Signaling Identity

chapter abstracts with representative bibliographic references

as of May 10, 2007

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Part I: Foundations

The introduction provides an outline of the book and its purpose. The signaling chapter is the foundation of the entire book; it explains signaling theory and the key issues involved in applying it to human behavior. The three final chapters in this section - on deception, reputation and impression formation - are short introductions to large concepts that are key to understanding signaling theory and its application.

1. Introduction

Human beings are social creatures. We live in groups, form intense relationships with each other, and structure our world with organizations ranging in size from partnerships to nation-states. Today, an increasing amount of this social interaction is occurring in the domain of mediated communication.

The mediated world is a synthetic space, wholly man-made. Its design determines what we can see, hear and do within it. It is a mutable space, rapidly evolving as technology advances and new interfaces are created. It is an increasingly ubiquitous world, touching every aspect of life. Email and other communication media allow people to maintain a much larger set of contacts and acquaintances; online forums make it possible for geographically and culturally distant people who share a common interest or concern to find each other. People rely on the net for support and friendship; it is the place to go for finding dates, business connections, and life partners.

The goal of this book is to help us understand the social dynamics of this ever changing world, and to help shape the design of future spaces. To do this I use the framework of signaling theory as developed primarily in the field of theoretical biology. Most of the things we want to know about each other – one's identity, status, and intentions – are qualities that are not directly observable. Instead, we rely on signals, which are indicators of these hidden qualities, in order to comprehend the world around us.

We may interpret a big house as a signal of wealth, direct eye contact as a signal of honesty, a pierced nose and tongue as a signal that someone is not seeking a career in banking. However, signals are not always reliable. Sometimes the sender deliberately manipulates them to create a false impression. Signaling theory provides a framework for understanding why some signals are open to deceptive use while others are not. Furthermore, in the human world, signals exist within a rich context of cognitive abilities and cultural meanings. We need to look to this larger context in order to understand how signals develop and how they are understood (or not) by those who see them.

Signaling plays an even bigger role in mediated communication, for the online world is a place built of information, in which nearly everything is a signal. Qualities we

are accustomed to simply observing become, in the mediated world, hidden traits we assess through observed signals. Height, for example, is directly observable in the face-to-face world. In mediated spaces, we can infer height only from signals, such as the claim "I am over 6 feet tall."

Mediated communication occurs within wholly designed environments. Whether you can see the face or hear the voice of your conversational partner, whether you can see a history of other people's actions, and whether or not some external evidence anchors their claims of identity are all a function of decisions made by the system's designers. These design decisions determine the reliability and effectiveness of communicative signals and other cues.

Yet today such designs are often made with an incomplete and often naïve understanding of what people are really trying to convey and interpret. By looking at communication through the framework of signaling, and by understanding how signals work – what makes them reliable and how they evolve – we can design better contexts and interfaces for social interaction.

The introductory chapter outlines the basic ideas of the book. It discusses the fundamental qualities of the mediated world – that it is synthetic and designed, that it connects millions of people, and that it is a disembodied world, composed of information rather than objects, bits rather than atoms. It will explain why the question of how we perceive and perform identity online is interesting and important and it will describe how examining these question though the lens of signaling theory can bring greater clarity to our understanding.

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2. Honest and Dishonest Signaling

This chapter explains signaling theory, which is the theoretical foundation of this book.

Many of the things we want to know about other people are not directly perceivable. Are you a nice person? If we had children together, would you be a good parent? Did you really like the cake I baked? We rely instead on signals, which are perceivable indicators of these interesting but invisible qualities. A quality can be almost anything: strength, honesty, genetic robustness, poisonousness, suitability for bookkeeping employment, etc. We rely on signals when direct evaluation of the quality is too difficult or dangerous. A bird wants to know if the butterfly it is about to eat is poisonous before it takes a bite, and relies on the signal of wing markings to decide whether to eat or move on. An employer wants to determine before making a hiring decision whether a candidate will be successful or not, and relies on signals such as a resume, references, and the candidate's actions and appearance to predict suitability for the job.

Signaling occurs in competitive environments. The interests of sender and receiver seldom align exactly and often are quite at odds with each other. Sometimes the

competition is fierce and overt, as with prey and predators. Potential prey may signal to predators that they are poisonous or that they can run so fast or fight back so strongly that pursuing them is futile. Sometimes the competition is subtle, as when the signaling is between seemingly congenial companions. However, even within cooperative relationships there are conflicts of interest about plans and identity. I wish to present myself in the best possible light while you want to know what I am really thinking and what I really can and will do.

In these competitive arenas, being deceptive can be quite beneficial for the signaler. If a bug presents itself as poisonous when it is not, it may avoid being eaten. If I present myself as more experienced than I really am, I may get a better job. However, such deceptions are harmful for the receiver. If the rate of deception becomes too high, the signal loses its meaning.

Signaling theory explains what makes some signals more reliable than others are. A reliable signal is one that is beneficial to produce honestly, but too costly when produced dishonestly. One class of signals that satisfies this requirement is known as "handicap" signals; these are signals that impose extra costs in the domain of the resource being signaled. In the animal world, the prototypical example is the immense antlers that signal the strength in an elk. Carrying such antlers is very costly in terms of strength: a weaker elk cannot afford to expend so much of its strength on this display, and thus must display smaller antlers.

The costs that ensure reliability can also be imposed from the outside. Much of human signaling is "conventional" signaling, where the relationship between signal and meaning exists by convention, rather than a tightly coupled structural relationship. Such signals are open to deception, for there is no inherently greater cost paid by dishonest signalers. However, the receiver or the community at large can impose costs on dishonest signalers to maintain reliability. Such social retribution requires knowing the identity of the receiver and a communication structure for coordinating the response.

Signaling theory has been developed primarily in biology, looking at animal communication. Applying it to human social interactions requires several modifications. First, people are adept at finding ways to circumvent the costs of deceptive signaling, and understanding the dynamics of this arms race is essential. Second, we are capable of complex social organization and can impose societal costs on deceptive signalers in ways that are impossible for non-humans; this enables our extensive use of dynamic, conventional signals. Third, most analyses of animal signaling have taken for granted that the meaning of the signal was understood by the receiver. In the world of human signaling, particularly with rapidly changing conventional signals, the meaning of the signal is often ambiguous. We need understand how signals acquire their meaning and to account for misinterpretation in analyzing the signaling process.

This chapter presents signaling theory, drawing from work done in economics, biology and game theory. It discusses the differences between unintentional cues and communicative signal, outlines the different types of costs and benefits that make up the economics of signaling and shows how to apply this theory to understand phenomena in daily social interactions.

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3. Deception

This is a shorter background chapter about deception.

Keeping signals reliable requires being able to detect and punish deceptions. We need to understand the underlying cognitive process that goes into creating and sustaining a lie, for internal conflicts about the lie may cause one inadvertently to reveal cues indicating one's deception. This has important design implications for creating mediated environments, for cues to deception may be obvious in one design and obscured in another.

Deception is present throughout our everyday life. Society condemns some deceptions: doing something wrong and lying to avoid punishment is not acceptable, and neither is maliciously concocting false tales in order to discredit another. Yet other deceptions are condoned or even required. If I do not like the cookies you have kindly baked for me, it is still required that I thank you graciously and with seeming sincerity for the well-intentioned treat. It is important to understand when reliability is actually the goal: sometimes, we prefer deception. Furthermore, in the social domain deception is often ambiguous. Where there are rigid class distinctions, attempting to pass as a member of another class is clearly proscribed as deceptive. However, in a society such as ours, where social mobility is celebrated, it is unclear whether cultivating a more desirable accent and dressing in the style of a social class above the one in which you were born is an example of deception or ambition.

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4. Individual identity and reputation

Identity and reputation play an important role in maintaining the reliability of signals.

Punishing deceptive signalers can make reliable signals that are otherwise insufficiently costly to prevent deception. A police officer's badge is a conventional signal of authority. The punishment that goes with impersonating a police officer, rather than the cost of the badge, keeps that signal honest.

Identity is required for such sanctioning: one must be able to connect the misdeed with a specific individual. More powerful than individual retribution is social enforcement, which requires the ability to communicate information about another individual – reputation information - within the community. Reputation allows many people to benefit from the experience of a few.

The foundations of social sanctioning, and thus of conventional signaling, are recognition (knowing the identity of another), memory (being able to retain that knowledge over time), and communication (being able to convey that information to another). In the animal world, species that do not have these abilities cannot have reputation based social enforcement. Humans do have them and social sanctioning is deeply integrated in our everyday communication – it is part of what has allowed us to develop our rich and dynamic vocabulary of conventional signals.

However, in the online world, we cannot take these abilities for granted. Identity is problematic: participants may be anonymous or use easily replaced pseudonymous identifiers. Recognition and memory are impaired in the perceptually sparse world of online interaction. In the physical world, our experiences provide rich impressions: we see the others' faces and clothing, hear their voices, and encounter each other in richly detailed contexts. Online, such sensory details are often missing: people may be identified only as cryptic login names or simple and often misleading pictures. Communication is may also be limited. For example, in some sites, public postings are the only means of communication.

In the face-to-face world, members of a group often share reputation information privately among themselves. This type of information sharing, often termed "gossip", is an important mechanism for maintaining social groups. It spreads information about an individual's actions, thus helping to maintain community mores and signal reliability. It also motivates people to maintain strong social ties, so that they will be in the loop for this valuable information, so that they will be in the loop for this information.

Gossip traditionally works on a small scale, among communities of acquaintances. The large groups of strangers that are common in the online interactions require a different process for sharing reputation information. Reputation systems, in which people describe their experiences with the subject in a public posting, are a common solution. Anyone in the community, which is often the public, can read these comments. These public rating sites do not require that the rater have any relationship with the listeners, and thus they function on a much larger scale than

gossip does among acquaintances. However, this raises issues of reliability: is a person with no ties to the listeners motivated to provide them with useful information?

This chapter will look at individual identity and reputation. The first part will discuss individual identity – which is itself a quality we interpret from signals of varying reliability, such as names, identity cards, biometric markers or one's face. The second part will be about reputation, looking at both at private gossip and at public reputation systems as means for disseminating it. The chapter will conclude with an analysis of alternative approaches to large-scale reputation management.

This chapter is important for the thesis of this book because many of the signals in the mediated world are conventional signals, which depend on reputation to maintain honesty. Contemporary public reputation systems are often unreliable; understanding how to make them more trustworthy is an important design challenge.

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5. Impression formation

Individual identity is about who specifically you are: it is the identity of ID cards, fingerprints, and face recognition. Social identity is about what type of person you are: it is the identity of impressions and prototypes, of the expectations we have of how others think and will act and of the rules that govern how we act toward each other. Social identity is fundamental to all social interaction: people want to know about others' beliefs, status, affiliations, and intentions in order to interpret their words and actions and to predict their future behavior.

The signaling examples from the world of biology have been simple mappings, with a direct correspondence between signal and trait: big horns indicate strength. Our interpretation of social identity is more complex. We bring to the process a number

of pre-existing prototypes and we form our impressions of each other by identifying them with one or another of these prototypes. Thus, from a limited set of interactions and observations we form richly detailed (if not always accurate) impressions of each other. Understanding how these we create these prototypes, share them across a culture, and use them to form beliefs about each other is an essential part of understanding how human social interaction.

Interpretations of identity are subjective. The prototypes that populate one person's cognitive map of the social world will be different from another's, formed by different experiences. The more people share of a common culture, the more likely it is that their social prototypes will be similar.

One of the paradoxes of the online world is that it brings together people from vastly different backgrounds into an environment where identity cues are sparse. The relative lack of identity cues necessitates relying more on one's personal prototypes to infer details about others, while the cultural difference among participants means that these prototypes, and thus the resulting impressions, are likely to be disparate.

Online identity cues are easily manipulated. A self-presentation is seldom a direct and "honest" indication of a person's actual internal state. People manipulate the signals they give off in order to manage the impression others have of them, to induce various emotional responses, and because it is required by society. Looking at impression management through the lens of signaling theory makes us focus on the constraints that keep these signals meaningful.

Sometimes, we want to assess others' internal state as well as possible, to "see through" the ways they have chosen to manage the signals they give off. But not always. Sometimes we are content with the behavior as it is, disregarding whether it is a reliable indicator of internal state. The dynamics of identity presentation and interpretation are complex, and the receivers may be complicit with the signalers in maintaining deception.

Online identity cues are also often novel, displaying different types of information than is available in the face-to-face world, or showing it in a very new form. The online world provides an extraordinary opportunity to see how people adopt and adapt to new forms of signaling. For example, social network sites display of all one's 'friends" as part of one's profile, a feature that provides a new modality for personal expression, manipulation – and for perceptive decoding.

This chapter will introduce these key concepts about identity. It will discuss prototype formation and the special problems presented by the culturally diverse yet communicatively sparse online environment. It will explore what "honest" signaling means in the context of identity management.

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Part II: Analysis and applications

The second part of the book looks at areas where signaling theory can change how we think about human communication and how we design for online interaction.

6. Fashion as a signal

The thesis of this chapter is that fashion, often thought of as foolish and frivolous, is actually a signal of one's adeptness and adaptability in an information society. It indicates one's level of access to new information and willingness to change continuously. With information becoming the key source of power and influence in our society, fashion is becoming an increasingly significant signal.

Fashions are signals where the form of the signal changes over time while the indicated quality, generally one's affiliation to and status within a particular social group, remains the same. There are fashions in clothing, music, language and ideas – indeed, any changeable, information-based expression. Just as displays of strength indicate one's prowess in the physical world, and displays of money indicate one's prowess in the financial world, displays of fashion indicate one's prowess in the information world.

Fashion signals occur in socially mobile cultures, where status is highly contested and knowledge and social connections are essential. As a widespread cultural phenomenon, fashion first emerged in Europe in the 14th to 17th centuries, as the rise of merchant and artisan classes brought new social mobility, and technological and scientific developments ushered in a world in which change and a belief in progress replaced the stasis of the medieval world. In the following centuries, information flow has accelerated, and so has the rate of change in fashion. Whereas 16th century fashions might change over a period of months or years, today there are fashions that emerge and sink within the course of a few days.

Fashion signals access to information within a particular social affiliation, one's willingness to adapt to new ways of doing things, and one's commitment to that affiliation. Keeping up with changing fashions requires knowing which fashion to follow (thus signaling information access) and spending time, money or other resources on frequent updates (thus signaling need and commitment).

Within the culture of fashion, there are innovators, leaders and followers: roles that require different levels of knowledge and resource expenditure. At the top of a fashion hierarchy one must spend considerable time maintaining the contacts that provide access to the newest ideas. As a particular signal moves down the hierarchy and become mainstream, less effort is required to learn about it. The path a fashion takes as is spreads traces the structure of a society.

In the 16th century, fashion signaled access to information, at the time a rare resource. Today, information is plentiful, but attention is limited and the ability to find the right information in a barrage of data is a valuable trait. Material fashion – fashions embedded in goods such as cars or clothing – cannot keep up with the rate of change that contemporary information flow make possible. What will be the future of fashion? How will fast, information-based fashion be integrated with personal display – and how will fashion become embodied in the virtual world? The chapter will conclude with an analysis of the design challenges posed by accelerating fashion.

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7. Gifts

Gifts are puzzling. They are puzzling to economists, who have noted that they are extremely inefficient. Enormous amounts of money are spent buying presents for

people who often do not want or need the item purchased for them. And they are puzzling to participants in the exchange: an entire industry of etiquette writers and department store gift advisors exists to help people figure out what is an appropriate present to buy. Holiday shopping is stressful, as people worry about who to give to, what to give, how much to spend.

The seeming inefficiency of gifts becomes much more understandable when we look at them as signals that indicate the sender's intentions for the relationship and beliefs about the recipient's interests. In this case, the inefficiency of the gift is an important part of its signaling function: it is a potentially costly risk. Indeed, there is a subtle but important distinction between gifts and other forms of exchange; when the focus is on the value of the gift or on the expectation of return favors, the gift becomes barter – or bribe. Gift giving is an example of how an increase in efficiency can cause a decrease in communication: if you make explicitly known your preference in gifts, then my giving you the right gift can no longer indicate how insightful I am about your beliefs and taste.

Gift giving has been proposed as a metaphor for the growing phenomenon of voluntary participation in collective endeavors. Such endeavors include software projects, from operating systems to mobile games, large publications, and extensive support networks. Like gifts, these voluntary efforts are puzzling to classical economists: why would someone find little joy working 8 hours a day to write compiler code for pay, then go home and happily code some more for free? Understanding the motivations driving these contributions is an important challenge, for an increasing number of significant projects are created as free collaborations.

This chapter will look at gift giving as a form of social signaling, discussing the distinction between gifts and other forms of exchange, and showing how some seemingly inefficient costs serve an important communicative function. The second part of the chapter will examine the role of gifts and gift-like behaviors in the formation of collaborative endeavors.

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8. Social networks

Social networks are the interlocking ties of relationships that form the structure of a society. The advent of the mediated world has changed these networks in several significant ways. First, it has made them bigger. Historically, a village resident might have had 100 contacts over the course of a lifetime; today's active online participant may be in communication with several hundred people and have an accumulation of thousands of contacts. Second, it has made them global. In the past, social networks had consisted primarily of local ties; today they are worldwide networks in which similarity of interests, rather than geography, defines proximity. Most recently, it has begun changing how they a formed. A number of software programs and web sites build large-scale renderings of social networks by inviting people to list all their friends and connections. These people in turn list all their friends and connections, creating a partial, yet extensive social network map. The goal of such sites is not only to depict the network, but also to assist people in making new connections through their existing ties.

This chapter will start with a description of the structure and formation dynamics of social networks. The focus will be on signaling information about social networks – how people indicate to others who their connections are and why they would do this. The chapter will then look at how communication technology is changing social networks and discuss the changes this makes in what information people want to know about each other and the signals they use to indicate it.

Current social networking sites are still primitive. Their notion of ties is uniform – they make little distinction between the ties connecting close friends and vague acquaintances. Nor is there any recognition of the faceted nature of social life. People associate with different groups, consonant with different facets of their lives: they may not wish to make those connections known to each other. The final section of the chapter will discuss new designs for social networking.

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9. Real and virtual faces

The face is essential in real world social interactions: we read character and expression in the face, we recognize people by their face, and the face indicates where one's attention lies. Yet the face is absent from many online interactions – and this is in part why many people find cyberspace to be only a pale substitute for real world contact.

There are numerous approaches for incorporating facial representations into online interactions. These range from the simple and now ubiquitous smiley to animated avatars to real-time video, all differing significantly from the experience of face-to-face, immediate interaction. Sometimes this difference makes a visual interface less useful or appealing than a textual one; in other circumstances, it can be preferable even to face-to-face discourse. Most notably, we can design the mediated face to selectively present information: it can convey expressions but not identity, or vice versa. Controlling the information a face conveys is a very complex challenge, for we read meaning in the subtlest of expressions.

Signaling theory is central to this chapter because the face's structure, decorations, and expressions all function as signals that we interpret as representing underlying qualities of character, affiliation, and emotional state. How reliable these signals are, whether they are innate or culturally dependent, and what is the real nature of the underlying qualities are all controversial topics. I will present arguments from research in cognitive science and related disciplines.

This chapter is central to the book's thesis. It starts with an in-depth discussion of the face as signal, and then uses that as the basis for analyzing online facial representations and for designing future implementations. It is the main example of how to apply the insight gained from signaling based analysis to new media design.

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10. Epilogue: The Not Quite Human Other

This chapter is about our relationship with the not-quite-human other: software agents, robots, highly augmented humans. It is the most philosophical chapter of the book, having at its core questions about our knowledge of other minds, the nature of empathy, and the extent to which we really want to know each other.

Throughout history, people have attempted to synthesize life. Ranging from the animatronics of Vaucanson to the dark myths of the Golem and Frankenstein, attempts to play the role of ultimate creator have elicited fascination and horror. With the advent of computers, this quest and the concerns surrounding it have achieved a new urgency, for these mechanical brains, while looking nothing like a living creature, arguably have the potential to produce thought and language, that which is most uniquely human.

In 1950, Alan Turing published the essay “Computing Machinery and Intelligence” in which he reframed the question “can machines think?” as “can we know if a machine is thinking?” He used the metaphor of the Imitation Game, now popularly known as the Turing Test, to show that it was conceivable that a machine would be undetectable able to imitate human interaction without necessarily thinking like a human.

In the early 1960’s, Joseph Weizenbaum created Eliza, a computer program modeled on a Rogerian psychoanalyst that used simple linguistic parsing to sustain its side of a conversation. His goal was to show that even an obviously non-intelligent machine could converse, and thus conversation was a poor arena for judging intelligence; instead, people reacted enthusiastically to the computational partner, even proposing it as a replacement for human psychologists. Weizenbaum, deeply disturbed by this reaction, retired from the field of computer science and wrote about

the dangers of becoming reliant on the machine made decisions, decisions that would be made without human compassion or wisdom.

Today, conversational agents are becoming common participants in mediated interactions. The issues raised by Turing – can we distinguish between machine and human in a mediated interaction – are essentially signaling questions. What are the signals that indicate that one is human? Conscious? Intelligent? How do we define these underlying qualities – and are they the ones we are trying to assess? In some contexts, we want to know if the other is truly empathic – and in others, all we really want to know is if they have access to an accurate train schedule.

This chapter will examine the problem of our perception of machines that seem human through the lens of signaling theory. It will start with a close analysis of Turing's paper and Weizenbaum's *Eliza* project. The signaling approach will highlight the importance of context – that depending on the qualities one really wishes to uncover, the relationship between signal and quality, including the costs of the signal and its reliability, differ markedly. The analysis will extend from software agents in the mediated world to robots and augmented humans in the immediate world. The chapter will conclude with a discussion of the implications of these ideas in terms of our understanding of human relationships and the importance of identity and empathy.

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