Memory of Firsts: Exploring How We Recall Earliest Memories Across Six Basic Emotions

Melissa Niu, Jenny Ye
Harvard School of Engineering and Applied Sciences
33 Oxford St., Cambridge, MA 02138, USA
{melissa, jennyye}@seas.harvard.edu

ABSTRACT
What are your earliest memories and when and where did they occur? This is the question that motivated our study and was eventually what we asked our users.

We created *Memory of Firsts*, an interface to collect earliest memories across six basic emotions and an accompanying data visualization that allows visitors explore memories submitted by others and discover trends. We found that users remember events that occurred earlier for certain emotions (e.g. happiness and surprise) and later for others (e.g. fear and disgust). Certain emotions are correlated - an earlier memory of anger likely predicts and an earlier memory of happiness.The content of submitted memories also offered a look into the types of memories we know to be our earliest experience of a certain emotion. To what extent do these memories define our understanding of specific emotions?

We see *Memory of Firsts* as a journey that spans crowdsourcing, psychology, self-understanding, and data visualization. We hope that this serves as a foundation for more creative exploration and analysis of memory and emotion.

ACM Classification: H5.2 Information interfaces and presentation: User Interfaces, H.4.m Information Systems: Miscellaneous

General terms: Design, Human Factors

Keywords: Autobiographical Memory, Emotions, Art, Visualizations, Psychology

INTRODUCTION
We are fascinated by the study of how and what we remember, especially as it pertains to our own lives. In psychology this is the field of autobiographical memory. A lot of research has been done on earliest memories, beginning with findings in 1994 that the age of earliest memory is correlated to birth order, sex, and race. Through interviews, researchers discovered that subjects with earlier first memories had more interaction with their parents at a younger age, and were socialized so that personal history was important to the development of self-concept [7]. Our culture influences how far back we remember and how we remember.

In addition to culture, emotion influences our autobiographical memory. The emotional content of an experience affects how we remember it, and our emotions at the time of retrieval affects how the memory is recalled [4]. In any research dealing with autobiographical memory, we must be cognizant of emotions along with culture.

In this project we hope to investigate the correlation between the age of earliest memories associated with particular emotions. We want to collect earliest memories associated with the the six basic emotions identified by psychologist Paul Ekman (anger, disgust, fear, happiness, sadness and surprise). By collecting these memories along with a persons age, gender, location (optional) and ethnicity (optional)–we hope to build a valuable dataset upon which to create visualizations and opportunities for analysis. There has been research done on earliest memories and emotional memories, but almost none at the intersection. What is effect of the type of emotional memory and the age of the earliest memory? If a person has a comparatively early memory associated with one emotion, is that correlated to the age of the earliest memories of other emotions? Are certain basic emotions more memorable than others?

Existent earliest memory projects dont involve a visualization or qualitative/statistical component. (*We Feel Fine* is an example of a web project that includes qualitative and statistical analysis, but focuses on crawling the web for emotions rather than asking new users to record memories. We take inspiration from the presentation of and research conducted in *We Feel Fine*) [5]. Through *Memory of Firsts* we hope to take a snapshot of how people remember their first experiences across different emotions. Because our goal is to reach as many people as possible, across age and culture, we hope to present an interactive way for users to explore the memories of other people, and discover patterns. Ultimately, our project will combine psychology, crowdsourcing and data visualization.

RELATED WORKS
Research on autobiographical memory made a huge leap in 1994 with the finding that that the age of earliest memory is correlated to birth order, sex, and race [7]. Emotion and autobiographical memory are linked. The emotional content of

UIST'12, October 7-10, 2012, Cambridge, MA, USA.

an experience affects how we remember it, and our emotions at the time of retrieval affects how the memory is recalled [4]. Research has also been done on the effect of long term (digital) personal memory archives as a tool for enhancing memory [1].

Crowdsourced memory projects are not new. After September 11, the September 11 archive was created to record memories from the day and has been included in the Library of Congress [8]. Organizations crowdsource memories as well - Mozilla created the Memory Bank, which focuses on cataloging users experience. Their motto is saving the history of Firefox, Thunderbird, and the entire Mozilla community [6].

The way that memories are organized is also a salient research topic. Researchers have found that personal primes like lifetime periods (e.g. school days) elicit more vivid memories than specific events (like holiday in Italy) [2].

We have platforms to share memories and emotions online and theres demonstrated potential in visualizing some of this using technology. We Feel Fine crawls the Internet to looks at mentions of feelings, and provides a platform to visualize and analyze the data [5]. In our research we hope to add to the field of memory visualization in addition to the study of emotion and autobiographical memory.

METHOD

Memory of Firsts is a two-fold project which involves collecting a set of earliest emotion-triggered memories from online users worldwide followed by an interactive visualization of the memories.

Collecting Data

n the data collection portion of *Memory of Firsts*, users were presented first with a brief introduction to the project as well as an notice that their memories will be published publically in our interface. So as not to bias users before they submit memories, we omitted our true purpose of hoping to discover patterns between emotion and age of earliest memory and instead presented simply that this was to contribute to an aggregation of memories. For each contributor, we collected the following demographic information about them: Age, Gender, Ethnicity (optional) and Location (optional). This information was used to not only categorize users into their age and location specific categories for filtering, but also to attempt to associate them with certain cultures (which we know affects memory age). After submitting their demographic information, users were shown a screen with six large buttons, each with one of the basic emotions. The order of the buttons was randomized to control for any biases that display order could create.

Once a button is clicked, the user is asked to share their earliest memory associated with a certain emotion. For example, a user might be asked Please share your earliest memory of feeling anger. Every memory was limited to 500 characters both to suggest to users that they were not required to submit long responses and also to ensure that long responses would not overcomplicate the visualization process. Users were also asked to share the age, and location (optional) in which a certain memory occurred. Each submitted memory is associated with the user id given after the demographic information page, so even if users leave the site after completing fewer than six memories, all of the necessary information is collected.

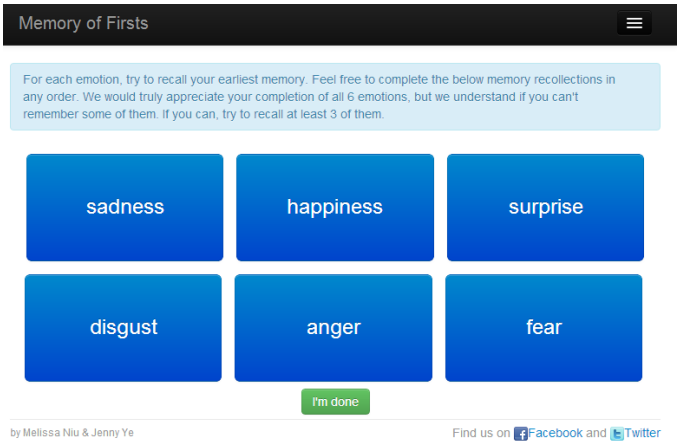

Figure 1: User submission buttons. Each button refers to an input dialogue where users can submt their memory

Soliciting Contributors

The main venues through which *Memory of Firsts* was publicized was by word of mouth and social media platforms such as Facebook (https://www.facebook.com/MemoryOfFirsts) and Twitter (https://twitter.com/memoryoffirsts). Upon submission of memories, users were able to then share the site on Facebook or compose a Tweet that automatically tags us in order to help promote the site and project.

RESULTS

54 unique users (35 female, 15 male, 2 other, 2 unidentified) submitted a total of 190 memories for our experiment. The average age was 21.1, with a standard deviation of 2.9 years. The youngest participant was 18 and the oldest participant was 36.

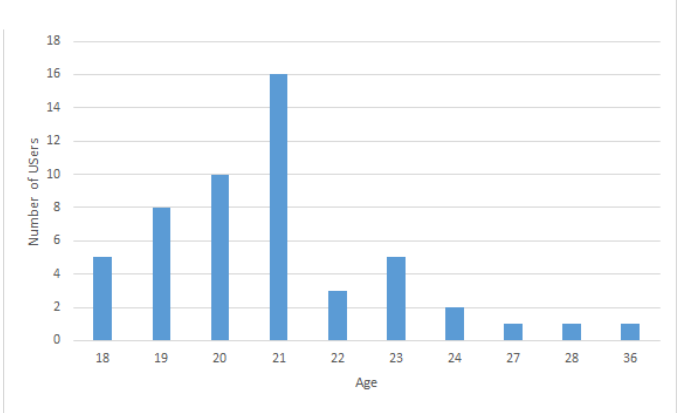

Figure 2: Distribution of age of contributers

The average age of earliest memories across emotions, from earliest to latest, is:

Emotion	Average Age $\pm$ SD
happiness	4 ± 1.9
surprise	4.5 ± 1.5
fear	4.6 ± 1.8
sadness	5 ± 2.2
anger	5.2 ± 2.2
disgust	6 ± 2.7

Table 1: Average age of memories by emotion

The entire collection of memories was distributed across many ages as follows:

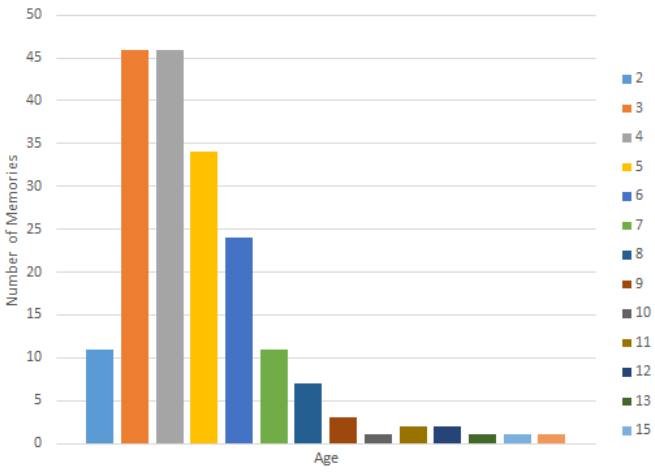

Figure 3: Distribution of age of memories

Analyzing Correlations Between Age and Emotions

Since we did not require users to submit memories related to all six emotions, most users (45 of 54) submitted between one and five memories. Of our 54 users, 30 submitted a memory of being angry, 17 submitted a memory of being disgusted, 42 submitted a memory of being fearful, 44 submitted a memory of being happy, 32 submitted a memory of being sad, and 23 submitted a memory of being surprised.

Using STATA, we plotted each pair of emotions to look for correlations.

	disgust	fear	happiness	sadness	surprise
anger	13 obs, p=0.680	24 obs, p=0.105	25 obs, p=0.003	23 obs, p=0.096	15 obs, p=0.011
disgust		16 obs, p=0.594	12 obs, p=.705	13 obs, p=0.656	12 obs, p=0.343
fear			35 obs, p=0.169	28 obs, p=0.001	19 obs, p=0.057
happiness				29 obs, p=0.296	20 obs, p=0.205
sadness					14 obs, p=0.164

Table 2: Correlation of emotions

Of these pairs, there are two that have significant correlation: 1) anger and happiness (25 observations, p value = 0.003)

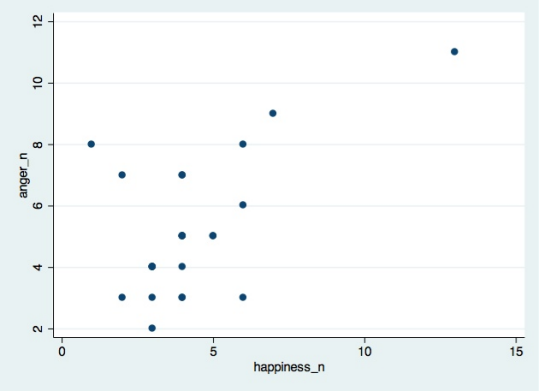

Figure 4: Scatter plot of anger vs. happiness

2) fear and sadness (28 observations, p value = 0.001)

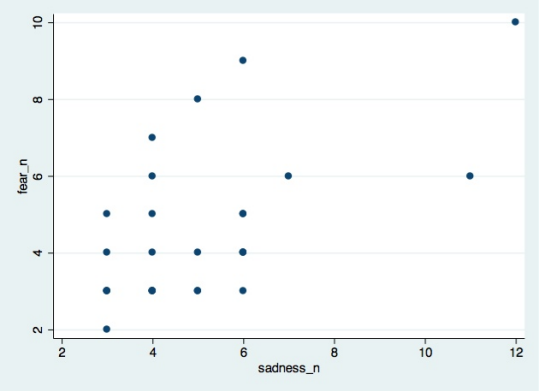

Figure 5: Scatter plot of fear vs. sadness

Analyzing Contents of Memories

It is also interesting to analyze the content of the submitted memories across emotions. As can be expected, many of the memories submitted had to do with parents or siblings. Across several emotions, we discovered some patterns that could be the foundation for further investigation.

Anger For memories associated with anger, almost every submission concerned being angry with a particular person. The two exceptions (This is my earliest memory of all. I woke up in the middle of the night (in my crib), stood up, and started screaming until I woke my dad up and he came into my room to comfort me. and Watching the movie James and the Giant Peach) involve being angry about something that happened during sleep and the other being angry at something in a movie.

Fear In looking at the memories associated with fear, we can distinguish between fears of things that have already happened (i.e. an injury) or things that may happen (i.e. parents not making it to pick up a child from school.). Of the 42 submitted memories associated with fear, only 7 concerned

events that could happen in the future. These people were afraid of possible events that included going to the doctor and being attacked by an animal during a camping trip.

Interestingly, anger and fear are two emotions that appear to be significant in the quantitative and qualitative analysis. With more data points, we could better test their significance.

VISUALIZATION

After data collection, the memories were compiled together in an interactive visualization. Each memory is shown as a floating sphere where the size is correlated to the current age of the user; larger spheres represent older contributors and smaller spheres younger ones. The colors are representative of the emotion the memory correlates to–happiness, sadness, anger, disgust, surprise, and fear being represented by yellow, blue, red, green, purple, and orange respectively. Each memory is allowed freedom to move both vertically and horizontally, but the movement is constrained horizontally by the age in which the memory occured; earlier memories are further to the left while older memories are along the right side.

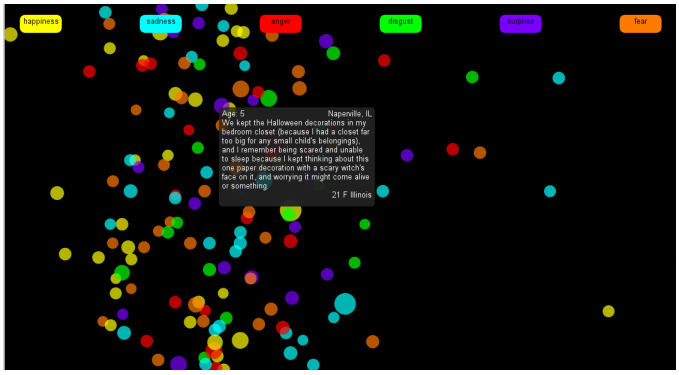

Figure 6: Final visualization showing all submitted memories. Each bubble represents a user's memory, with colors representing the emotion, the size representing the user's current age, and the horizontal placement representing age at time of memory

To make the visualization more interactive, the user can engage with the memories by hovering over any sphere to freeze the sphere and activate a text panel which describes the age and location (if given) of the memory, the memory itself, and the age, gender, and location (if given) of the contributor. To filter memories, any of the emotion buttons at the top will show/hide memories of the given emotion.

Like *I Want You to Want Me*, we hope for the *Memory of Firsts* visualization to be a mirror for users to discover similarities across experiences and hopefully better understand or recall their own earliest memories. We hope to engage this project with Harvards Arts First weekend audience as a demonstration of the intersection between crowdsourcing, psychology and art.

DISCUSSION

Though we had 54 users submit memories, our interface distributed a total of 160 user ids, indicating that a significant number of visitors who began our experiment did not

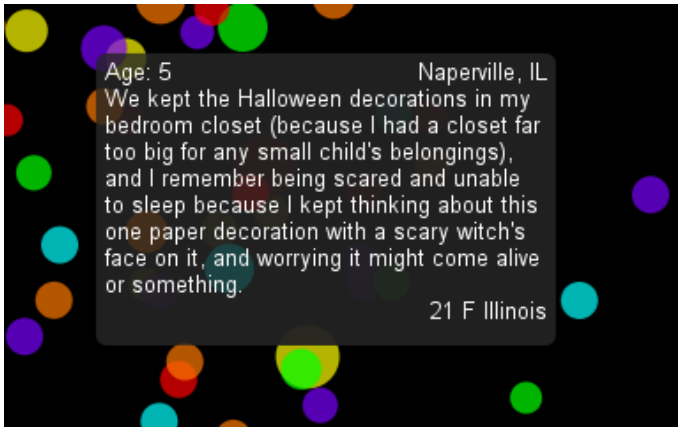

Figure 7: Text showing information on a memory. Each bubble contains the age and location of the memory, the memory itself, and demographic information of the user

complete it. Our interface collected demographic information from users first, and then prompted for memories. We considered switching the order in which we asked for information when we began to notice the stark drop off in users, but we wanted to remain consistent with our initial format. Despite our efforts to reach to a diverse audience across age, an overwhelming majority of our users were around 21 years old, most likely because our networks are dominated by college-aged individuals. If we were able to get a more diverse audience, it would be more important to continue collecting demographic information in the way that we are currently because we want to make sure that if user leave the page after submitting fewer than six memories, we already have their information for analysis.

Our results offer many opportunities for further research.

One direction we could explore is the relationship between earliest memories and current experiences of basic emotions. Ekman says that our appraisal of a current event is influenced by our ancestral past. [**?**] What made us angry when we were young? What makes us angry now? How does this difference affect the way people recall memories when thinking about such memories? This difference could explain the way in which people reflect upon their early memories and why certain memories might come to mind more concretely than others.

There are also several ways we foresee augmenting our visualization. One way is add a search function for key terms mentioned in memories. In line with our hope for *Memory of Firsts* to be a mirror for visitors, there is an opportunity to facilitate greater discovery and connection between new users and past visitors. Furthermore, given that many users supplied their locations despite it not being required, we can investigate location based correlations and visualizations as well.

CONCLUSION

This study represents our initials steps in studying earliest memories across basic emotions. We were able to fulfil-

l our expected contributions - we collected earliest memories across the six basic emotions, discovered correlations between the age in which certain emotions become memorable, and developed a visualization for users to explore memories across different variables.

Our next steps include continuing on our visualization, collecting more data and looking for ways to engage more users across ages (through ArtsFirst and other opportunities). When we began, we did not find previous studies on earliest memories and emotions. We hope that our findings offer an initial look into where this research could go and some potential applications for visualizing memories across several variables. Most importantly, we hope that our project helped users better recall their earliest memories and generates interest in exploring earliest memories in search of patterns and understanding of how memory works.

ACKNOWLEDGMENTS

The authors thank the generosity of our friends, Facebook friends, Twitter followers and everyone in Computer Science 279 for contributing memories and also letting their networks know about our project. We are also very thankful for the feedback and instruction weve received along the way.

REFERENCES

1. Chen, Y. and Jones, G. Augmenting human memory using personal lifelogs. In *Proceedings of the 1st Augmented Human International Conference (AH '10).* ACM, New York, NY, 2010.
2. Conway, M. and Bekerian, D. Organization in autobiographical memory. *Memory & Cognition, 15*, MRC Applied Psychology Unit, Cambridge, England, 1987, 119-132.
3. Ekman, Paul. An Argument for Basic Emotions. *Cognition and Emotion, 6* 1992, 169-200.
4. Holland, A. and Kensinger, E. Emotion and autobiographical memory. *Physics of Life Reviews, 7,* 2010, 88-131.
5. Kamvar, S. and Harris, J. We feel fine and searching the emotional web. In *Proceedings of WSDM-2011.* ACM, Hong Kong, China. 2011.
6. Mozilla Digital Memory Bank. Mozilla Foundation and Center for History and New Media at George Mason University, 2006.
7. Mullen, M. K. Earliest recollections of childhood: a demographic analysis. *Cognition, 52,* 1994, 55-59.
8. September 11 Digital Archive. Center for History and New Media and American Social History Project/Center for Media and Learning. 2002.
9. Yang, I. and Eastman, C. Human autobiographic memory simulation. In *Proceedings of the 1988 ACM sixteenth annual conference on Computer science (CSC '88).* ACM, New York, NY, 1988.