Device Assisted Creation of Semantic Associations to Improve Recall of Proper Names

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ABSTRACT
This paper explores the value of context at the time of meeting a new person, and how it can be applied to helping commit their name to memory. Smartphone technology provides an easy way to gather this contextual information, and decades of memory research lay out techniques that can leverage context to better remember faces and names. The primary technique explored was the creation of semantic, or meaningful, associations between two relevant pieces of information, in this case the context of a meeting, and the person that was met.

Author Keywords
Memory; faces; names; context; semantic associations; digital notes; smartphones.

INTRODUCTION

Remembering the names of unfamiliar people can be a struggle, especially for a young person starting their career who is already flooded with new information on a daily basis. There has been much research done on the difficulty of recalling face-name pairs, showing why a person's face can feel so familiar, while their name is completely forgotten. In the workplace, this disparity can lead to awkward second meetings, or avoidance of new people and situations.

Smartphones are a common, but impressive piece of technology in the modern workplace. Not only do these devices keep people connected to each other and to their personal data on the go, they can provide information about a person's surroundings, such as their location, the time, and the current weather. When a device with these capabilities can also be used to take notes, including the name of someone you just met, why not attach this wealth of contextual information to the note?

This project didn't set out to reveal, or invent, a completely new technique for creating long-term memories. Instead, the goal of this research was to reduce the cognitive load that comes with remembering the names of new people by combining smartphone technology with proven memory techniques in the area of semantic associations. The approach centered on efficiency in a busy environment by lowering the setup time required by a user.

In the decades that memory has been researched, it has been shown that forming semantic, or meaningful, associations between two things is a powerful way to improve recall. The aim of this project was to explore what types of semantic associations a smartphone can provide that will help someone better remember the names and faces of people that they meet throughout the day. The experiment attempted to simulate these meetings in a simplified way, while also allowing the subject to form associations between names and the context of the event.

An iPhone was used during this study, but any phone with similar capabilities could be used to replicate it. For the concept to work in reality, certain information must be available to the device at the moment of entering a new name, including the current time, the user's location, and their schedule. Furthermore, a smartphone is a good fit since phones are typically carried with a person for quick, easy access, making them ideal for use in short bursts. Having the device readily available is important for avoiding the decline of memory retention, often called the "forgetting curve", and for quickly entering the name to be recalled.

RELATED WORK

This project relates to prior research in a variety of ways. Some of the related material has a focus on using mobile devices as a memory aid for general information, while other research sheds light on specific techniques geared toward remembering faces and names.

Semantic Associations

It has been shown that names naturally possess fewer semantic associations than something more meaningful, like a person's occupation [1]. This is due to occupations possessing previously defined meanings, while names are essentially meaningless. The "Baker-baker paradox" shows that when a person's name is the same word as their occupation (e.g. Mr. Baker, who is a baker), the occupation is still more easily remembered than the name [9].

In short, the meaningfulness of an item has a strong effect on how easy it is to recall. Cohen, et al. further proved this by finding that a name only became more memorable than an occupation if the occupation title was made-up, or meaningless [3]. They also showed that occupation was the key feature in recognizing a person, since it defines the person's identity and provides an access point for further information [3]. This research was a good starting point for

developing a new memory strategy, especially one with a focus on the workplace, where occupation is both readily available, and important.

Optimal Testing Patterns

The hypothesis of the forgetting curve states that the memory of new information declines over time, unless it is cued or tested. The effect can be reduced with the proper spacing of tests, however, and it was shown by Landauer, et al. that the optimal approach to retain information is an "expanding pattern" [2]. The ratio they found most efficient was 0,1,3,8, meaning the new information should be tested very soon after being presented, then shortly after, then after a gap three times as long, and finally after a long gap. If the user continually recalls the information correctly, it has the potential to become a long-term memory, fulfilling our goal.

A psychological phenomenon known as the testing effect also states that regular memory tests strengthen long-term retention more than simply studying the information [6]. Taking this at face value, it could mean that cued recall is an ideal candidate for distributed sessions of learning face-name pairs. Feedback from the MemReflex study found that mobile micro-learning, using a mobile device to learn new information in short bursts, helped people make good use of time in situations like walking, shopping, taking the bus, and during coffee breaks, which are all common situations for a young professional to be in [5]. In addition, they found that it was most efficient to blend study and testing, since a session with a mobile application can end at any time.

Visual Imagery and Mnemonic Devices

McCarty tested and compared a variety of mnemonic memory techniques for remembering faces and names. The mnemonics varied, but most of them revolved around creating mental imagery of a person's face that tied in with their name, by either sounding out the name phonetically, or emphasizing certain physical features of the face. He found that subjects performed worse when the associations being made were arbitrary, and when no previously acquired knowledge could be usefully applied to the mental images [7]. This emphasis on current knowledge echoes findings from other research, and reinforced focus on making contextual associations memorable by basing them on information relevant to the user.

While the mnemonic techniques seem powerful, they can become quite complicated for someone unfamiliar with the process. Creating the necessary imagery takes time and effort, and is a skill unto itself. Automatically adding context to the notes was a core goal of this project, which leads to the last body of related work.

Context as a Retrieval Key

The research of Lamming, et al. revolved around using personal technology devices for note taking and supporting human memory. They found that the context of an event could be easier to remember than the person who was interacted with [4]. The location, list of other people present, and events that took place before and after can all be used as cues for recalling a particular person from a meeting. This was a great discovery in support of the proposed research, and sparked an idea to also integrate the calendar capabilities of smartphones to provide context of the events surrounding the meeting of a new person.

Current Tools

There are a number of existing tools available to help with memory and recall, ranging from simple flash cards to complex software applications, but the one most similar to the approach of this project is a smartphone app called Evernote Hello. When using it, the process begins with entering the name of a person you've met, along with optional notes about them, including a space to add a photo or business card.

Evernote Hello also adds the user's current location when a new name is entered, giving some context to the entry in the form of a "last meeting place". This is a great first step, but there is a missed opportunity to leverage other information that a smartphone can provide at the time of note creation. The tools itself is also geared more towards note taking, and not necessarily meant to help with recall, since it is intended to be used more as a reference.

That being said, since the framework already exists, Evernote Hello will act as a good starting point for finding out if contextual information is useful for creating semantic associations, which in turn may improve recall.

METHODS

The experiment was centered on testing the recall of names and faces, with and without the semantic information that a smartphone can provide. The primary focus was to see if improvement was found when contextual cues were given during testing, compared to showing a face and nothing more. The contextual information that was provided included a location, the time and date of the meeting, and the closest events on the user's calendar before and after the meeting.

Each set of faces was tested three times, with a chance to review before each test. This was done to find out if the percentage of recall changed over multiple tests, and to see if one set improved more than the other. The target audience was a busy person on the go, so the time it took to complete each test was also recorded.

10 participants were shown 20 different face-name pairs split into two experimental sets, one that showed context at test time, and one that did not. All photos were of Caucasian males from a MIT Face Recognition Database [8] and each were given first and last names of 2-3 syllables each, to avoid any obvious biases and outliers. Occupation information was omitted to avoid having that become a key

memory component, since the focus was meant to be on contextual associations from the meeting itself.

Due to time constraints, the semantic information gathered about each entry was fabricated and shown to the participants along with the face-name pair as if they were meeting this person for the first time. A simple web slideshow was created to allow paging between the faces for the study and test phases. Figure 1 shows an example of a slide from the study phase.

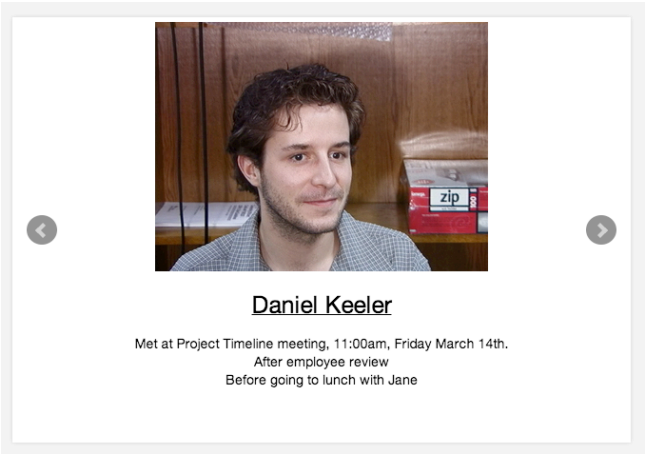

Figure 1. Screenshot of the study interface

To make the experience more realistic, the participants were asked to manually retype the name of each person into Evernote Hello, using pre-populated entries for all of the meetings. Typing out the name is a form of initial testing and recitation, and would be a required step if a tool like this were used in the real world.

After entering the names, a memorization, or study phase began, and lasted three minutes. During this phase, the participants were tasked with trying to remember each face-name pair, as well as read and remember the contextual information whenever possible. The requirement to remember unfamiliar context is an obvious failing of the setup, since the events and information surrounding each meeting should have actually happened to the subject, forming real world memories and cues for recall.

As soon as the study phase was complete, a testing phase began, again using a web slideshow. The participants were instructed to enter the corresponding name for each face being shown using a text input field, and to guess when necessary. They were told that the time to complete each test was being recorded, but accuracy was more important. The choice to provide context for each test was randomized, and the subject was not told whether they would have the information available before the test. Figure 2 shows an example of a slide from the test phase that includes context.

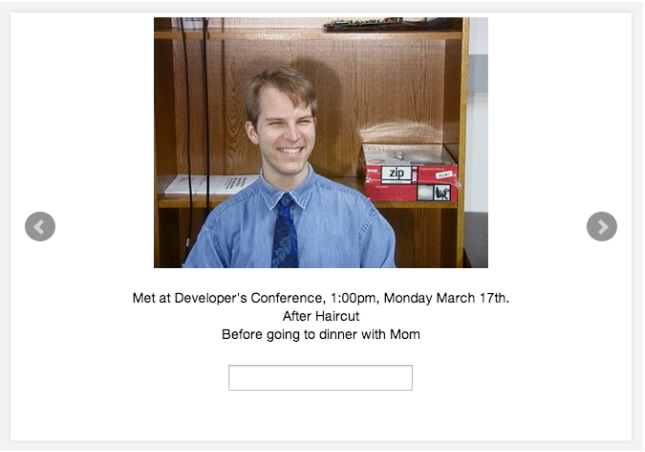

Figure 2. Screenshot of the testing interface, with contextual information shown

Each user was then tested two additional times, following a three minute review of the face-name pairs before each test. The second study and test phases were administered one minute after the first, and the third set occurred after a 10-minute break. The time gap between tests was chosen based on research on the forgetting curve by Landauer, et al., which also emphasized the value of testing over simply studying information [2].

After all tests were complete, each participant was briefly interviewed about the process. This was done to find out which methods worked best for them, and to see if the context was helpful or not.

RESULTS

Accuracy of answers and the amount of improvement between tests were the key metrics studied during the experiment, in an attempt to find a trend between spaced study and whether providing context improved a subject's results.

The percentage of names correctly recalled was averaged across all participants for the six tests, and graphed in Figure 3. The percent answered correctly improved for each subsequent test, both with and without the semantic information. This is most likely due to the nature of repeated study, though it is interesting to see that the amount of improvement over time was not significantly different when given contextual information.

The standard deviation was fairly high for all tests, which could be explained by the variety of subjects that were involved. Effective use of memory techniques can be taught to anyone, but some people are naturally good at applying them, giving those people an inherent advantage in a test like this.

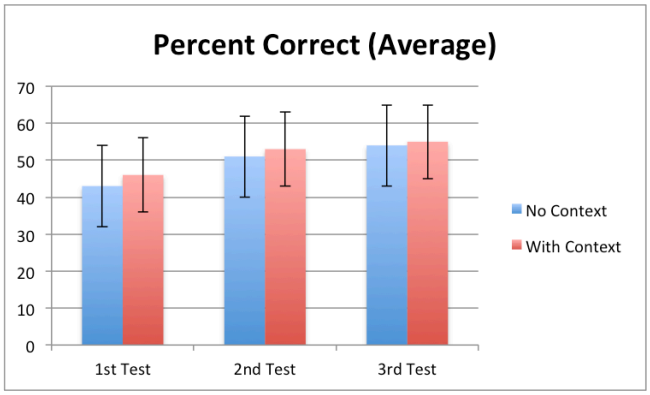

Figure 3. Percentage of correct responses, averaged for all participants.

The time spent to complete each test was a tertiary metric in this experiment, but was worth analyzing nonetheless. After all, a goal of this project was to improve the memory of proper names quickly and easily, and the time spent attempting to recall each name should be as low as possible to prepare for the inevitable real life second meeting. Figure 4 shows the average time it took to complete each test.

We see improved completion time between each test, but the time to finish tests with semantic associations was considerably longer. A possible conclusion here is that it took people longer to read the information during the testing phase, which also shows that some subjects must have tried to use the context to improve their score instead of just ignoring it.

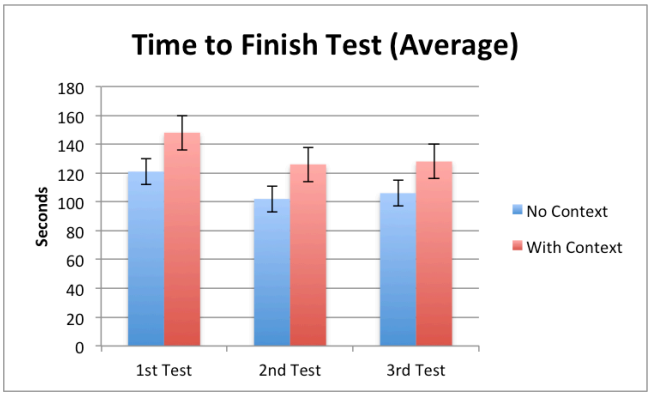

Figure 4. Time to complete each test, averaged for all participants.

Based on the time improvement seen over multiple tests, it should be noted that making an application like this usable on a mobile device would allow for testing in short bursts, which could lead to improved recall over time. This method of short study sessions, followed by memory tests is very efficient for a busy person on the go [5], and the accuracy and time improvement seen here is further proof that easy access to both the names and tests is essential.

From the interview portion, when asked, "what techniques best helped you remember each face-name pair?" subjects responded with a variety of answers. Many of them used existing memories of people they knew, especially those with the same name as the fictional person they were shown. The physical attributes of the faces were also used often in forming memory cues, a technique that has been previously researched for use in mnemonic strategies, but not mentioned explicitly by the researcher during this experiment. Additionally, it helped a few people to say the contextual information out loud during the study phase, or fabricate stories that were centered on the faces to create cues for their names during the test phase.

All subjects agreed that actually meeting these people would have helped considerably, and having the contextual information made relevant to them would also have been beneficial. A few people mentioned that because the information was unfamiliar, it was a chore to use, since it required additional memorization along with the name, and knowing the context didn't add to their score directly.

DISCUSSION

Adding contextual cues to a memory test did not significantly improve results, though it also didn't hurt the accuracy of responses. The value of these cues was perhaps overestimated, and may have been a bit forced in their use for this project, but using a smartphone to automatically provide information about digital notes could still be a useful application of mobile technology, and there is room for further research in this area.

The current state of memory research does not emphasize the use of technology as much as it could, and even if forming long-term memories is not a strong suit of semantic associations and contextual cues created by a device, they could prove useful for other purposes, such as sorting and organizing small bits of information, or committing a location based to-do list to memory.

A large failing of the experiment was that the information provided was not relevant to the subjects, and may have caused confusion instead of aid. This could be fixed with more setup time, and an additional system to gather information about each subject before they were tested.

The study of memory is a broad field spanning many disciplines, and semantic associations are a powerful tool, which can be leveraged using smartphone technology. Further study could show that this technology driven, contextual information can instead be used to reinforce other, proven memory strategies, instead of acting alone. There is room for technology in memory research, and this project provides a good platform for future endeavors in the study of smartphone aided memory techniques.

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