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KeyStrokes: Personalizing Typed Text with Visualization

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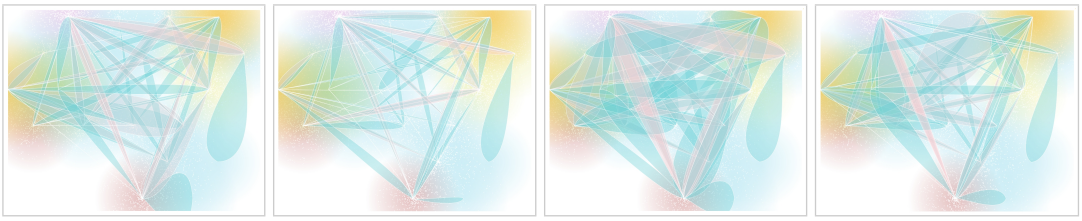


Abstract

With the ubiquity of typed text, the style and much of the personality of handwriting has been lost from general communication. To counter this we introduce an artistic real-time visualization of typed messages that additionally captures and encodes aspects of an individual's unique typing style. The potential of our system to augment electronic communication was evaluated and the results are provided along with analysis of their implications for social visualization.

Categories and Subject Descriptors (according to ACM CCS): H.5.2 [Information Interfaces and Presentation]: User Interfaces – Graphical user interfaces (GUI); I.3.3 Computer Graphics Display Algorithms

1. Introduction

Electronically written text communications are becoming the standard for today's correspondence. E-mail and instant messaging are already replacing handwritten letters and messages. Even e-cards are now being used for birthdays or holidays as a replacement for the physical card. People can converse across distances electronically quickly and cost-effectively, making it a very popular choice for conversation. However, typed text messages lack the personal character of handwriting. Some characteristics of the message author's writing style, such as neatness of writing, or how individual letters are shaped is lost in typed messages. This lack of personal character has led to attempts to enliven electronic messages through ASCII art, emoticons, or through the embedding of HTML options.

The goal of this work is to build visualizations that automatically encode personal typing characteristics to enrich communication. By looking at how people type an electronic message, we can notice many different typing styles involving typing speed, typing rhythm, hand-usage, and how many times letters or words are erased, reprinted, or replaced. We capture and use the details of a person's style to create a visual representation of a message that can then be used for asynchronous distribution, for example, as an electronic postcard. Our visualization differs from previous approaches in that we focus on visualizing the process of creating a message whereas previous work has mostly been concerned with visualizing characteristics of the already created words and sentences.

This work has two main contributions. Our first contribution is the KeyStrokes system for visualizing personal and message characteristics of typed text. We know of no other information visualization that attempts to display this type of data for personalizing electronic communication. An evaluation and an analysis of the system in terms of its design and motivation forms the second contribution of this work.

2. Related Work

KeyStrokes is part of a growing body of research that uses text as a source for social data analysis. Text, in its various forms, is probably one of the most prevalent data sources available today. Thus, not surprisingly, a large number of visualization techniques have been developed that represent different aspects of textual data. The body of work most related to our system is concerned with visualizing the social aspects of text-based communications. Several visualiza-

tions of persistent conversations (conversational exchanges with applications such as e-mail, blogs, instant messaging, etc.) have explored ways to uncover the underlying social patterns. For example, The Babble System reveals social awareness of online chat activities through a social proxy visualization [ESK*99]. ChatCircles [DKV98] shows synchronous conversation, visualizing one's presence, activity level, and chat identity. CrystalChat [TC06] integrates visual representations of social patterns with temporal aspects of chat conversations. It has been noted that observing graphical patterns of one's own communications encourages retrospection and story-telling [VBN*04, TC06]. Perhaps inspired, as we have been, by the proliferation of emoticon use as evidence that people want to include their emotional state in their messages, there has also been research into visualizing emotion [TC06, LD06]. A visualization of emotional content of blog messages has been developed by using the words preceded by "I feel" and "I am feeling" [HK06]. In this vein, the work that most closely relates to our project is Cheiro [LD06], an animation of text that is based on mouse gestures. However, each typed word requires the user to gesture with the movement of the mouse.

Studies have shown that monitoring the intervals between keystrokes and duration of keystrokes as an individual types is sufficient to support the determination of their identity [She95]. From this, we know that it is possible to distinguish individual users' typing style by looking at these characteristics. Our research aims at embedding visuals representing one's unique typing characteristics within the typed message. One important advantage to this approach is that our visualization can be created without any extra effort on the part of the person typing the message.

3. KeyStrokes Visualization

We had several design goals in creating our visualization. Foremost, we wanted the visualization to minimize effort for the person typing the message. To do this, we extract keystroke data during typing and use it to create a responsive visualization so that the visuals representing a given key stroke would appear rapidly enough for the connection between action and response to be evident. We also wanted to create a visually appealing design that would be scalable for different sized screens. We use typing style and textual content to develop patterns to enrich and personalize a message. Our visualization currently uses the metaphor of a postcard that can be filled with our visualization of a message on one side and the typed text of the message on the other. In developing KeyStrokes, we considered design criteria such as background and foreground objects, splattering effects, and differing stroke styles including stroke movement and direction analogous to strokes created with a paint brush.

3.1. Visualizing Writing Patterns

Each letter of the alphabet and some common punctuation keys are represented at a fixed 2D spatial location in our visualization corresponding to a jittered physical English QWERTY keyboard layout (Figure 1).

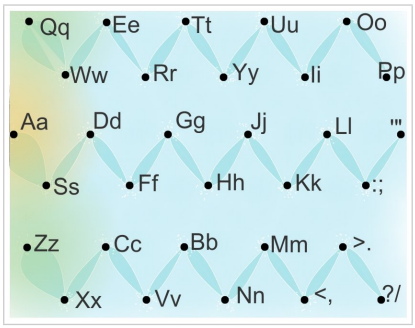
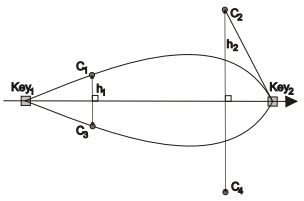


Figure 1: *Mapping of key locations.*

When a key sequence has been pressed, we connect the corresponding key locations with a semi-transparent stroke to mimic the strokes created with a brush or pen. Figure 2(a) gives an overview of the design of a stroke. The strokes are drawn with two Bézier curves using two control points on each side to give the stroke a visible direction from thin to thick. The height h of the control points c_i is determined by the amount of time between keypresses. In Figure 2(b) the top key combination was typed slowly resulting a in wide stroke. Compare this to the middle and bottom stroke where there was a much shorter delay between keypresses resulting in narrower strokes. In this way, the strokes connecting each sequential keypress implicitly reveal the temporal movement of fingers (and hands).



(a) Stroke design with Bézier control points and key locations.

(b) Slow (top), medium (middle), and fast (bottom) strokes.

Figure 2: *Stroke Design (a) and stroke types (b).*

For many people, writing style can also be distinguished by how many times letters have been erased, retyped, or replaced. We show the use of backspacing between key combinations by a curved white line connecting the two keys while erasing the previously created stroke (see Figure 3(a)). Note the many backstroke lines in Figure 4 where an artistic placement of keystrokes has been attempted. The curved line is drawn to imitate a crossing-out motion in hand-written

text where mistakes are not completely erased even when an eraser or white-out is used.

3.2. Visualizing Message Patterns

One way visualized message patterns are shown in our system is through the frequency of letters and keystroke sequences. The frequency of pairwise key sequences becomes visible through the overlap of the semi-transparent and white outlined strokes, as can be seen in Figure 3(b). We encode several message characteristics in the background of the visualization. The frequency of an individual key is emphasized through a transparent circle in the background (see Figure 3(c)). When a key is more frequently pressed, the colour of the circle will change from blue to pink or cool to warm colours. To aid discrimination and comprehension, we redundantly encode repeated key presses with a splash of white dots around the key location, increasing the radius and spread of the splash after each key press. An example is given in Figure 3(d). Another characteristic that is visualized in the background is word beginnings. At the beginning of a word, vowels are drawn with a yellow background and consonants with a green background to visualize soft and hard sounds. The change in background colour is used to add dynamics and to balance the whole composition. Figure 4 shows all of the mentioned representations combined.

(a) White strokes to encode erasing gestures.

(b) Semi-transparent and white outlined strokes show temporal aspects and frequency of key combinations.

(c) Circles in the background encode message patterns.

(d) White splashes encode frequencies of keypresses.

Figure 3: *Visualization characteristics.*

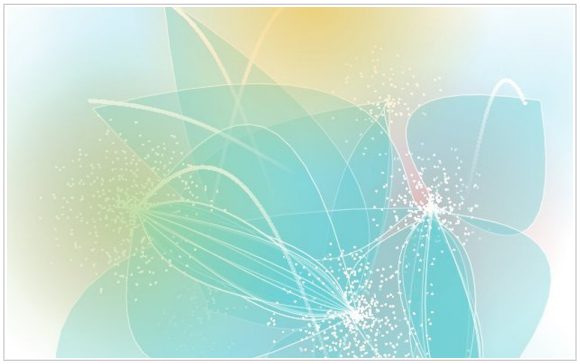
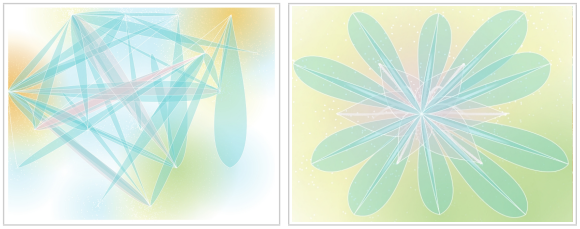


Figure 4: *A painted message showing the combination of all message pattern representations.*

3.3. Interaction

User interaction with our visualization is natural, requiring nothing beyond normal typing. As soon as one starts to type, the visualization space is filled with painted strokes in real-time and recently placed strokes are animated. The animation shows strokes vibrating in the display for a short period of time to enforce the dynamic nature of the visualization and to show where the last letter was typed on the screen. During informal demonstrations of the system in our lab, we noticed two very different usage patterns. Many people tended to compose a meaningful text that was conveyed in the visualization (Figure 5(a)). Others started to create intentional artwork after learning how and where keystrokes were displayed in the visualization. The typed words did not have any meaning attached to them, but the created image carried the message, as in Figure 5(b) where a floral pattern was created to send to a close friend.



(a) A message with meaningful text.

(b) Message content embedded in the image.

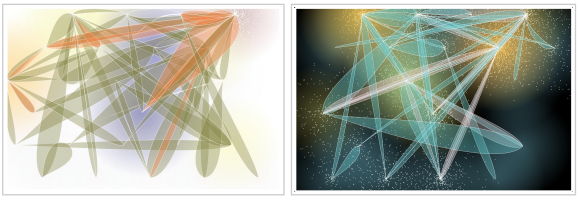
Figure 5: *Two different types of messages.*

3.4. Individualization

The images shown at the top of the first page represent a visualization of a poem typed by four different people. Different writing styles and similarities in typing become apparent by how the strokes are printed in the visualization. It is possible to get an overall feel for the individual typing speeds,

with the third typist being generally slower. You can also see how different key combinations took longer for certain individuals to type. The individuals typed essentially the same message which can be recognized through the similar stroke pattern and by how background colours are placed. A common characteristic seems to be that all individuals seemed to pause before pressing the final character ".". This shows as the thicker stroke on the right side of each image.

Another way to personalize a KeyStrokes message is through the selection of different colour themes so that the tone or feeling of a message can be individually selected. Figure 6 shows two additional colour themes we developed.



(a) A slightly darker theme. (b) A pastel theme on black.

Figure 6: *Two different colour themes that can be selected.*

4. Personalization with KeyStrokes—An Evaluation

After the initial design of the KeyStrokes software we received a number of positive responses from casual users in our research laboratory. To further assess the response to and effectiveness of our visualization design in a more general setting, we designed a questionnaire and collected responses during two demonstrations sessions at international conferences. The results of this assessment indicate that the KeyStrokes visualization was well received and also raise several interesting points for discussion.

4.1. Design of the Questionnaire

The questionnaire contained four types of questions: general background (demographics), information relating to the motivation for this work, information on the current visualization, and a general comment field concerning the KeyStrokes system. The background questions asked participants to state their occupation, age group, electronic communication use and frequency, and hand-writing frequency. Questions 1–4 were answered using a five-point Likert scale (strongly disagree (1)–strongly agree (5)).

Question 1 was specifically targeted at one of the main motivations for our work:

Q1: I find electronic communication lacking in personality.

Our hypothesis was that recipients would generally find electronic communication lacking in personality. With Question 2 we wanted to determine whether this lack of personality was generally seen as a benefit or drawback of electronic communication:

Q2: I value the anonymity of electronic communication.

Questions 3 and 4 asked about the main data source for our visualization and whether participants had any privacy concerns with the visualization of this data:

Q3: Visualizing finger positions, key transition speeds, and editing can capture some of my character.

Q4: Visualizing finger positions, key transition speeds, and editing reveals too much of my character.

The remainder of the questions asked about the motivations and usage patterns for the KeyStrokes system.

Q5: Would you use Keystrokes visualization to augment your communication? (yes/no)

Q6: Why?

Q7: When?

Q8: In conjunction with what type of electronic communication?

4.2. Study Setup

We collected responses to this visualization through a questionnaire given out in paper form at two conference demonstration sessions. At each of these sessions, we set up a laptop running our KeyStrokes system with an external keyboard. Each participant was introduced to the theoretical background of the system and its different functionalities. We encouraged participants to try the different features of the system and to ultimately type a message, thus creating a KeyStrokes visualization that we printed for them on 4"×6" photo paper. During the printing, we asked the participants to volunteer to fill out our questionnaire. These four-hour demonstration sessions were held at the 2006 IEEE Symposium on Information Visualization (InfoVis'06) poster session [NTZC06a] and the 2006 ACM Conference on Computer Supported Cooperative Work (CSCW'06) demonstration and poster session [NTZC06b].

4.3. Participants

A total of 68 people (37 InfoVis'06, 31 CSCW'06) completed our questionnaire. We included demographic questions to determine if answers were different according to age, occupation, gender or between the communities at the two conferences. However, we found no significant differences for any of these variables with the exception of the electronic communication use of e-cards which were reported to be sent/received significantly more by participants at CSCW'06 (2-sided Fisher's Exact Test, $p = .034$), and these participants also reported significantly more electronic communication usage in the "other" category (2-sided Fisher's Exact Test, $p = .035$); mostly video and VOIP services. Participants stated they most heavily used email (97% total), instant messaging (IM) (72% total), and text messaging (48.5%). Electronic communication was pervasive with more than 60% of our participants reporting that they used hand-written communication only "yearly" or "never anymore," while all of our participants reported to use electronic communication daily.

Question	Sex U p	Occupation χ^2(df) p	Age χ^2(df) p	Conference U p
1	106 .814	4.71(4) .324	5.729(4) .221	497.5 .336
2	74 .310	2.266(4) .696	3.876(4) .430	497 .6
3	94 .667	2.567(4) .675	4.03(4) .414	543.5 .886
4	81.0 .301	1.927(4) .763	2.285(4) .684	553.0 .983

Table 1: *We found no significant correlation between the answers to Q1–4 and the background variables sex, occupation, age, and conference. Scores are reported according to two-tailed Mann-Whitney Test (Sex, Conference) and Kruskal-Wallis Tests(Occupation, Age).*

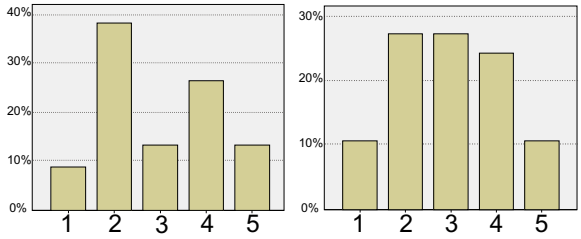
4.4. Analysis Method

For the analysis of relationships between all collected variables in the questionnaire, the threshold for statistical significance was set at $p < .05$. For categorical data we used Pearson's Chi-Square measure when less than 10% of reported frequencies had a count of < 5 and Fisher's Exact Test for small sample sizes. For ordinal data we used the Mann Whitney test for two independent samples and the Kruskal Wallis Test for k independent samples. Due to the ordinal nature of our variables and also the relatively small sample size we used non-parametric tests to determine relationships between specific variables. We determined whether there was a correlation between questions by doing a pairwise comparison of the answers to the questions by using the appropriate above-mentioned tests.

4.5. Results

Results will be provided with interpretations to follow in Section 5. For Questions 1–4 we found no significant difference between the respective responses and the demographic variables sex, occupation, age, and conference through pairwise comparison (see Table 1). Overall, participants reported to either agree or disagree on whether they found electronic communication lacking in personality (Q1). 47% of participants disagreed or strongly disagreed and 40% agreed or strongly agreed with this statement. Figure 7(a) gives a graphical overview of the bimodal distribution of answers to this question. Figure 7(b), the responses to Q2, show that participants did not have a consensus on whether they valued the anonymity of electronic communication. 38% of participants disagreed, 35% agreed, and 37% were undecided.

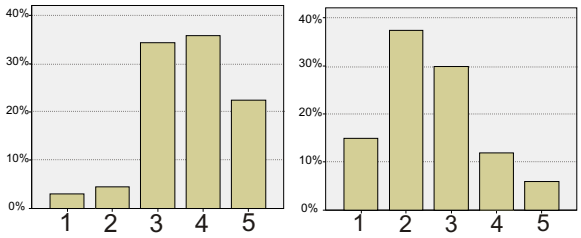
In Question 3, participants tended to agree that visualizing finger positions, key transition speed, and editing could capture some of their character. Participants also generally disagreed in Question 4 that the visualization of this data would reveal too much of their character. Figure 8 gives



(a) Q1 "I find electronic communication lacking in personality". (b) Q2 "I value the anonymity of electronic communication".

Figure 7: *Answer frequencies to Questions 1 and 2.*

an overview of the answers to these two questions. Overall, 71% of people reported in Question 5 that they would use KeyStrokes to augment their communication. Two recipients (3%) did not report either yes or no and wrote a "maybe" next to the provided checkboxes.



(a) Q3 "Visualizing finger positions, key transitions speed, and editing can capture some of my character". (b) Q4 "Visualizing finger positions, key transitions speed, and editing reveals too much of my character".

Figure 8: *Answer frequencies to Questions 3 and 4.*

Questions 6–8 were free-form questions. We combined similar answers to each question into distinct categories for analysis. For example, the following answers to Question 6: "It's personal", "To personalize my email, blog", "for personal notes" were combined in a category called "personalization". Question 6 "Why?" was asked in direct reference to the answer given in Question 5 "Would you use KeyStrokes to augment your communication?". Table 2 gives an overview to the main categories of answers given to Question 6 in relation to Question 5.

There were 16 different answer categories for Question 7 ("When?"—see Table 3). 39 people answered this question. Only three people who reported that they would not use the tool gave an answer to this question: personal correspondence (2), e-mail (1). Table 4 gives an overview of answers to Question 8: "In conjunction with what type of electronic communication?". In the general comments field participants gave mostly appreciative comments and advice about how to improve the tool. We will report on those comments in more detail in the following discussion.

Would use the tool			
Yes		No	
Why	# (%)	Why	# (%)
Personalization	20(46.5)	Insufficient information	5(29.4)
Fun	11(25.6)	Too confusing	3(17.6)
Visually Appealing	7(16.3)	Can't envision usage	3(17.6)
It's novel	2(4.7)	Not for professional communication	2(11.8)
Speed	1(2.3)	Fun	1(5.9)
Like the idea	1(2.3)	It depends	1(5.9)
Can't envision usage	1(2.3)	Too distracting	1(5.9)
It depends	1(2.3)	Lack of control	1(5.9)
	43(100)		17(100)

Table 2: *Q6 ("Why") in relation to Q5 ("Would you use KeyStrokes to augment your communication?").*

When	# (%)
Personal Correspondence	19(48.7)
E-mail	3(7.7)
Not Sure, Daily, Greeting Cards	2(5.1)
Greeting Cards & IM, Greeting Cards & Electronic Signature, IM, Learning to Type, Whenever it is ready, To impress, Any text, When time permits, For fun, Correspondence to art-minded colleagues, Occasionally	1(2.6)

Table 3: *Answers to Question 7: "When?".*

5. Interpretation of the Results

From the questionnaire we learned that over 70% of our participants said they would use the tool. This can be seen as a success for an information visualization tool that participants had only experienced for a few minutes during our demonstration sessions. However, through our sampling method participants were self-selected and obviously in some way interested in the tool by attending our demonstration. Nevertheless, examining the results of our questionnaire gave us interesting feedback on the tool, our motivation, design, and future work. The following sections contain more detail about our interpretations of the data and hypothesize on why the KeyStrokes tool received such positive responses. For the interpretation of each of the questions, it is important to keep in mind that all answers were given by participants from the visualization creation standpoint, we did not ask participants to read and interpret messages that other people had created.

Electronic Communication	# (%)
Email	33(48.5)
IM	16(23.5)
Ecards	5(7.4)
Any Text	3(4.4)
Blogs	2(2.9)
SMS, Wiki	1(1.5)

Table 4: *Answers to Q8—"In conjunction with what type of electronic communication?".*

5.1. Is Personalization a Motivation to use KeyStrokes?

Participants reported their main motivations to use the tool were personalization, fun, and visual appeal (Table 2). Personalization was actually also one of our main motivations to design the tool. We saw a general lack of personal characteristics in electronically written communication and set out to design the tool to bring personality back into electronic communication. In the questionnaire we asked whether participants agreed with this motivation. We found that participants responses were quite dispersed as to whether they found electronic communication lacking in personality or not. Interestingly, however, 21 of 32 people who did not find electronic communication lacking in personality reported that they would use the tool, even though they did not agree with this motivation. Ambiguity in the question might also have allowed responses relating to personality in the message rather than the medium. While a significant proportion of responses did agree with the motivation for the work, it is unknown if those who disagreed have very different measures of personalization. A question to provide a baseline reference might have been "Do you feel hand-written messages have more personality than electronic messages?"

5.2. What Makes KeyStrokes "fun" to Use?

A quarter of the participants who said they would use the tool reported "fun" as their main motivation. This characteristic is not one commonly reported of information visualization tools. KeyStrokes includes some game-like features, as reported in [Mal80], that could lead to participants saying it was "fun" to use:

- The tool is challenging. It has a main goal: to see or communicate personal typing and message characteristics. It also has an uncertain outcome: typing characteristics are hard to foresee with changing messages and are also different between people and many of the encoded variables are hidden for users to discover.
- The tool has an emotional aspect to it. One can learn about one's own typing patterns and also share this personal information in a message. One of our participants commented: "This adds a loving touch to notes."
- The tool evokes curiosity: the tool attracts attention through its visual appeal (as reported by a number of participants, see Table 2) and pulsating strokes that indicate recently pressed key combinations. It engages people in interpreting the visualization and its novelty encourages people to explore it more.
- The tool encourages creativity: we observed people circumventing the intended usage of the tool to create interesting looking patterns (e.g. floral patterns) as the main content of a message (Fig. 5). Some people thought of

very creative ways to use our tool that we had not previously considered: for learning to type, electronic signatures, SMS, blogs, or wikis (Table 3 and 4).

- The tool is easy to use: one common characteristic of popular games is that they are quite easy to learn or provide appropriate help for learning to play the game. A KeyStrokes visualization can be created without much effort while typing a message and can then be attached to the message to share with others. The design of visualizations that require minimal effort to use is an important venue to consider in the area of information visualization.

5.3. What Negative Aspects were Reported?

Despite the majority of positive responses about the tool, about 30% of all participants reported that they would not use the tool, or at least not in its current form. Their main motivations were: a lack of information in the visualization, the visualization being too confusing, or not being able to imagine a use for the tool (see Table 2). During the demonstrations many users of our system expressed that they wanted to read the actual content of the message from the visualization in conjunction with getting an overview of the patterns of the message and the typing characteristics of the composer. Therefore, the first motivation may be related to the second one in that people found the visualization too confusing because they could not read the actual message back from the graphic.

5.4. Are there Privacy Concerns?

The questionnaire data generally confirmed our choice of typing characteristics used for the KeyStrokes visualization. Overall participants agreed that visualizing finger positions, key transition speeds, and editing habits could capture some of their character (see Figure 8(a)). One of our concerns while designing the visualization was that people would have privacy concerns and would, for example, not like to be identified by someone else as a slow typer or as someone who made lots of mistakes while typing. Generally, participants did not confirm this concern (see Figure 8(b)). However, a quarter of those participants who supported that KeyStrokes could capture some of their character also affirmed that it would reveal too much of their character. So overall, we did identify some privacy concerns among participants. This raises an interesting point for the field of information visualization, as often the goal of a visualization is to reveal as much information as effectively as possible. Our tool, however, can capture and visualize more data than some users might want to share with others.

5.5. Did Participants Like the Aesthetics?

It has been shown that the use of aesthetics and visual abstraction as part of the visualization can attract people's attention and interest [Tra97, Nor02]. We deliberately tried to create visual mappings of typing characteristics with abstract and aesthetically appealing graphical representations. In the questionnaire we received overall positive responses for our visual design. In fact, a quarter of participants who would use the tool reported its visual appeal as the main motivation. This also confirms the above mentioned findings by Norman and Tractinsky [Tra97,Nor02]. Several participants also gave positive feedback on the design in the general comments field (e.g. "It's beautiful work", "Thank you for the beautiful e-card", etc.). Some participants requested changeable colours, and stroke control, or to use it as a visualization of currently typed text rather than a visualization of the complete message. Colour and stroke control will enable users to set the "tone" of the visual message enabling a more direct display of the moods and feelings the sender had when typing a message or even parts of a message.

5.6. Where Can the Tool be Used?

During the design, we envisioned KeyStrokes to be used in an electronic communication environment like an email or chat client. During our demonstration sessions we had deliberately not embedded the tool into such an environment in order not to restrict the users in their answers to Question 8. The main envisioned usage by our participants corresponded to ours. However, we received several interesting application ideas from participants, in particular, to use it for cell-phone text messages or in an email subject line. We believe that our principle design idea is scalable and can be adapted to small screens and display areas. We will consider these ideas for future versions of our tool.

5.7. KeyStrokes as a Social Data Analysis Tool

Wattenberg describes several hypotheses for the popularity of the online NameVoyager tool in [Wat05]. He hypothesizes that its popularity stems from the tool being part of an online social environment. Similar to our tool, he also suggests that his tool has game-like features that make it fun to use and suitable for social data analysis. In his paper he defines social data analysis as "a version of exploratory data analysis that relies on social interaction as source of inspiration and motivation." This definition seems to apply to our tool as well. KeyStrokes was built with the intention to share information visualizations with others making it essentially a social data analysis tool. One of our participants specifically confirmed this design in the open comments field: "A lot of fun to use, especially in the group setting." Wattenberg suggests that viewing exploratory data analysis as a social activity could explain much of the positive reaction towards his tool. We hypothesize this to be true for our tool as well but within a much closer community, in which the individuals know each other's character to some degree already. This hypothesis stems from the fact that many participants reported that they would use it for personalization when corresponding to friends and family or would not use

it for professional communication. The common ground of data analysis through our tool would be an understanding of the senders' character and typing skills at a certain point in time that could be read back and interpreted from the visualization. How the tool is used and accepted in the group setting when embedded in a specific communication environment will have to be determined in further evaluations.

5.8. Directions for Future Work

Results from our study suggest several directions for future work on KeyStrokes. One important aspect of the tool will be to further research its privacy implications. We would like to examine which types of information would make participants most uncomfortable if shared with others. Also, how such information can be hidden or transformed to make it more ambiguous needs further attention. In the field of CSCW several solutions to the problem have been explored for example in the area of screen sharing or video media spaces. These solutions include blurring or pixelating information that is often transmitted as pixel graphics. How or if these techniques can be applied to information visualizations and the KeyStrokes system in particular will have to be explored. In terms of the design of the visualization, we will add features to select colour or manipulate the principal stroke shape. Also, we would like to add the possibility of temporal reading of the strokes so that the actual letters of the message can be read back in order. With these changes, we will address the main points of critique uncovered during our study. An interesting and as yet unexplored venue for future work will include further studies on whether the tool can be used as an electronic signature. Previous work has shown that statistically users could be identified by how they typed their passwords [She95]. It seems possible that visualizations of this data could be used as electronic signatures.

6. Conclusion

The KeyStrokes system is a tool designed to enrich typed communication with personal characteristics. In this sense KeyStrokes is a social data analysis tool that allows shared analysis and exploration of personal data. The creation of this visualization was motivated by the lack of personal characteristics of electronic textual conversation compared to hand-written messages. KeyStrokes was created with several design goals in mind: to minimize the effort required to create and share the visualization, to encourage use of the tool through a visual appealing design, and to encode personal typing and message characteristics to bring character back into electronic communication. In order to assess the response and effectiveness of KeyStrokes, we performed a user study. The KeyStrokes tool received an overall positive response during our study, with many requests to make the tool publicly available. We identified several possible reasons for this positive response, discussed reported critique of the system, and talked about feedback on our design, tool usage, and directions for future work. In general, we found that many participants felt electronic communication to be lacking in personality; so, visualizations that are built to aid in personalization fill a needed gap.

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