Social Intelligence for Reducing Disruption

Ted Selker

[1]Association for the Advancement of Artificial Intelligence
Atlas, University of Colorado
University of Colorado, Boulder CO
ted.selker@gmail.com

Abstract

Saying the wrong thing at the wrong time can destroy opportunities and even ruin prized relationships. A highly tuned social intelligence guides when, why,and how we communicate with whom. This project takes past work on considerate systems as a base and seeks to map out what a "complete" social intelligence of a person would be. The goal is to demonstrate the value of better models of social intelligence for teaming exercises to create a deeply competent model of social intelligence as well.

Introduction

Social intelligence was first described in Edward Thorndike's 1920 article as the ability to understand people and to act wisely in human relations. It is more deeply examined in (Kihlstrom and Cantor 2011). A raft of popular books like "Emotional Literacy: Intelligence With a Heart" (Steiner and Remkus 2003) describe the value of knowing your feelings, having a sense of empathy, learning to manage your emotions, repairing emotional problems, and emotional interactivity. Infants actually show abilities to understand that intentions and attention guide human action within a few months (Henderson, Gerson, and Woodward 2008). There is a rich bank of popular literature on how to become socially intelligent. Modern language theorists like Steven Pinker describe the many ways we use body, stance and affect in communication (Pinker, Nowak, and Lee 2008). Rational agency (der Hoek and Wooldridge 2003) is described as including the need for understandign of collective intelligence as well (Han and Pereira 2010). Still none of this work provides much of what we might need to operationalize the value of social intelligence in working with computers.

We get a glimpse in the media equation which showed that people personify and treat computers as if they were sensitive to criticsm (Nass and Reeves 1996).

Social intelligence and its related emotional quotient or emotional intelligence is valued and valuable in most human experiences. Unlike general intelligence, social intelligence is a contained domain. It is not based on world knowledge, but acts on it. Building a complete model of world knowledge is impossible because it covers everything and is always changing. What would it mean to make a complete model of social intelligence? Considerate systems research (Selker 2011) has begun to do some of this. Social intelligences demonstrate the value of better models of social intelligence for teaming exercises and show what it would take to make a deeply competent model of social intelligence as well.

Considerate communication can notify a person based on the relevance and importance of communications. The theory is based on decades of performance-tested research on email, SMS, conference calling and meeting support. The idea of making offers to communicate much more likely to be relevant and useful can make huge improvements in human and group productivity. Such systems can integrate into mail, PC, and phones to alert a user of important times and things in their life. This will integrate instant messages, calendar activities, other apps and phone conversations. Considerate communication can even use notifications to mentor activities such as driving as the product unfolds. The process requires developing an understanding and theory of how to recognize the cognitive needs of a person in tasks and collaboration. The theory of context aware interacting, peripheral interaction, and social feedback in communication are all necessary to advance considerate communication.

Imagine you are interested in an important email about a meeting you are scheduled to attend in a few minutes. Unfortunately, you are in another communication thread on social media and talking to another person, or even in a car and on an on-ramp. Any email notification you will be getting is more likely to be to notify you about new job opportunities than about the important meeting. Considerate Communication will specifically prioritize currently important emails and other notifications. It will not notify you of spam and avoid notifying you when you are deeply engaged in other things.

Considerate communication represents a new way of working in two ways. It should work across apps to help a person concentrate and respond appropriately to others. Second it will focus on the opportunity of bundling functionality in a multimodality communication suite. A goal is to help people in a complex and integrated life be more effective in learning, decision making and actions whatever medium the

communication is communicated on. It will then act as assisting and advisory agents to give new ways to empower people, teams and cyber-physical teams.

The Considerate communication helps anyone who processes complex and varied streams of communication on their computer or phone. It can be used to support people in high-velocity communication needs. These approaches might be used for triage enterprise style communication response jobs like help desks, IT support and other services organizations, procurement, medical scheduling and response call centers, etc. On a phone and in mobile venues it becomes a critical tool for eliminating distractions.

Communication today

Three forms of online communication dominate: email, instant messaging and social networking. Email has continued to grow with 347 billion emails per day in 2023. Corporate emails are said to average 121 per day with 10% spam even after filters. At the same time instant messages are also strong with 3.8 billion instant messages sent in 2015. Social networking represents a similar communication volume with 3.9 billion posts in 2015. These are all messaging forms that we can aid; we can easily analyze them and help them interact with us in appropriate times and ways. Organizing and pacing text messages can improve productivity by 30% [8]. The technologies of helping people pay more attention to relevant emails, send more well-formed emails and making all interruptions more appropriate can have untold improvements in people's lives

Opportunities for Considerate Notifications

As humans we implicitly classify and are able to tune out low relevance interruptions such a toaster or microwave timer, as someone else's phone ringing, a message about system updates, a new email notification, navigation advice for a driver. What should be prioritized and when should it be an interruption? Much work has been done to help decide when things should be an interruption and how they might be organized. Disruption Manager(Arroyo and Selker 2011) shows that prioritizing Instant Messages can improve people's performance. Simply reordering the messages and pacing their interruptions with an AI model made the difference. Intelligent mediation can help audio communications as well. Considerate Audio MEdiating Oracle (Rajan, chen, and Selker 2012) shows that thoughtfully interjecting a meta-comment into it a system can improve a conversation.

Approaching a person appropriately requires thinking about their social situation: taking a considerate computing stance. An AI based notification prioritization architecture that can improve people's lives. Comments or notifications to a person can disturb or improve their work across computer tasks, human communication, and physical tasks. Automatic analysis of email can also be used to help any email user be aware of the email they are getting. Merely labeling the subject lines makes a difference. The value of simplifying notifications about emails might greatly improve people's responses to each other. Driftcatcher (Lockerd and Selker 2002) is a research email system that improves people's response performance with a UX that labels implicit social context. Driftcatcher annotated subject lines with indications of informing, inquiring, interest, keep In touch, planning, sharing, intimate, and supportive. Such a system can put more emphasis on time and space coincidence (emails about what you are doing). It can put more emphasis on relevance to the scheduled or actual topic you are engaged in (IMs and phone calls that are coincident or related to the message). It can put more emphasis on emails you have been responding to with urgency in the past. It can put more emphasis on planning emails.

Another notification opportunity for email is in the writing of it. This is demonstrated in a system that comments on the email you are writing. The empathy buddy (Liu, Lieberman, and Selker 2003) system improved people's outgoing emails by making faces based on the emotional content of the emails. In this case empathy buddy notifies the writer of email with faces to reflect the emotional content of what they are writing; indeed, they change the tone of their emails. A follow-on project created in the startup Alphyco called Reflect used fine tuned AI models to help a user consider how their text, email or even video conference call utterances might be recieved by others. It gives visual and short phrase feedback for some 25 salient affects (Alphyco.com).

The Disruption Manager (Arroyo and Selker 2011), shows that time shifting IM's by up to 2 minutes, improved people's success and responses. Time shifting due to activities while driving as described above in simple notifications can reduce distractions as well. Indeed in many cases when a person is attending to one thing, timesharing another notification long enough to allow them to absorb the current communication is valid. Even time shifting a traffic direction by a second or two would allow a sentence in person or on the phone conversation to be completed. As well we focus on recognizing similarity of topic or reasons for multiple communication channels. In this aspect the system can use common sense reasoning or other semantic analysis approaches known in the art to compare tasks represented by audio and textual communication, calendar and other applications indications of tasks of importance. The system can choose to avoid communication for a variety of reasons. It can note activities such as changing speed in a car or stopping and starting on a bike, it can note topic similarity like checking the entrances of a building and calling people that work in the building, it can use activities as reasons to be pertinent and timely. Of course it will reduce textual interactions when driving. It will reduce ringing during sentence completion, performing any complex task like with hands or body or vehicle. It will reduce or eliminate communication when loud important noises occur (breaking dishes, PA system announcement, a person explaining something). It will increase volume when there is high ambient noise.

NoteMinder Architecture

Noteminder consists of a considerate sensor stage, a triage conflict assessment stage, and a considerate output stage. The considerate sensor stage consists of sensors which can be physical sensors or Virtual software 'sensors'. Considerate sensors register and process inputs to understand activ-

ities. Activities in an email can be social requests, requests for actions etc. Activities in a mapping system can be steps in route, changes in route, discussions about routes etc. Activities such as these are assessed with rules or machine learning algorithms to prepare them for the triage conflict assessment stage. The Triage stage collects not just what the considerate sensor said it needed but how much it thought it needed it. The triage sensor takes into account how much a sensor wants to notify a person and other things. First, it notes how often this sensor is correct in its assessment of its need to notify a person, next, it takes into account other sensors needs to notify. Some of the sensors come from other factors of what the person is doing. For example, if the person is busy with their boss, the sensor can request a student's IM be delayed. The considerate output assesses the frequency, interruption value, and emotional valence of messages it will deliver. It considers how (audio, screen, beep,. . .) and when to deliver the message (immediate, delayed, negotiated,)(McFarlane 2002). .

Each element: considerate sensor, triage assessor and considerate output are currently controlled by rules that come from heuristics or machine learning. As needed the elements can migrate to more sophisticated controls of a Bayesian network.

Each element further includes models of user, system, and task as they were developed in the Understanding Considerate Systems paper (Selker 2011). Such models are implicitly embedded in any system. Typical systems include a static user model assuming - that the user knows the interface and its implications. Systems might have a non-reflective system model that will respond to user actions to turn on a motor or whatever. Systems might have a system centric task model that the user will only pay attention to this system. Noteminder includes a dynamic user model that changes to represent the user by their actions and relationships to others and other organizations. Noteminder includes a system model that Noteminder is coordinating communication from multiple sources while the user is doing other things. Noteminder includes a task model that is assessing how important it is to the user, who is of course, engaged in their life. These models are implemented with operational rules such as "if the person is talking don't talk also" relative to a task model.

Improving social effectiveness of computer notifications

Systems notify people in many situations, these can usually be more responsible. When is a message urgent? A system using random forest learning stopped TV shows when it heard a doorbell, dishes breaking, it made the volume louder when it heard dishes being washed, or people commenting.

There are many examples of where systems could know not to interrupt. For example, Skype, IM, and email alerts might change when a presentation is in process. IM's could wait for breaks in conversation, end of phone calls and even turns in a car or give progressive requests for interruptions (such as a clearing throat noise) instead of barging in with a statement immediately. Telephone radio signal power indications could be mapped to help a phone know when it will not render good service. Low radio signal indication can use collected data for such a map. With a phone signal power map, the phone can forecast the possibility of a dropout in the next few minutes and help conversants expect when their call might resume. When a signal is going to drop out, the phone could be ready with a recorded a message to send the other person, the phone can alert you, turn on music, engage you in an important secondary task, play music, or at least help you know when the call will resume and give apologies so you don't have to.

Mentoring

Computing agents can be separated into assistive agents which do things for you and advisory agents that teach you to do things. While the notification system can use both approaches, advisory remarks might be useful as an educational tool. Consider the video conference calling system CAMEO's statements "turn taking" or "something to say". These comments significantly improve the dynamics of short conversations. A notification system then can be a social mirror, helping the people that use it learn to communicate better.

Future of Considerate Systems

Operationalizing Social Intelligence's Impact on computing interfaces start with simple things; we can use AI to recognize pace, tone, relatedness of topic information. The more difficult issues of actually using expressions of empathy, manage your emotions, repairing emotional problems, and emotional interactivity have also been attempted in Alphyco.com's reflect and other systems described in this article. Problems of social intelligence are so important in human responses that getting these things wrong can be disastrous with large numbers of accidents being caused by using smartphones while driving. The value of continuing to focus on fine tuning AI's for socially appropriate responses should be an ongoing and important goal for human system as well as all teaming uses of computers.

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