들은 이메일을 상호 소통의 도구로 사용할 뿐 아니라 문서 보존, 문서 전달, 업무 관리, 스케쥴링 등 여러 목적으로 이용하고 있다. 자연스럽게 이메일은 한 사람의 인생의 정보가 녹아 들어가있다고 할 수 있다. 이 논문에서 최종적으로 보여주는 결과물은 @mail(엣-메일)이라는 이름으로 이메일이 작성자의 감성을 보다 효율적으로 담고 이를 이용해 라이프 로그(life log)를 만들어갈 수 있는 새로운 시도라고 할 수 있다. 본 논문에서는 라이프 로그를 다루었던 여러 시도들을 개괄적으로 살펴보고 이러한 시도들의 취약한 부분과 한계에 대해 고찰해보았다. 최종 디자인은 이러한 사례 조사를 통해 얻어진 통찰을 기반으로 아이디어를 전개해나갔다. @mail 시스템의 독특한 점은 이메일이라는 커뮤니케이션 매개체를 이용해 인생의 기록을 쌓아나간다는 것이라 할 수 있다. 특별히 감성적인 표현을 위해 이메일에는 작성자의 감성을 추측할 수 있는 기능이 포함되어 있다. @mail 은 소프트웨어와 하드웨어 두 부분으로 이루어져 있다. 특별히 고안된 소프트웨어는 @mail 만의 여러 기능을 담고 있으며 이런 감성을 유지하고 보다 강조하기 위한 전자 타자기를 이용해 구현된 @mail 만의 출력 하드웨어가 개발되었다. 디자인 개발 과정 동안 아날로그 감성을 구현한다는 큰 주제를 내걸고 진행하였다. 최종적인 개발 작품은 소프트웨어, 하드웨어 각각 따로 인터뷰와 설문조사를 병행한 사용자 평가를 진행해 사용자들의 반응을 이해하고자 하였다.

A

A. References

A. References

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대학시절 내내 – 학부시절부터 이 작품 논문이 만들어지는 그 순간까지 – 정신적으로도 물질적으로도 언제나 큰 힘이 되어주었던 소중한 친구들 혜인, 재민, 희진, 상하에게 마음을 담아 감사를.

마지막으로 한결같이 든든한 조력자로서 많은 조언과 격려로 이 논문의 모든 것들을 함께 한 동일에게 미흡하나마 온전히 이 논문을 바칩니다.

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