Are you still waiting for an answer? The Chronemics of Asynchronous Written CMC[1]

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This study examines the chronemics (time related messages) of response latencies in asynchronous computer-mediated communication (CMC) by analyzing three datasets comprising a total of more than 150,000 responses: email responses created by corporate employees, responses created by university students in course discussion groups, and responses to questions posted in a public, commercial online information market. Mathematical analysis of response latencies reveals a normative pattern common to all three datasets: The response latencies yielded a power-law distribution, such that most of the responses (at least 70%) were created within the average response latency of the responders, while very few (at most 4%) of the responses were created after a period longer than 10 times the average response latency. These patterns persist across diverse user populations, contexts, technologies, and average response latencies. Moreover, it is shown that the same pattern appears in traditional, spoken communication and in other forms of online media such as online surveys. The implications of this uniformity are discussed, three normative chronemic zones are identified, and a quantitative definition for online silence is proposed. Implications for educators and administrators working with online students and with online teaching staff are discussed.

Introduction

Teachers who wish to succeed in online education are always encouraged to be timely in their responses to the students (Hiltz, 1995), to have frequent interactions with the students (Schrum & Hong, 2002; Walther & Bunz, 2005), to respond quickly to student contributions (Berge, 1995), and to log on frequently (Palloff & Pratt, 2000). Nevertheless, the literature fails to provide empirically validated norms of responsiveness beyond average response latency, or criteria to determine whether specific response latencies are appropriate. This is not surprising, since the norms will vary between various technologies, contexts and environments.

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Online communication can be likened to a conversation, and the most apt term for online conversations was minted by Erickson & Herring (2005): “persistent conversations”. This term captures, on the one hand, the similarity to traditional spoken conversations, and on the other hand, the unique attribute that separates the ephemeral spoken conversation from computer mediated conversation, a conversation that leaves a persistent record. What has research taught us about response latencies in traditional, spoken conversation?

Conversations are rhythmic in nature, and the rhythms of conversation have long attracted the attention of diverse communication researchers (Brady, 1965; Cappella, 1979; Jaffe & Feldstein, 1970; Sacks, Schegloff, & Jefferson, 1978). Analysis reveals that when the durations of each of these classification categories are plotted on a semi-logarithmic graph, the points tend to fall along a straight line, a phenomenon that has "generally been found to be exponential" (Jaffe & Feldstein, 1970, page 25). This exponential relationship is a manifestation of skewed distributions in which the majority of the durations are relatively brief, and only a minority is of average or above-average length. Extracting the results of Jaffe and Feldstein (1970) from the original graphs and re-plotting using contemporary computerized statistical tools suggests that a power law distribution yields a better fit than the exponential distribution. Inspired by the classic research on conversational rhythms, turns, and pauses in traditional conversation, our research sought to apply the same tools to the analysis of pauses and response latencies in Computer-Mediated-Communication (CMC). Our work aims to demonstrate that while traditional conversation and CMC seem different, some significant chronemic (time related messages) aspects of both types of communication are shared. This comparison provides insights about some key aspects of asynchronous CMC, such as turn-taking, chronemic non-verbal cues, and the nature of interactivity and responsiveness. Our findings may inform anyone who uses CMC media to teach, collaborate, carry out transactions, or for any other type of reciprocal online communication.

The Research Question

This study explores whether persistent conversation shares fundamental properties with traditional, spoken conversation. Specifically, our research question is: Are chronemic distribution patterns similar for turn-taking pauses in spoken and persistent conversation? If so, what are the common patterns?

Methods

Characterizing Aggregate and Individual Response Latencies

Three distinct datasets of asynchronous computer-mediated communication were analyzed. The first dataset, "Enron emails," includes the response latencies of corporate email users. Data extracted from the correspondence of Enron employees, as described in detail in Kalman and Rafaeli (2005) included email messages that were responses to previous emails, and that included a timestamp of the original email. The difference in timestamps was calculated, resulting in a response latency for each email message.

The second dataset, "University forum," is described in Ravid and Rafaeli (2004). That study investigated discussion groups formed by users of a university learning management system. The university offered around 400 courses (undergraduate and graduate); the courses were supported by an Internet site that included a discussion forum used for discussions among students registered in a particular course, as well as between those students and the faculty.

The third dataset, "Google Answers", described in Rafaeli, et al. (2005), contained 40,072 response latencies of answers to questions posted to Google Answers (http://answers.google.com). Google Answers is a commercial website where designated and certified responders provide paid answers to questions posted by users who pay them according to a price bid they placed with the questions.

Each of these three aggregate response latency datasets was analyzed separately by the same methods used for identifying power law distributions (Newman, 2005) and response latencies in traditional spoken communication (e.g. Jaffe & Feldstein, 1970). The response latencies were grouped into bins and plotted on a log-log graph; regression analysis was performed for the power distribution and a coefficient of determination (R^2) was calculated.

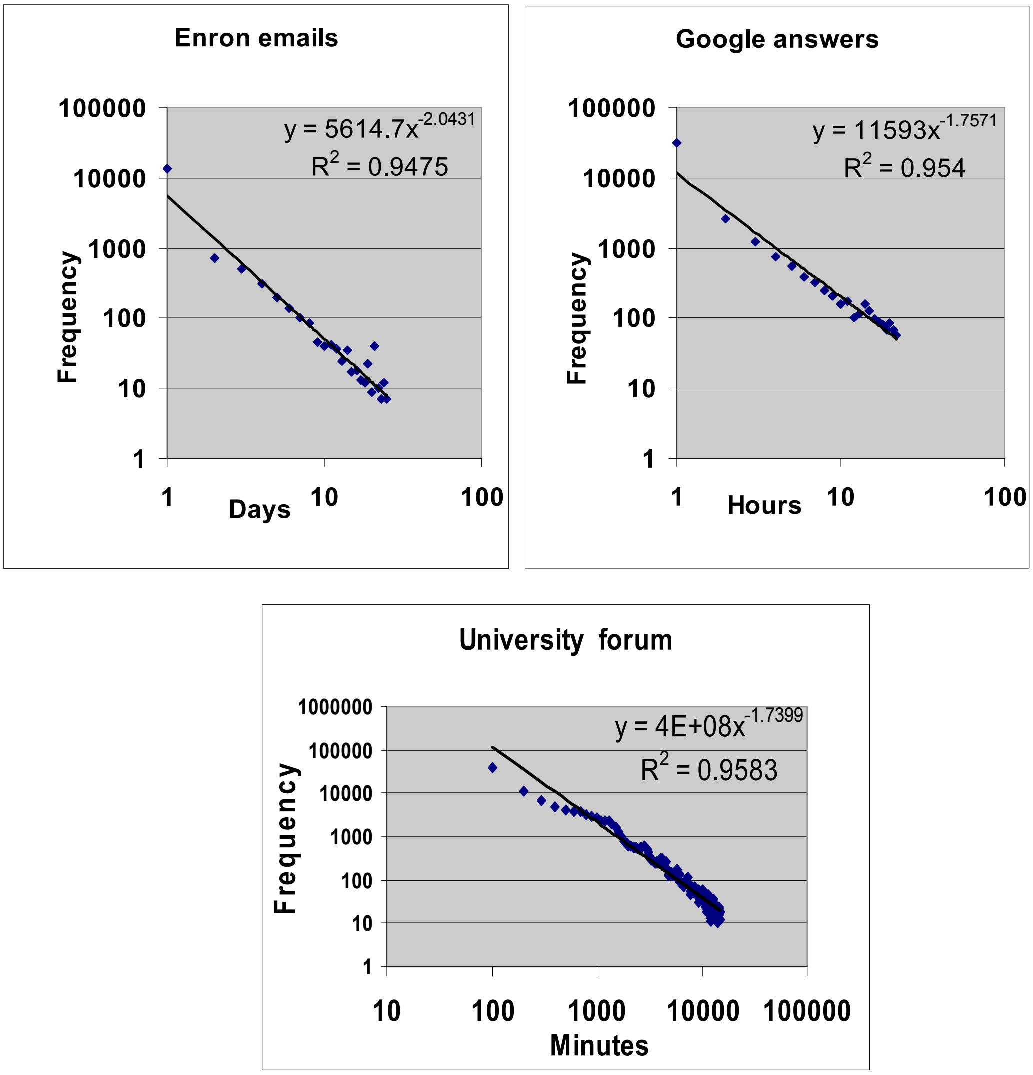
The percentiles of the average response latency as well as the percentiles of ten times (10x) that average response latency were calculated. The percentile analysis was then repeated for all individual users in the Enron emails dataset, as well as for 15 individuals from the Google Answers dataset (5 users with the largest number of responses and 10 of the users with 100-120 responses). Finally, a small sample of Enron email responses that were created after a long delay was selected, and its contents inspected.

Results

Distribution of Response Latencies

115,416 University forum responses, 15,815 Enron email responses, and 40,072 Google Answers were analyzed. Despite the diverse sources of these responsiveness profiles, when plotted on a log-log graph, all three datasets presented a power-law distribution (Figure 1 a-c) with similar slopes: (-1.74), (-1.76), (-2.04).

Figure 1: Power law plots of the cumulative response latencies of the three datasets



An analysis of the distribution of each of the datasets revealed that the *average* response latency in each of the datasets falls at or above the 80th percentile. It also revealed that 10 times the average latency in each of the datasets falls at or above the 97th percentile (Table 1).

Table 1: Average response latencies in each dataset, and the percentile rank of that average response latency, and of ten times (10x) that average response latency, for each dataset.

Dataset	Average response latency	Percentile rank of average response latency	Percentile rank of 10x average response latency
Enron emails	28.76 hours	86%	97%
University forum	23.52 hours	80%	99%
Google Answers	1.58 hours	84%	97%

This remarkable similarity across datasets comprising aggregate responses created under diverse circumstances, by diverse populations, and by many individuals, raised the question whether this generalization about percentiles is a result of the aggregation of many response latencies, or if it is also reflected in the behavior of individual users. A detailed analysis of many of the Enron users, and a few representative users from the Google Answers dataset revealed that the vast majority of the individual users created most (70% or more) of their responses within their average response latency, and almost all (96% or more) of their responses within a latency equal to 10 times their (individual) average response latency. This relaxed generalization also holds for the cumulative results.

Discussion

An analysis of the distributions shows that all three user groups, in aggregate, display similar mathematical distributions of response latencies. Closer inspection of the distributions shows that despite the significant differences among the types, purpose, and context of the asynchronous conversations taking place within each group, in all three of them, at least 80% of the responses were sent within the average response latency of that group, and at least 97% of the responses were sent within 10 times that average response latency. In cases where analysis was possible, even individual users show the same skew: At least 70% of almost every individual's responses were made within that user's average response latency, and at least 96% within ten times his or her average response latency (RL). These findings allow us to delineate three normative chronemic zones of response latencies in asynchronous CMC, based on the average response latency τ:

Zone I - quick to average ($RL<\tau$). The majority of the responses fall in this zone
Zone II - above average ($\tau < RL<10\tau$). A minority of the responses fall in this zone
Zone III - long silence ($RL>10\tau$). A negligible minority of the responses fall in this zone

Generalizability of the Findings

The findings point to common chronemic characteristics of asynchronous CMC. The three datasets are very diverse in their characteristics: They represent different user populations (business people, students, and varied Internet users in a public arena), assorted asynchronous text-based CMC technologies (email, discussion forum, web pages), a variety of contexts (academic education, major corporation, competitive online bidding), a range of average response latencies (from 1.5 hours to a little over one day) and of cohort sizes (more than 15,000 to more than 100,000, a total of over 170,000 responses), a period spanning at least seven years, and respondents from the U.S. as well as from other countries. Despite these differences, a recurring pattern surfaces when analyzing the aggregates as well as when drilling down to the level of individual users: Users of asynchronous CMC tend to create responses within a relatively short time, in the order of magnitude of the average response latency, and are unlikely to respond after a duration longer than one order of magnitude higher than that average response latency.

The robustness of the generalization receives further substantiation when one looks at well established rules describing latencies and response latencies in traditional forms of communication. For example, in Jaffe and Feldstein's work (1970) in face-to-face contexts, the duration of pauses by one speaker in a face-to-face dialogue (p. 76, figure IV-9) presents the same characteristics as any of the three CMC datasets described here: a power law distribution, where 70-80% of the pauses are shorter than the average pause length (τ estimated at .97 seconds), and a pause longer than 10τ, (9.7 seconds) did not occur even once in that 50-minute dialogue.

Unresponsiveness and Silence in Asynchronous CMC

Our findings on responsiveness, interactivity, and the maintaining of conversational threads in CMC provide tools to investigate instances when unresponsiveness and silence disrupt a conversation. Silence has been researched extensively in traditional settings, exploring issues such as psychological and ethnographic perspectives on silence, silence as a nonverbal cue, silence in court, and silence in a cross-cultural perspective (Tannen & Saville-Troike, 1985). Nevertheless, little research on this topic has been carried out in online settings which are increasingly important in today's virtual organizations, distance learning programs and a variety of similar contexts. The results reported here provide, for the first time, a quantitative definition of online silence. We can now confidently state that "**no response after a period of ten times the average response latency**" constitutes silence. This definition yields a better than 95% confidence level that a response is not likely to occur in the future. We base this on our finding that only 3-4% of the responses are created after that time. An inspection of Figure 1 suggests that this is a direct result of the behavior of the power law function at the slopes relevant for our datasets (-1.7 to -2.0). When the average response latency covers 70-85% of the responses, then a move to the right on the x-axis of one order of magnitude translates to a move of roughly two orders of magnitude on the y-axis. Thus, responses that take longer than 10 times the average response latency (10τ) will number a few percentage points or less.

This result is highly informative for those who moderate online forums such as online classrooms, and who wish to avoid online silence. Quick responses, preferably in the order of magnitude of τ, create an atmosphere of ongoing conversation, of an uninterrupted online exchange. Discussing with students the concept of average response latency, and explicitly defining the expected range of response latencies can also enhance the flow of the conversation. In addition, it is important that administrators who deal with e learners and with faculty who are teaching at a distance, as well as faculty who are responding to email queries sent by students studying at a distance be aware of the expectation to receive a response within a day or two (around τ and at least send an acknowledgement of receipt in case a quick response is not possible.

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