Chronemics in CMC

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Introduction

When I communicate with others using computer mediated communication (instant messaging, sms, social networks, also known as cmc), I frequently notice that the conversation has a rhythm and pace. For example, responding quickly to messages says something different from responding slowly. Another example is that texting someone at 6 in the morning feels very different from texting them at midnight. In interpersonal communication, this is called chronemics. The phenomenon I am choosing to investigate in this paper is chronemics in computer mediated communication.

To define this cmc chronemics clearly, chronemics must be defined. A study by Walther and Tidwell (1995) is a great place to start here. They quote Burgoon and Saine's 1978 textbook to define chronemics as "how we perceive, structure, and react to time and ... the messages we interpret from such usage" (qtd. as cited in Walther & Tidwell, 1995, p. 356). They go on to explain that "Temporal cues may be perceived by users, when they detect—with some systems, explicitly directed to detect—the arrival of a message, or the amount of time between one message and the next" (Walther & Tidwell, 1995, p. 356). In this case, we're using the same definition. To summarize, chronemics in this paper means the frequency of communication, the pacing of the conversation itself (which is sometimes the same as the frequency of communication), and the time at which it takes place. This paper concerns cmc chronemics, so these attributes will be applied to computer mediated communication. My personal belief as I explore this topic is that chronemics communicate a lot in computer mediated communication, and to some extent take the place of nonverbal cues. Additionally, I think chronemics can be used to pull empirical data about relationships out of individual and aggregated conversations. This paper will begin by examining the way researchers have studied the existence of chronemics in cmc, and then discuss the ways researchers have been able to put chronemics to use. Researchers began to document the

existence of chronemics in cmc in the 90s, and are still catching up to the pace of communication today.

Useful Theories

To start examining the literature on computer-mediated chronemics, we need to define and explain some general theories. The first and traditional theory is cues-filtered-out theory. This theory was introduced by Sproull and Kiesler (1991), and is an extremely naive approach. It argues that cmc and cyberspace exist without any non-verbal cues, and therefore is a fundamentally different space. The main conclusion is that there will be fewer and less intense relationships in cyberspace. A side effect, according to the theory, is that relationships are less hierarchical and more democratic; everyone can have an equal share of the conversation. A good summary of the theory is that it views cmc as "inherently impersonal" (Kim, 2005, p. 16). The cues-filtered-out approach is the traditional approach that most other theories exist to disprove, and most people who have experienced cyberspace in any meaningful way would agree that this theory is seriously lacking.

The second theory to discuss is the social information processing (SIP) perspective. It claims that people are able to edit how they present themselves more, while people also give each other the benefit of the doubt more in cyberspace (Kim, 2005). This means that there is an opportunity for even more emotion and intensity of relationship than normal in cyberspace. It also claims that because people are missing normal cues, they fixate on what cues there are, such as writing style, written "nonverbals" like emojis, and other text cues like repeated letters (Kim, 2005). Walther (1996) uses longitudinal studies to explain both why this SIP perspective is the right one, and why studies supporting cues-filtered-out theory delivered the results they did. In short, cmc can be slower both to communicate in at all, and therefore to develop relationships with (Walther, 1996, p. 12). When cues-filtered-out experiments convened "one-shot" partnerships or groups, this failed to account for the time which relationships need to develop (Walther, 1996, p. 12).

Describing CMC Chronemics Phenomena

The first and most important discovery by researchers about cmc chronemics was the acknowledgement that they exist and influence people's impression of the conversation. This is the claim made by Walther and Tidwell (1995), in contrast to the previous view that cmc is impersonal and doesn't contain nonverbal cues. This was the first, most important paper which refuted cues-filtered-out theory. It finds that altering time and date stamps changes the way external observers see the communication. Walther and Tidwell (1995) validates two hypotheses and has complex results for others. First, it proves that a social message sent at night signals less dominance than a social message sent during the day and that a task message sent at night is more dominant than a task message sent during the day. This suggests that even in cmc, "different parts of the day correspond to different activity contexts, and formal 'business hours' versus informal 'after hours' carry different expectations" (Walther & Tidwell, 1995, p. 361). Second, it proves that a slow reply to a social message indicates greater affection than a fast reply, but a slow reply to a task message indicates less affection than a fast reply (Walther & Tidwell, 1995, p. 370). Not all of their hypotheses have simple results.

One complex finding is that a faster response suggests a more equal footing between participants, rather than suggesting that the replier is less dominant than the sender (Walther & Tidwell, 1995, p. 371). Something similar is pointed out in Y. M. Kalman et al. (2013), which will be discussed as well. Walther and Tidwell (1995) was originally based on email communication, but it was also effectively replicated for sms by Döring and Pöschl (2009).

The next important phenomenon documented by researchers is that of online silence. The idea that even in asynchronous communications, it is possible for silence to exist was documented by Ravid et al. (n.d.) and also by Y. Kalman and Rafaeli (2005). Kalman explains that "silence can be defined as no response after an x period of time, at which, say,

99% or 97% of the responses have already been created" (2005). Y. Kalman and Rafaeli (2005) also explains that the silence generated there can have major disruptive effects on online communication, from interfering with team collaboration, to creating misunderstandings.

This can be viewed through the lens of expectation violation theory as well, as described in Y. M. Kalman and Rafaeli (2011) and Sheldon et al. (2006). Surprisingly, they find different results; both concluded that the reward valence of the person violating chronemic norms changes how that violation is perceived, but Sheldon et al. (2006) found that low-reward violaters were more simply more negatively perceived that high-reward violaters. Y. M. Kalman and Rafaeli (2011) found a more complex interaction, although both studies agreed that the norm violation was perceived negatively. Part of that is the context, as both the studies were centered around work. That lines up with Walther's claims that task focused messages with high latencies were percieved negatively. These studies validate SIP theory by suggesting that chronemics are a form of nonverbal communication that participants tend to read into; cues filtered out theory would expect participants to ignore or discount the chronemics because the communication is happening in cyberspace.

Chronemics Applications

Part of the reason cmc chronemics are so interesting is that people build the systems that these interactions occur in; to me that means that if we can discover patterns in cmc chronemics that are well understood, people can apply those patterns when building cmc systems. For example, if a short response latency automatically meant that two communicators were closer to each other, that would be useful for measuring relationship strength and recommending future relational links in a social network. As far as I can tell, no such simple application exists. Instead, it seems that chronemics are being analyzed, but there isn't all that much interest in it as a measurement. Part of this is because of contamination by other correlated variables, which will be discussed later. First, there are

some promising uses of chronemics, starting with an apparent correlation with personality type discovered by Y. M. Kalman et al. (2013).

This study evaluates a measure called interpost pause. It builds on the findings of Y. M. Kalman and Rafaeli (2011) and SIP theory by using chronemics as nonverbal cues that participants use in place of normal face to face cues. Y. M. Kalman et al. (2013) found that people who were more extraverted "exhibited shorter interpost pauses," and that pairs who trusted each other less had longer interpost pauses (p. 16). Interestingly, the correlation with trust was stronger than the correlation with extraversion. Walther and Tidwell (1995) had previously observed that a faster response suggested more equal standing between the two participants, which matches these results well.

Unfortunately, it's hard to know why these two results exist. For trust, Y. M. Kalman et al. (2013) suggests it may come down to the assumption that lying is harder than telling the truth (and therefore should take longer), but it may also be that people just prefer their conversation partner to respond quickly and the dislike of slow responses bleeds into their trust for the person. For extraversion, Y. M. Kalman et al. (2013) suggests this is mostly because extraverted people talk more and with less hesitation than intraverted people. Essentially, the same thing happens in face to face communication because that's just the way people are. To me, this is incredible because it opens the possibility of studying those attributes with access to chat logs and without surveys which can be difficult to sample properly. For example, if Facebook wants to find out which of its users trust each other, it could conceivably make a computer model depending on interpost pause in messaging to find that out. Previously, they would have had to do a survey, then write a model comparing attributes in the survey to user attributes. Those attributes may not have yielded any correlation at all.

The idea that interpost pause or measurable chronemics of any kind could be very useful is something that for some reason, I couldn't find many studies on. In particular, I

was surprised I didn't see studies using it to weight relationships and generate tie strength measurements. Facebook and other social medias generally recommend "friends" or other social links algorithmically, and in order to do that, they usually need measures of a user's current relationships and their strengths. Link recommender systems for social media are incredibly important and profitable, and if you can generate better measures of relationships, you should get a better recommendation. First, we'll discuss some cases where chonemics were able to improve tie strength prediction.

Arnaboldi et al. (2013) is a good example of this. In particular, they use five chronemic variables, when most other studies have only one or two. The most effective were "number of days since last communication, the frequency of contact (bidirectional and related to incoming interactions) and the number of days since first communication" (Arnaboldi et al., 2013, p. 1137). Recency of communication was a great predictor of tie strength, validating the idea that tie strength should be predicted by chronemics. Unfortunately, most researchers (like Servia-Rodríguez et al. (2014)) only look at recency and duration of relationship. While this makes sense from a running time standpoint, it seems that interpost pause or time frame of most communication (like from Walther and Tidwell (1995)) could be useful.

Here we'll discuss studies by Marsden and Campbell (1984) and Liberatore and Quijano-Sanchez (2017) that may provide an answer to why chronemics isn't used more. Tie strength measurements in social networks (in general rather than the cmc specific meaning) have existed for a long time. One study which provides an example of that is Marsden and Campbell (1984). It considers multiple variables for constructing tie strength in social networks. In particular, they consider measurements for duration and frequency of contact, in face to face interaction. The most important part of the study is that they find issues with using duration and frequency of contact, because there are so many confounding variables with those two measures. One example they discuss is neighbors - you may see

your neighbor every day, and be dragged into an hour long conversation with them every day, and still dislike them or feel indifferent towards them. I think this type of confounding tends to make researchers apprehensive when they consider attempting studies like Kalman et al's 2013 study. There are other explanations though.

One can be found in Liberatore and Quijano-Sanchez (2017), in which a meta-study is conducted on the different ways to generate tie strength in cmc social networks. This is the measurement that I would expect to see chronemics factor into. The study does consider chronemics with one measure: Duration (of relationship) (Liberatore & Quijano-Sanchez, 2017). Unfortunately, many of the approaches in Liberatore and Quijano-Sanchez (2017) don't really consider chronemics outside of that factor. One of the reasons may be the difficulty of generating the data for every user; the studies which did include chronemics of individual pair conversations typically used a lot of variables, and still didn't consider interpost pause. To get an idea of the problem with scale and runtime, it's worth mentioning that what Facebook considers its "fast slice-and-dice data store" contains 100 terabytes of data (Bronson & Wiener, 2014). Unfortunately, the more variables used to generate tie strength, the worse the model can be to use, because the model can risk over fitting the data and being quite slow and expensive to use. In particular, if Facebook wants to generate tie strengths for their entire network, it will prefer models that are simpler because they take less computation time and are more reliable.

Conclusion

Researchers have refuted theories that cmc doesn't have chronemic nonverbal cues. A cues-filtered-out theory was introduced by Sproull and Kiesler (1991), and was refuted in Walther and Tidwell (1995). Researchers have documented their existence and influence on conversations, and have used them to some extent, although there is still much to be exploited in terms of their use. SIP theory, as described in Kim (2005), explains that cmc is in fact personal and that participants perceive nonverbal cues. Many chronemic phenomena,

as defined in Walther and Tidwell (1995) are in fact perceived as nonverbal cues and influence positive and negative general affection, dominance, and team collaboration (Döring & Pöschl, 2009; Y. Kalman & Rafaeli, 2005; Y. M. Kalman & Rafaeli, 2011; Walther & Tidwell, 1995). Researchers have been able to put chronemic cues to work to some extent to generate tie strengths (Arnaboldi et al., 2013; Servia-Rodríguez et al., 2014). However, chronemic cues can be influenced by confounding variables which can limit their use (Marsden & Campbell, 1984). Few tie strength models use chronemic cues beyond coarse duration of relationship or recency of contact (Liberatore & Quijano-Sanchez, 2017) despite chronemics offering a wealth of information on user personality and dyad trust (Y. M. Kalman et al., 2013). To look ahead a bit, the research in Liberatore and Quijano-Sanchez (2017) and Y. M. Kalman et al. (2013) suggests that there is an opportunity to try to predict tie strength with interpost pause and aggregate time of messaging.

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