Indirect Requests and their Role in the Conversational Scoreboard

Master's Thesis

Presented to

The Faculty of the Graduate School of Arts and Sciences
Brandeis University
Department of Computer Science
Sophia A. Malamud, Advisor

In Partial Fulfillment
of the Requirements for

Master's Degree

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August 2012
ABSTRACT

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A thesis presented to the Department of Computer Science

Graduate School of Arts and Sciences
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Waltham, Massachusetts

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Speech Acts, as introduced by J.L. Austin have long been the study of philosophers and linguists alike. The speech act is a term created to explain those utterances that are not descriptive in nature, but rather serve to perform an action. Once these types of utterances started to be analyzed, it quickly came to light that there are many types of such utterances. This gave rise to the study of indirect speech acts (Searle, 1975 and Grice, 1975). Not only is their form varied, but so is their function and interpretation.

The aim of this thesis is to create a unified model of conversation, including motivation for and interpretation of indirect requests. I will apply game-theoretic methods to tie utterances together into a language game.

Publicly available corpora were analyzed to determine the form and function of indirect speech acts. Building on theories of politeness as the motivation for indirect speech acts, conversation is modeled as a language game (Brown and Levinson, 1987 and
Utterances in this model are treated as moves in a conversational scoreboard (Lewis, 1979), using a preference hierarchy (CP-nets, Boutilier, 2004) as utilities.

Utterances made correspond to moves in an elaborate game. Every utterance, direct and indirect speech acts alike, has its own place on this scoreboard and its own price.
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1. Introduction

“Take care of the sense, and the sounds will take care of themselves.”
-Lewis Carroll, Alice's Adventures in Wonderland, Ch.9

1.1 Widespread Occurrence of Questions about Ability and Imperatives

Communication comes in many forms. The focus of this paper is on language communication, primarily focusing on requests – how they are formed, interpreted, and responded to in a conversation. Three main types of utterances will be identified and discussed in this paper – declaratives, interrogatives and imperatives. Two main types of requests will be considered – questions about ability (QA) and imperatives (IR). Requests are performed in every context every day. Requests occur between people in every power relationship and with every social distance. The form of the request varies in different contexts, as does the response, and this paper concerns itself with the reasoning and calculation between these differences.

There currently exist many theories concerning the interpretation of indirect requests. There are many proposed theories as to the semantics of actions, as well as many theories exist that serve to explain how a successful conversation functions. The theoretical background section of this paper will discuss many of these theories.

There are many components to formulating and interpreting indirect requests. It
is important to be able to define the semantics of a conversation, as well as fully develop a unified theory to understand indirect requests. In addition, such a theory will help develop an algorithm to identify indirect requests – something that can be tricky and illusive.

1.2 Structure of the Paper

Sections IV and V provide theoretical background, describing Searle and Grice's theories of speech acts and the cooperative principle. Sections VI and VII provide a detailed account of the semantics of utterances and the conversational scoreboard. Section X describes the corpus study I performed to gain an empirical understanding of such and such phenomena and to test my model. Section VIII introduces game theory in general and its applicability to conversational modeling in particular, Section 10.3 analyses naturally-occurring and made-up examples, and Sections XI and XII contain the discussion and conclusion.
II. Study

2.1 Objective

Indirect requests have long been the focus of philosophers and linguists alike. They are an important part of speech acts (Section IV), as introduced by Austin, and analyzed by Searle and Grice. In addition, a lot of work has been done on the conversational scoreboard (Section VII) and the language game. There is need for a unified theory that is able to explain how individuals communicate – what goes on behind the scenes, how utterances are correctly interpreted and acted upon. The objective of this paper is to provide such a theory, explaining the motivation behind an utterance, the interpretation of an utterance, and ultimately the response to an utterance.

2.2 Methodology

2.2.1 Data

Data was collected from The Santa Barbara Corpus of Spoken American English (Du Bois et al, 2000, 2003, 2004, 2005). This freely available corpus contains sixty segments of transcribed discourse. Using Python and NLTK indirect requests were extracted from these discourse segments. Questions were extracted by searching for the ‘?’ string, after which the questions were annotated for indirectness, and background information was used to interpret if the questions were in fact indirect requests. This provided a unique insight into indirect questions and their use in everyday speech in
America. An example from this corpus is analyzed in detail in Section X. In addition, an algorithm was created to extract imperatives from this corpus. The NLTK tagger was first used to tag part of speech (POS). The Penn Treebank POS tags are used by this tagger (Santorini, 1990). The algorithm then searched for verbs in base form (denoted VB in the Penn Treebank tagging system). Once these were located, the algorithm identified those sentences in which the verb in base form was NOT preceded by: (1) a noun (POS tags NN, NNS, NNP, NNPS); (2) an adverb (POS tags RB, RBR, RBS, WRB); (3) to (POS tag TO); (4) a pronoun (POS tags PRP, PRP$, WP, WP$); and (5) a modal (POS tag MD). This is reflective of the syntactic rules for forming an imperative in the English language. The resulting sentences were mostly imperatives, however there were a few sentences that weren't (e.g. 'We'd all be sitting in a circle'). Some of the inaccuracy may be due to the Penn Treebank POS tags – the 'd' in 'We'd' is tagged as a separate entity, in this example it is correctly labeled MD, and 'all' is labeled DT (determiner). In this case the phrase 'We'd all' refers to 'We' however this is hard to pull apart and identify as a pronoun using the POS tags. There is room for improvement with this algorithm, but this is a task within the realm of possibility. Creating an algorithm with similar techniques to identify indirect requests would be nearly impossible. In order to write an intelligent algorithm, one must first understand the process by which an indirect request is identified. This is one of the goals of this paper – it is a proposal of how indirect requests are identified and responded to.

The Santa Barbara Corpus of Spoken American English was used as an initial starting point, and as inspiration for the analysis to follow. The theory of indirect requests, as well as other types of utterances are discussed at length below in order to
create a cohesive theory of conversation (Sections II - VI). Game theory (Section VIII) is also introduced as a useful tool in analyzing conversation, after which a unified theory is presented (Section X) and tied back to an algorithmic process.

2.3 Theoretical Interest

In this paper, the main participants in a conversation will be denoted 'the Speaker' and 'the Hearer'. The Speaker is the one making the first utterance in a conversation (or conversational segment). The Hearer is the one responding to this initial utterance by the Speaker.

I will be concerned with three main clause types: declaratives, interrogatives and imperatives. Each of these clause types is defined by its syntactic form, however they also possess semantic and pragmatic denotations. To distinguish between these various elements of each clause type, the following will be used for interrogatives and imperatives:

For the interrogative clause type -

Question = set of propositions (semantic denotation)
Query = speech act (pragmatic denotation)

For the imperative clause type -

Action = semantic denotation (details to be described in Section VI)
Jussive, or directive = speech act (pragmatic denotation)

2.3.1 Questions about ability (QA)

Interrogatives, are very common in language and conversation. They possess a specific syntactic form in English, namely a tensed auxiliary verb (e.g. 'can', 'will', 'do',
etc) followed by the subject and the untensed lexical verb. Specifically, this paper will be
dealing with questions about the Hearer's ability to perform some action. Interrogatives
are generally thought of as being quests for information, however there are also
interrogatives that are really requests. Questions about ability can either be interpreted as
quests for information, or requests. The classic example, 'Can you pass the salt?' is
literally a question about ability, if interpreted purely based on its direct meaning, it is
asking the Hearer if they are able to pass the salt. However, more often than not, this
question is interpreted as a request to pass the salt. This paper is concerned with how and
why the Hearer would come to this conclusion, and why the Speaker would choose to use
an interrogative rather than an imperative to make a request.

2.3.2 Imperatives (IR)

An imperative is in many cases a command. For example, 'Go home!' is a classic
imperative meant to be a directive. However, utterances that appear to be directives on
first impression, may in fact turn out not to be, e.g. 'Touch the cake and I'll slap you'.
This sentence is an imperative, however it is not meant to be interpreted as a directive,
but rather as a threat. The goal of the Speaker by uttering this sentence is to make sure
the Hearer does not touch the cake, in contrast to what the imperative 'Touch the cake!'
would mean. The same sentence structure may also be used to make a promise, e.g. 'Cut
the cake and I'll give you a piece'. With this utterance, the Speaker is requesting that the
Hearer cut the cake, in return for a piece of it. So how does the Hearer determine
whether the Speaker is making a request or a threat? In addition to threats and promises,
Lascarides and Asher present additional examples of imperatives that are not meant to be
interpreted as such in their paper 'Imperatives in Dialogue' (Lascarides and Asher, 2004).
For example, they discuss utterances such as 'Go straight on and you'll fall down the stairs', which is not a directive, rather is an assertion. Convention alone is not enough, as both types of sentences in some cases have the same structure, as illustrated above.

More specifically, in order for the Hearer to interpret an imperative as a request, promise or threat, she needs to take into account both the literal meaning of the utterance, as well as the extra-linguistics factors involved (such as context and social power relations). It is the goal of this paper to describe this process of pragmatic reasoning in detail.
III. Goals

3.1 Semantic Definitions

Each element of discourse has its own semantic type. Semantic denotations will be provided (Section VI) for the main clause types discussed: declaratives, interrogatives and imperatives. Assuming different types for the three clause-types allows for a precise model of conversation, with different moves restricted to accept specific semantic types. There restrictions, introduced by Portner (Portner, 2004) will be further discussed in Section VII.

3.2 Language Scoreboard

A complete conversational scoreboard will be developed to model conversations containing requests (Section 7.4). The scoreboard will contain structures that take types of three types of utterances: declaratives, interrogatives and imperatives.

3.3 Pragmatic Analysis

One of the main concerns of this paper will be the pragmatic elements of discourse. Reasoning social and situational factors is essential to understanding discourse containing requests, and helps to fill in any gaps that arise in the interpretation of utterances. Specifically, politeness (Section V) will be analyzed as motivation for the Speaker's formulation of
requests, as well as the Hearer's interpretation.

The main questions that I will address in this thesis are:

(1) Why would the Speaker choose to utter an indirect request?; and

(2) How does the Hearer go about interpreting an indirect request?.

3.4 Reconciliation: CP-nets and Game Theory

The final step in analyzing conversation is how do the Speaker and the Hearer ultimately understand each other and successfully communicate. Game theory (Section VIII) is a useful conservation modeling tool, as it provides a sequential structure with utilities for each action. The utilities, usually numerical, will be comparative in this paper, defined by CP-nets (Section IX).
IV. Theoretical Background: Speech Acts

4.1 Overview

Semantics and pragmatics, the studies of language meaning and interpretation, are by no means new fields of exploration. Pragmatics, the study of language meaning in context, has been developed and furthered by many philosophers and linguists throughout the past century. Theories were expounded to explain language uses that extend beyond mere semantics (communication structured as sets of propositions with truth values). Language philosophers and linguists have concerned themselves with the fact that speech can be used to perform real actions, for example the sentence “'I name this ship the Queen Elizabeth' as uttered when smashing the bottle against the stem” (Austin, 1975) performs the action of naming a ship. Therefore we can conclude that speech is not limited to propositions with (or without) truth values. This leads to the definition of speech acts, to the construction of a set of maxims to explain how meaning is communicated, and to notions of politeness. In recent decades, game theory was brought in to help model communication, and specifically to determine which speech act an utterance expresses based on the preferences of the conversational participants.

In this section, I review Speech Act theory and accounts of direct and indirect requests with this theory.
4.2 Austin's Speech Acts

J. L. Austin in his book *How to do Things with Words*, introduced the concept of performative utterances, to distinguish between sentences that perform actions and those that don't. He further divided the possible actions performed by an utterance into three distinct categories: locutionary acts, illocutionary acts and perlocutionary acts. A *locutionary act* is the act of uttering something, an *illocutionary act* is the intended action in uttering something, and a *perlocutionary act* is the resulting consequence of the intended action. A locutionary act need not have a purpose or an intended audience. For example talking at the TV constitutes a locutionary act with no communicative purpose. In contrast, an illocutionary act is an intentional communicative act; an illocutionary act has a goal and an intended audience. An illocutionary act can always be reworded into an utterance that performs an action by one's stating that one is performing it. For instance, instead of the request 'Clean your room' one may say 'I request that you clean your room'. A perlocutionary act may or may not be an intended act. To illustrate these concepts consider the following three sentences:

(a) Sam said 'walk the dog'.

(b) Sam demanded that I walk the dog.

(c) Sam talked me into walking the dog.

Sentence (a) is a depiction of what Sam uttered, or the locutionary act performed by Sam. In (b) we describe Sam performing an action by 'demanding' something of me; this is an illocutionary act where the goal is for me (the intended audience/hearer) to walk the dog. Sentence (c) describes what would happen if Sam succeeded in his endeavor in (b), this is a description of a perlocutionary act, that is, the events described in this sentence are in
some ways the consequence of the events described in the previous sentence. The hearer could have ignored the speaker and done nothing, in which case the perlocutionary act would have been that Sam did not succeed in getting me to walk the dog. Where (b) depicts an intentional communicative action – an illocutionary act, (c) depicts the consequence of that action – a perlocutionary act. When considering an illocutionary act on its own, we know that an action was performed (that of the speaker) but we do not know what effect (if any) it had on the hearer. A perlocutionary act tells us this, and so in some ways it is the illocutionary act from the perspective of the hearer. Austin also introduces the term 'illocutionary force'. This is the intended 'force' or action that is created by the illocutionary act.

The ultimate illocutionary force of an utterance may differ from its apparent force. This happens in cases when one illocutionary act is performed by way of performing another. Such illocutionary acts are called indirect. For example, consider the following joke:

If a diplomat says, "yes," he means "Maybe."
If a diplomat says, "Maybe," he means "No."
If a diplomat says, "No," he’s no diplomat.

The crux of the joke is the difference between the apparent and the true illocutionary force of each statement. In the statement 'If a diplomat says, "yes," he means "Maybe."', 'yes' is the locutionary act of the diplomat, with the apparent – direct – force of agreement. However, 'maybe' is the true illocutionary force of that act. Thus, by uttering 'yes', the diplomat ends up performing the illocutionary act of expressing possibility of agreement.

As this example illustrates, the concept of illocutionary act or force is crucial to
modeling conversation in general, and indirect requests in particular.

4.3 Searle's Speech Acts

Austin realized that language could perform actions that have consequences outside of language despite not being a physical entity and that it needs to be recognized as having this capability. Austin's student John Searle goes on to define speech acts in his paper “What is a Speech Act” (Searle, 1969). Here he expands on illocutionary acts, defining various forms of illocutionary acts in terms of propositions, language rules and language functions (e.g. “I state...” is the function/action of stating and not merely a proposition). Searle contends that in many cases an illocutionary act contains a proposition (e.g. 'Sam, close the door!' contains the proposition 'Sam will close the door'). Searle further classifies illocutionary acts into five different categories: assertives (expressing a truth commitment, e.g. 'I believe it's 5 o'clock'); directives (expressing action requests, e.g. 'Get down here this instant'); commissives (expressing future commitments to future actions, e.g. 'I will get you there on time'); expressives (expressing attitude and emotion, e.g. 'Welcome to Boston'); and declaratives (changing reality, e.g. 'I name this ship the Queen Elizabeth') (Searle, 1975a). Searle is looking for the conventions governing the form of a speech act. The category this paper will be looking at very closely is directives. These are utterances in which the Speaker tries to get the Hearer to do something, e.g. 'Pass the salt!' or 'Can you please pass the salt'. The category of directives includes imperative and indirect requests, however it does not include promises or threats, as these are both part of the commissives category. Searle mentions the closeness of these two categories, and the possibility of combining these
4.3.1 Searle's Analysis of Indirect Speech Acts

Once the groundwork had been set to explain inference and the many layers of meaning a statement can have, it became possible to explore various speech acts as relating to literal meaning and linguistic and extra-linguistic context. In particular, the distinction between indirect and direct speech acts is of particular interest because, as opposed to a direct speech act, an indirect speech act requires the Hearer to perform extra work to understand the intended meaning. This can seem un-cooperative, as well as risky – the less direct the utterance, the greater the chance for a misunderstanding or mis-communication. An indirect speech act is an utterance that cannot be analyzed using grammatical knowledge of the English language alone. An indirect speech act has an illocutionary force that is underdetermined by what can be syntactically and semantically analyzed and understood. This is in contrast to a direct request, which is a request which can be fully understood and interpreted to be such using knowledge of semantics and syntax. For example, 'I request that you open the door' can be directly understood using knowledge of the meaning of the word 'request'. Even imperatives (e.g. 'Close the door') can be understood as directives because the imperative syntactic form has directive meaning in English that any native speaker would be familiar with. However, if one attempts to analyze the utterance 'Can you close the door' using knowledge of literal word meanings and the way those are grammatically composed in English, one would understand this to mean 'Are you capable of closing the door'. Nevertheless, a native speaker in most situations will understand that 'Can you close the door' is in fact not a question of ability, but a request with the same illocutionary force as 'Close the door'
(however, perhaps different social meaning). ¹

In his paper “Indirect Speech Acts” in, Searle catalogs the conventional structure of indirect speech acts in an attempt to connect this structure to the meaning and interpretation of such acts (Searle, 1975b). Searle attempts to justify the argument that indirect speech acts are recognized and understood as such by native speakers because they have a conventional form (similarly to direct speech acts, such as imperative requests). In English, there are many words and phrases that may be part of an indirect request, including phrases such as 'Would you', 'Ought you', 'It might help if', and even structures such as 'Would you mind awfully if I asked you' (Searle, 1975b). Searle then gives a list of facts and generalizations that set such forms apart from their direct counterparts. Searle concludes with a list of logical steps the hearer must take in order to understand the meaning of an indirect request. Consider two people eating dinner together, and A says to B 'Can you pass the salt?'. Searle (Searle, 1975b), Searle lists 10 steps B would use to understand that A in this context (i.e., understand that 'Can you pass the salt?' is a request for B to pass A the salt). These steps are as follows (from the perspective of B): (1) Observe the facts – A has asked me about my ability to pass the salt; (2) Cooperation – Assume A is cooperating in the conversation; (3) Use contextual information – the context is not conducive to A theoretically inquiring about ability; (4) Use contextual information – A is most likely aware of B's ability to pass the salt; (5) Infer that A has another motive in asking the question; (6) Use theory of speech acts – a

¹ Not every imperative is used as a directive, e.g. 'Close the door and I'll hit you' has the syntactic structure of an imperative, but it also has the additional threat, turning it into a commissive. The meaning of this utterance can in fact be the opposite of what the imperative part suggests, i.e. 'Do not close the door'. However, in a decontextualized setting, any utterance with the syntactic structure of an imperative will be understood to be such; an added layer of context is necessary to distinguish between the two.

² Searle calls this the Principles of Conversational Cooperation; this is the equivalent of Grice's Cooperation Principle (Section 4.4)
pre-condition for a directive illocutionary act is the ability of the hearer to accomplish the requested action; (7) Infer that an affirmative answer would require B to be able to perform what was asked; (8) Use contextual information – it is normal to pass salt at a dinner table; (9) Infer that A has most likely asked a question by which to get B to perform an action; (10) Infer that A most likely would like B to pass the salt.

4.4 Grice and the Cooperative Principle

Instead of focusing on form and convention, Grice, in his paper 'Logic and Conversation' (Grice, 1975) introduced the concept of implicature as the driving force in communication. Grice makes the assumption in a conversation that the speaker and the hearer expect each other to be as relevant, informative, clear, and truthful as possible in order to get their message across. This expectation is what allows lying and implicature to be possible. If the Hearer expects the Speaker to tell the truth, the Speaker may be able to get away with lying. Grice labels this concept the Cooperative Principle (CP) and defines four maxims of speech that specify in more detail the way this principle operates. These maxims are maxims of (1) quantity (be informative but not overly so); (2) quality (speak only what is true and what you have evidence for); (3) relation ('be relevant'); and (4) manner (speak in a coherent, orderly manner). The maxims provide implicit rules that both the speaker and hearer assume to exist, allowing them to communicate in a meaningful manner. Based on these maxims, participants in a conversation can make inferences, called implicatures, to glean meaning above the literal meaning of an utterance. By 'flouting', or intentionally disobeying, one of these maxims, the speaker can communicate using non-literal speech like sarcasm, irony and metaphor.
Grice describes a rationalistic way to analyze communication; rather than relying on convention to glean meaning (as Searle does), he proposes a system in which the underlying intended meaning can be computed based on the expectations of cooperation. Grice does not deny the existence of conventions in speech; however he goes one step further and attempts to explain how meaning in conventions can be rationally analyzed. For example, if Speaker A says 'Julie looks really young' and Speaker B responds 'She just graduated college', one can infer using Grice's maxims that Speaker B has confirmed Speaker A's suspicions. The important maxim in this example is the maxim of relation – using this maxim Speaker A can assume that Speaker B's response is in fact relevant to the conversation and Speaker A's utterance; from here Speaker A can assume that Speaker B's utterance is in fact a confirmation of her own. Yes, Julie is really young, because she just graduated from college, common knowledge and contextual information will tell Speaker A that this means she is probably around 22 years old, and this constitutes an age at which someone is considered to be 'really young' according to Speaker B. Searle may claim that this response follows conventional patterns; that in response to a descriptive utterance such as the one Speaker A uttered it is conventional for Speaker B to respond with a supporting observation. However convention alone will not provide a rational, calculable method for analyzing conversation.

Grice does not claim that these maxims are exhaustive, and mentions the possible necessity for additional maxims, such as 'be polite'. This is an interesting point, since on the one hand politeness is ingrained in many as the 'proper' way to speak, but on the other hand it is an artificial concept and is not intrinsically necessary for communication or understanding. Politeness is an aspect of the cultural and social world, so if 'be polite'
were a maxim, and the speaker were to flout it, this would give rise to implicatures with contextual and social meaning. Such implicatures, however, would not shed any light on the propositional meaning for the hearer. In this way, inferences resulting from flouting a politeness maxim would be different from inferences resulting from flouting one of Grice's maxims.

4.5 Searle vs. Grice

This paper is more concerned with the Gricean concept of the cooperative principle and inference than it is with Searle's analysis of convention. This paper is an attempt at defining a rational method to explain how indirect requests are understood, the rationale behind using them, and the place they hold in a conversation. Grice's approach of analyzing an utterance based on a set of maxims is an important pragmatic technique.

Although Searle's approach and goal is very different from that of Grice, he relies on principles of conversational cooperation to analyze the situation above. Without such a concept, Searle's steps would fall apart as there would be nothing tying A's question about passing the salt to anything relevant about the context. Searle also makes use of inference in many of his steps—another concept which is so vital to Grice's maxims. Therefore, even though Searle's goal is to show that there is a convention involved in the interpretation of indirect requests, he still must make use of a Cooperative Principle and rationality-based inference to make his point. Searle also asserts that politeness is the primary motivation of a speaker to use an indirect speech act (in particular, to use an indirect request). Grice's approach is more to understanding conversation is more conducive to formal modeling.
4.6 Necessity of Context

When analyzing speech acts and their role in conversations, context plays a very crucial role. Searle and Grice analyzed the interpretation of speech acts, and how the Hearer may analyze their meaning. However, one key aspect of meaning and motivation, namely the social and extra-linguistic context of speech, is not analyzed by Searle and Grice. Searle had mentioned that politeness is an important motivator for using indirect speech acts, and this is the focus of the next section.
V. Politeness

5.1 Brown and Levinson

In their book *Politeness*, Penelope Brown and Stephen Levinson take up this thread to further analyze exactly what effect politeness has on language (Brown and Levinson, 1987). They use the concept of face, originally introduced by Erving Goffman (Goffman, 1955) and of the face threatening act (FTA) to explain the motivation for polite speech. Face is defined as “something that is emotionally invested, and that can be lost, maintained, or enhanced, and must be constantly attended to in interaction.” (Brown and Levinson, *Politeness*, p.61). Face is further split into negative face and positive face. Negative face is defined as the need for “freedom of action and freedom from imposition” (p.61) and positive face is defined as the need for the self-image to “be appreciated and approved of” (p.61). Brown and Levinson assume that every individual has both aspects of face as well as rationality. Both concepts of face tie directly into politeness and its usage in society. Certain statements may threaten the negative or positive face of the hearer. For example, a request or an order threatens the negative face of the hearer by potentially creating an obligation which imposes on her freedom of action. Positive face can be threatened by not recognizing the positive face of the hearer; this may be accomplished with over emotional statements, belittling or boasting statements, embarrassing the hearer, etc. The notion of face implies the existence of an FTA, or an act that contradicts the desires of an individual contained in her
face values (negative or positive). Thus politeness speaks directly to face, whether it be saving face or purposely committing an FTA. There are many types of FTAs, pertaining to both the speaker and the hearer, and these vary depending on whether they threaten positive or negative face.

To further complicate matters, a speech act can go on record or off record. A speech act is on record if there is only one clear way of interpreting it, in other words all participants will be able to correctly interpret it. On the other hand a speech act is off record if it lends itself to many interpretations, and so the speaker of the act cannot be held accountable for any one interpretation. The speaker then can either perform an act baldly (i.e., by performing a clear and unambiguous speech act without any further mitigating speech), or with redressive action in which an attempt is made to recover face (of the speaker or the hearer).

5.2 Politeness and IR

Using Brown and Levinson’s framework to analyze the meaning and intention of indirect speech acts leads to many interesting options to be considered. Considerations of face are one of the many possible motivators for the Speaker to use one form of request over another. In what types of situations would one form of request be preferable over another? Contextual factors include social power relationships, setting (formal vs. informal), and degree of imposition.

In their book Politeness, Brown and Levinson propose a method for calculating the weight of an FTA. They identify three main elements affecting the weight of an FTA: (1) Social Distance between the Speaker and the Hearer; (2) Power relationship between
the Speaker and the Hearer; and (3) the Degree of Imposition presented by the FTA. Given these three factors, the weight of an FTA is the sum of all three. When the Speaker is deciding on whether to use an indirect request, she must consider the weight of the FTA she may be imposing upon the Hearer. An indirect request may be a way for the Speaker to mitigate an FTA for herself, or the Hearer. Similarly, when deciding what to reply to the Speaker's utterance, the Hearer must also consider any potential FTA weight that may come along with the response.

Speakers make phrasing choices based on these factors. Conversation is riddled with uncertainty: the Speaker needs to tailor her requests to the Hearer in the way she believes is appropriate; the Hearer then analyzes these requests based on what he was expecting and what he believes the Speaker intends and responds accordingly. Such decision-making under uncertainty can be modeled using game theory. Using a sequential game with comparative utilities assigned to the various forms of requests and their interpretations, a broad analysis of indirect requests can be performed. It can be difficult to deduce numerical utilities in situations concerning politeness and request type choices, therefore comparative utilities will be used. These utilities will be defined using CP-nets (see Section IX). CP-nets will be used to capture the Speaker and Hearer's preferences, specifically their preferences for which types of requests to use. Similarly to the weight of an FTA presented by Brown and Levinson, preferences will depend on three contextual factors: (1) Degree of formality of the setting; (2) Degree of social distance between speakers; and (3) Degree of desperation (i.e., how important is it that the request be fulfilled). A CP-net will be created for the Speaker and the Hearer, depicting each individual’s preferences.
VI. Semantic Representations

6.1 Formal Semantics

In formal semantic theory, an attempt is made to mathematically interpret various linguistic forms. In this paper we will utilize model-theoretic semantics based on predicate-logic interpreted in a model with possible worlds. A proposition, e.g. 'the cat is running', can be represented as a predicate logic proposition Run(c) where c is 'the cat'. In this case, 'the cat' is the constant c, and the one-place predicate Run denotes running. There are also two-place predicates, like 'love', that need two participants, e.g. 'the cat loves the hat'. This would be represented as Love(c, h) where h is 'the hat'. A proposition denotes a set of possible worlds, specifically the ones in which it is true. I assume that declarative clauses denote propositions, as in (1).

1. $p = \{w \mid p \text{ is true in } w\}$

Possible worlds can be thought of as 'states of affairs' or 'different ways in which things could be'.

6.2 Semantics of Questions

There are many types of utterances that do not denote propositions and do not have truth values. One such type is questions. Hamblin, in his paper 'Questions' (1958) proposes that questions be treated as sets of answers, i.e. propositions. Groenendijk and Stokhoff further explore this proposal in their PhD Thesis 'Studies on the semantics of
questions and the pragmatics of answers' (Groenendijk and Stokhoff, 1984). So, the question 'Does the cat love the hat?' is the set of two possible answers 'Yes, the cat loves the hat' and 'No the cat does not love the hat'. A set of answers is a set of propositions. Since each answer corresponds to a set of possible worlds, a question is then a set of sets of possible worlds. I assume interrogative clauses denote questions:

\[ q = \{ p \mid p \text{ is an answer to } q \} = \{ \{w_{ij}\} \mid i \text{ is the answer number, } j \text{ is the number of worlds in which that answer is true} \} \]

6.3 Semantics of Directives

Finally, as the focus of this paper is on directives, we need to define the semantic form for requests (direct and indirect). Direct requests are those expressed by imperative clauses. There are several different views regarding the type of denotation that imperatives possess – I will be using the one initially defined by Krister Segerberg in his paper 'Validity and Satisfaction in Imperative Logic' (Segerberg, 1990), and expanded upon by Chris Barker in his talk (Barker, 2011). He argues that imperatives are actions, e.g. 'Close the door!' is the action of closing the door (by someone). And actions change the world. Therefore, imperatives should be represented as a pair of before and after worlds – the world as it was before the action was performed, and the world as it will be after. So, for example, 'Close the door!' will be semantically represented as a set of pairs of worlds: \[ \{ <w_{11}, w_{12}>, <w_{21}, w_{22}>, <w_{31}, w_{32}>, \ldots <w_{i1}, w_{i2}> \} \] in which \( w_{11} \) is the world in which the imperative was made, with respect to one particular door, and \( w_{i1} \) is the world in which that door is now closed. \( w_{ik} \) represent worlds containing all the possible doors to which the imperative refers to, with the door presumably open in the first world,
and closed in the second\(^3\). Thus, the first world in each pair is one in which the action is possible. In a conversation, the worlds serving as the first elements of each pair are those worlds limited to being possible actual worlds; that is, these are worlds compatible with what is known in conversation.

These semantic representations will serve as the components of the conversational scoreboard introduced in the next segment.

To summarize the denotations of the various clause types:

1. Declarative. \( d = \{ w \mid d \text{ is True in } w \} \); this is a set of possible worlds.

2. Interrogative. \( q = \{ a \mid a = \{ w \mid a \text{ is True in } w \} \} \); this is a set of sets of possible worlds

3. Imperative. \( i = \{ < w_{i1}, w_{i2} > \} \in \mathbb{N}; \) this is a set of pairs of possible worlds.

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\(^3\)We are not taking these actions as 'accepted by the hearer', an action if performed, will change the world. The Hearer not accepting is not part of the semantics. Similarly, the semantics of a declarative (a proposition) does not include evaluation of the asserted proposition by the Hearer.
VII. Language Game

7.1 Semantics of Conversation

The first step when analyzing directives, particularly indirect requests, is how the Speaker chooses to formulate the request. Based on the many contextual and social aspects of politeness and social norm, the Speaker chooses a preferred speech act. Based on this decision, she then formulates her utterance. Once the utterance is made, it is then the Hearer's turn to decide how to respond.

As is clear from the discussion in the previous section, any utterance can be represented in terms of possible worlds, even though it may not have a truth value. In his paper 'Pragmatic Presuppositions', Stalnaker argues that presuppositions and contextual knowledge can be represented in terms of possible worlds (Stalnaker, 1974). In this conversation dynamic, the common ground is defined as the intersection of all propositions known to be true by all the participants. The common ground provides the groundwork by which utterances may be judged, and potentially accepted. However, participants in a conversation often times have their own knowledge base that need not correspond to the common ground.

Below I will discuss where declaratives, interrogatives and imperatives belong in a conversation, and discuss the notion of a language game and its various components. Each type of utterance has its own semantic type, as discussed above. Each of these types of utterance corresponding to the denotation of a declarative (proposition), an
interrogative (question), and an imperative (action) has its own place on the language scoreboard. Portner introduced the concept of every part of the conversational scoreboard being able to accept a specific semantic type (Portner, 2004). This concept will be adopted in this paper. A declarative is placed on the Commitment Set (CS) of the speaker, and once it is accepted by other participants, onto the Common Ground (CG) (Section 7.2). The CS and CG are structures that accepts items of type proposition – set of possible worlds. An interrogative is placed on the Question Under Discussion (QUD) (Section 7.3). A QUD is a structure that accepts items of type question – set of sets of possible worlds. An imperative is placed on the To-Do-List (TDL) (Section 7.4). The TDL is a structure that accepts items of type action – set of pairs of possible worlds.

Once the utterance has been made, the Hearer must decide how to interpret and act upon it. The Hearer will need to decide where to place it on the scoreboard based on its direct or indirect meaning. The Hearer will need to account for contextual and social cues to determine if the Speaker meant the utterance in a direct sense or not. Once the Hearer figures out which meaning to attribute to the utterance, she needs to decide where to place it on the scoreboard based on its type. Once the Hearer has placed the utterance on the part of the scoreboard she deemed appropriate, her preferences work to sort the possible worlds to help her make a decision upon an action, if necessary.

7.2 Common Ground

A conversation is a 'language game'. And every game needs a scoreboard. David Lewis in his paper 'Scorekeeping in a Language Game' analyzes this concept and what it means to keep score in a conversation (Lewis, 1979). Utterances are relative and
meaningless unless there is some standard against which they may be evaluated. Hence the concept of a 'Common Ground' was introduced, as a set against which statements are analyzed, as defined above (Stalnaker, 1974). The common ground, as originally proposed, is a pool of facts mutually known to each participant in a conversation. The common ground can contain anything from the law of a country to local or family knowledge to a record of conversation up to its current point. In addition to the common ground, each participant in a conversation has their own personal knowledge base. From here one can imagine a conversation between two participants going something like this: Speaker A makes a statement. Speaker B evaluates the statement against her personal knowledge and if it doesn't contradict anything the statement is added to the common ground, and so on. The knowledge of each participant is the Commitment Set (CS), introduced by Christine Gunlogson in her paper 'True to Form: Rising and Falling Declaratives as Questions in English' paper (Gunlogson, 2003). The CS accepts the same elements as the CG however there is a separate CS for each participant.

7.3 Question Under Discussion

What if Speaker A were to ask Speaker B a question? Where would this be placed in the conversational scoreboard? In her paper 'Information Structure in Discourse: Towards an Integrated Formal Theory of Pragmatics', Craige Roberts played an essential role in defining the Question Under Discussion (QUD) as a central force in conversation (Roberts, 1996). When a question is asked in a conversation, it goes onto the QUD, and an assumption is made that the goal of the participants in the conversation is to resolve it. Once a question is on the QUD, there are various strategies the speakers can adopt to
resolve it and remove it from the QUD. Roberts uses Grice's maxims to analyze these strategies, and what it means to answer a question in a meaningful way. In this paper, the concept of the QUD will be used as the position of a question once it is uttered.

7.4 To-Do-List

What about requests? The imperative 'clean your room' doesn't have a truth value, nor is it a question, so how will the hearer evaluate it? It is clear that in order to account for utterances that do not denote propositions or questions we will need a more complex view of the conversational scoreboard. A recent proposal that allows modeling requests incorporates, in addition to the common ground, utterances that do not denote propositions or sets of propositions (questions). The concept of the 'to-do-list' (TDL) as a part of the conversational scoreboard was introduced by Paul Portner in his paper 'The Semantics of Mood, Complementation, and Conversational Force' (Portner, 1997). Utterances like imperatives, of type set of pairs of possible worlds need a place in the conversational scoreboard. This is the function of the TDL. In his paper 'The Semantics of Imperatives Within a Theory of Clause Types' (2004), Portner defines an imperative as a property. For example, the imperative 'Go home' is the property of 'going home'. He then defined the discourse component of the imperative to be the TDL, which is a function from individuals to properties. In other words, the TDL is a set of properties that the Hearer must make true; by making these properties true, the Hearer will effectively be performing a set of actions. In this paper I will use Portner's concept of the TDL as the discourse component of an imperative, however its use and type will be different. In this paper, in contrast to the way in which Portner utilized it, the TDL is a component that
accepts items of the type set of pairs of possible worlds, so an individual’s TDL will be a set of sets made up of pairs of possible worlds.

7.5 Scoreboards

The classical view of the conversational scoreboard is that of a single scoreboard for a conversation (Stalnaker 1974, Lewis 1979). There can be conflicts between participants, requests for clarifications and concerns reconciling scoreboards. Ginzburg uses requests for clarification to argue for separate scoreboards. Ginzburg introduces this idea in his paper 'An Update Semantics for Dialogue' (Ginzburg, 1994). As the conversation progresses, each participant updates information in her own personal scoreboard. The intersection of the two scoreboards would be the public Common Ground. Reconciling the two different scoreboards may in some cases cause conflict – this is where game theory would come in using the CP-net preferences established from each participant’s personal scoreboard.

In this paper, it is proposed that each individual scoreboard contain the following four components:

1. The Commitment Set (CS). This term was coined by Christine Gunlogson in her Dissertation 'True to Form: Rising and Falling Declaratives as Questions in English' (Gunlogson, 2003). This component contains items of the type set of possible worlds. This is where the Hearer will evaluate a declarative utterance.\(^4\)

2. The Question Under Discussion (QUD). This is the component that takes

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\(^4\) Gunlogson makes the distinction between the public CS that the individual has publicly committed to, and the private CS that contains the individual’s private beliefs (which may or may not differ from her public CS). Ginzburg in his 1996 paper proposes that every part of the scoreboard possess a private counterpart. In this paper, I will adopt the private CS as part of the scoreboard – called the Knowledge Base (KB). This is the only part of the scoreboard that will have a private component.
items of the type set of sets of possible worlds, or interrogatives. This component represents issues that participants are trying to resolve.

3. The To-Do-List (TDL). This is the component that takes items of the type set of pairs of possible worlds. This is where the Hearer would place an action she has committed to performing. The denotation of an imperative typically goes here (as well as a threat or a promise) – the pragmatic analysis of an imperative starts with it being added to the TDL.

Note that the denotation of a declarative or interrogative isn't of the right type to go on the TDL. So for indirect requests, the Hearer needs to figure out if it is a request, and then to determine the content of the requested action. It is then provisionally added to the TDL, after which the Hearer determines whether or not she will commit to performing the action. Austin, in his book *How to do Things with Words* introduced the concept of uptake and compliance which is what distinguished illocutionary force from perlocutionary force. These are the two steps that the Hearer must take in order to understand and respond to a request. Every step along the way also has a place in the scoreboard. Uptake is the step in which the Hearer decides what is intended by the Speaker's utterance – whether the utterance is an assertion, a query or a directive), and places the utterance on the corresponding part of the scoreboard; and the compliance step is when the Hearer decides whether or not to commit to the assertion (keep it on her CS and/or KB), respond to the query (keep it on her QUD), or commit to the action requested (keep it on her TDL).

Once each participant has labeled and placed an utterance into the proper component of the scoreboard, their preferences (represented by CP-nets, Section IX)
come into play. Once preferences are determined, game theory (Section VIII) will be used to revise each participant’s scoreboard and reconcile the different scoreboards.

A Common Ground (CG) will be present as well as a joint aspect of the participants' scoreboards. The CG is the intersection of propositions present in each participant's CS (or a union of possible worlds present in this intersection of propositions).

7.6 Labeling an Utterance

Now that we know where every clause type (declarative, interrogative, imperative) would be placed on the conversational scoreboard, we need to turn our attention to how the Hearer goes about labeling an utterance. Many times an utterance is syntactically of one clause type, but its ultimate illocutionary force is not the one conventionally associated with that type, e.g. 'I order you to close the door' is a declarative, however it is meant as a request and not an assertion. In fact, one conventional form of an indirect request in English is an interrogative, 'Can you close the door?'. Imperatives can be tricky as well, for example, in their paper 'Imperatives in Dialogue', Lascarides and Asher provide examples of imperatives that function like declaratives (they serve to make an assertion) e.g. 'Go straight on and you'll fall down the stairs' (Lascarides and Asher, 2004). Though this may initially sound like a directive, it is unlikely that it would be interpreted as one. So how does the Hearer decide where to place an utterance on the scoreboard? A lot of her evaluation has to do with context and social setting. This will be discussed in Section 8.2.
VIII. Game Theory

8.1 Definitions

Definition (game): A game, $(P, A, U)$, is a set of participants, $\{P\}$, actions available to
them, $\{A_i\}$ in $P$, and utilities that participants assign to outcomes of actions $u_i: A_i \rightarrow \mathbb{R}$.

The utility $u_i$ maps an action $A_i$ to a real number, however as mentioned
previously, we will be considering comparative utilities as defined by CP-nets (section IX). CP-nets create a preference ranking of all of the possible actions and outcomes for
the speaker. Therefore, a better definition for $u_i$ in this case is $u_i: A_i \rightarrow L_{ij}$ where $L_{ij}$ is
the location of the action $i$ on the CP-net, together with its ranking, $j$, given other
contextual factors.

Definition (Nash Equilibrium): A set of actions $w$ is a (weak) Nash Equilibrium iff for all
of $i$'s actions $w_i$, it holds that $(w_i', w_{-i}) \leq_i w$. (where $w_{-i}$ is the action set of the other
players). Strong equilibrium would hold if $\leq_i$ were replaced by $<_i$ (Benz, 2006).

8.2 Uses in Conversation

A participant chooses which action to employ based on the (context-dependent)
utility associated with it and possibly the moves of other players. There are many
different types of games. Games generally applied to speech are sequential games in
which two participants take turns making a move.

Game theory has been applied to many different types of speech acts over the
course of the last decade. Theorists in the field include Prashant Parikh and Robert van Rooij. In one of Parikh's many papers, “Communication, Meaning and Interpretation”, Parikh discusses strategic inference, or what it is that allows the hearer to infer what the speaker is saying (Parikh, 2000). There are many potential ambiguities present in any communication that he considers, including lexical/structural ambiguity, anaphora, etc. Parikh uses games of partial information with which to analyze the difference inferences that the speaker and the hearer make about their utterances. The goal of the game is for each participant to successfully communicate the meaning that they had intended. van Rooij, in his paper with Merlijn Sevenster, “Different Faces of Risky Speech” (van Rooij, 2006), considers a game theoretic model of a coordination problem in which the two participants agree to meet at a certain time but neglect to mention the location. He then continues on to define signaling games (Lewis 1969), of which the coordination problem is one example. A signaling game is a cooperation game in which the two participants strive to communicate for a common goal pertaining to their situation. In many ways this is an analysis of how best to communicate for a shared goal. van Rooij also examines risky speech, or speech which can be interpreted in several different ways, some of which are described as being 'safe' and other as being 'risky'. He examines games in which a risk-dominant strategy is preferable to one that is more safe. This is strongly tied to questions of face and FTAs – a risky strategy is one in which communication has more chance of failing, so an indirect request would pose more risks than a direct request. van Rooij mentions that in the case of a mis-communication, a risky utterance may be explained as a 'face-saving' action (van Rooij, 2006). It is further possible to assume that the Speaker may play it safe and issue a direct request in order to get her intentions
across, but due to considerations of politeness and saving face, it may in fact be more worthwhile for her to save her own face or that of the Hearer and go with the more risky (more indirect) strategy. This creates an interesting balance between maintaining politeness, FTA weight considerations, and successful communication. Interestingly, van Rooij also used signaling games (Section 8.3) as the basis for his game theoretic calculations, with possible 'risky' and 'safe' strategies for each participant.

8.3 Signaling Games

In his book *Convention*, David Lewis introduces the signaling game (Lewis, 1969). A signaling game is a game between a Sender and Receiver in which each player can see what is sent over to them but does not have further contextual information. A signaling game is a game of incomplete information, which is a sequential game in which each player has a 'type' (informed by nature, or in this case context). One player is more informed than the other and sends the less informed player a 'signal' or message, from which the less informed player updates her knowledge and may (or may not) determine the informed player's type. Each signal sent in this game is the equivalent of a move in a normal game (defined above). For example, a classic game is the prisoner's dilemma (PD). This is a game in which two people are caught for committing a crime, and are given a chance to cooperate or defect. If they both cooperate, they will both get lesser sentences, but if one cooperates and the other defects, the one who cooperated will get a greater sentence (see Table 1).
In the classical PD game, the Nash Equilibrium is where both players defect. Each player, when questioned individually, has no incentive to cooperate, because if one cooperates but his partner doesn't, he would get a more severe sentence (C, in this game, which is the worst sentence). Given the possibility that one player may defect, the best move for the second player is to defect as well, and by definition this is the Nash Equilibrium of this game. Interestingly, if both were to cooperate, they would both get lesser sentences, however, this is not an equilibrium point for the game. Some interaction between the players is necessary for them to both cooperate, and therefore get a lesser penalty.

While classically PD is a game in which both players move simultaneously without any knowledge of the other player's move, consider a PD signaling game. As in van Rooij's example (Section 8.2), suppose one prisoner was of the defecting type, while the other was cooperative. These are now the types of each player. Suppose also that Player 2 was able to signal her move to Player 1 before Player 1 moved. This would give Player 1 a chance to figure out whether Player 2 was defection-prone or cooperative and maybe change her move. A conversation is a type of signaling game because each participant has their own beliefs, preferences, and personal knowledge, and every utterance that a participant makes gives out information about themselves. For example,
consider the following excerpt from *Through the Looking-Glass* (Lewis Carroll, 1991):

'Where do you come from?' said the Red Queen. 'And where are you going? Look up, speak nicely, and don't twiddle your fingers all the time.'

Alice attended to all these directions, and explained, as well as she could, that she had lost her way.

'I don't know what you mean by YOUR way,' said the Queen: 'all the ways about here belong to ME--but why did you come out here at all?' she added in a kinder tone. 'Curtsey while you're thinking what to say, it saves time.'

Alice wondered a little at this, but she was too much in awe of the Queen to disbelieve it. 'I'll try it when I go home,' she thought to herself, 'the next time I'm a little late for dinner.'

'It's time for you to answer now,' the Queen said, looking at her watch: 'open your mouth a LITTLE wider when you speak, and always say "your Majesty."

'I only wanted to see what the garden was like, your Majesty--'

If this conversation were to be analyzed in terms of a signaling game, it would be clear that the Queen has the upper hand and Alice is not sure how to respond. The Queen prefers giving orders, which Alice tries to obey. In this game, the Queen is being a queen – or someone who doesn't think twice about giving orders. Alice, on the other hand, prefers doing what she is told because she doesn't understand the rules of her surroundings. This is the social and contextual reasoning behind the Queen and Alice's preferences, which in turn govern their speech.

Using game theory to analyze indirect requests involves a number of things: 1. relationship between speakers; 2. context of conversation (where is it taking place? Is there an audience [intended/unintended]?), does the speech constitute a habitual occurrence? Etc.); and (3) how much the speaker wants the request to be fulfilled (is it very urgent? Or is the speaker relatively indifferent about the outcome?). These facts
make up the structure of the game. These factors are going to be captured by CP-nets and used as comparative utilities. The goal of any game is winning however as there is no such thing as a clear cut win in a conversation, the goal is reaching equilibrium.

8.4 Utilities

8.4.1 Numerical Pros and Cons, Why it Won't Work Here

In classical game theory, the utilities $u_i$ are a function from the actions to Real numbers. This allows for a precise calculation of utility values for each player. In addition, using numerical utility values gives players a precise sense of how much more beneficial one strategy is than another. This ratio of strategy payoffs is lost in comparative utilities, and hence a game with numerical utilities is in some ways more precise. For example, Parikh in his paper “Communication, Meaning and Interpretation” uses numerical utilities (Parikh, 2000). His calculations of payoffs and Nash Equilibrium depend on numerical utilities, the source of which Parikh does not back up or explain. Language situations do not lend themselves naturally to numerical utilities as it is hard to find any rational support for a number to assign to a strategy. In his paper, Parikh constantly stresses that his numbers are completely arbitrary, and their only important aspect is their order relation. Therefore, there is really no need for them at all.

8.4.2 Comparative – Why They Work

In this paper, I will be using comparative utilities only. A comparative utility is a partially ordered scale, ordering a player's strategies according to that player's preferences. The advantage of using comparative utilities in this paper is that no numerical values need to be assigned. The disadvantage of using a comparative utility
scale is not knowing precisely by how much one strategy is preferred to another. This view is in fact more indicative of the way in which speakers think in a conversation. It is unlikely that someone will be able to judge precisely by how much she prefers one response to a request over another. Not only is it more true to the situation, but numerical values are also not necessary for my analysis. The goal of this paper is not to generate precise equilibria or numerical utility values, but rather to use utilities as a valuable tool to explain how requests work in conversations and the motivation behind them. The scale will be represented using CP-nets (Section IX).

8.5 Iterated Best Response (IBR)

In his dissertation, “A Signal to Act”, Michael Franke proposes that a logical pragmatic strategy in language is iterated best response (IBR) with focal point (Franke, 2009). IBR with focal point is a method of reasoning in which one is immediately drawn to the focal point, and iteratively reasons from there. For example, if a Speaker (Alice) were to utter “Would you tell me, please, which way I ought to go from here?” (Lewis Carroll, 1994), the focal point for the Hearer would be the direct sense of the interrogative utterance, in other words a query of potential future action 'would you be able to tell me something'. The iterative reasoning would then be composed of steps such as those proposed by Searle to reach the conclusion that in fact the Speaker was issuing a request, and not asking a question. So when the Cheshire Cat responds ”That depends a good deal on where you want to get to.” we understand that he successfully understood the intended meaning of Alice's question. In natural language communication, Franke claims that the semantic meaning of a sentence is the starting focal point. In this paper,
the focal point will be the direct speech act, as determined by its clause type (declarative assertion, interrogative query or imperative directive). Whether or not this is the intended meaning, the hearer will be drawn to the direct meaning and continue her reasoning from there. If the sentence was meant literally (i.e., directly), she will not have to reason very much further. If not, she will need to consider the direct meaning of the sentence as a comparison point for what the speaker had really intended to say. This is a very useful strategy when considering games involving indirect interrogative requests because the focal point of the literal meaning of the utterance (namely, a query) provides a platform from which the Hearer will understand the request. The hearer may think to herself that clearly the direct meaning was not the meaning intended by the Speaker, therefore given the familiar construction, the query is not in fact a query but a request. This ties in well with Searle's proposed steps that a Hearer takes to understand an indirect request. IBR, in a way, is one theory explaining why one tends to reason in the way that Searle proposed – start from the direct meaning (closely tied to the syntax and semantics of the utterance) and reason on from there using contextual clues. Knowing the construction and the semantic meaning also allow the hearer to understand the degree of politeness that the Speaker intended with the request.
IX. CP-nets

9.1 Definitions

A Conditional Preference Network (or CP-net) provides a graphical representation of preferences (Boutilier, 2004). They are based on preference relations.

**Definition (preference relation):** A preference relation is a (partial or strict) ordering between objects, generally elements of a set S.

**Definition (partial ordering):** A partial ordering over a set, S, with elements \( w_i \) (i in \( (1, n) \)), is a binary relation \( \geq \) such that if \( w_i \geq w_j \) if \( w_i \) is preferred to or equally as preferred as \( w_j \).

**Definition (strict ordering):** A strict ordering over the set is a binary relation \( > \) such that if \( w_i > w_j \) then \( w_i \) is always preferred to \( w_j \).

**Definition (ordered set):** A (partial or strict) ordered set is a set, S, over which there exists a (partial or strict) ordering.

Orderings can be represented visually using directed graphs.

**Definition (directed graph):** A directed graph, \( G \), is a graph in which there exists a direct association between vertices, connected by edges with arrows. The graph is represented as \( (V, A) \), where V is the set of vertices (or nodes) and A is a set of vertex pairs connected by an arrow.

**Definition (CPT):** A Conditional Preference Table (CPT) is a table of preferred child nodes given each parent node (Boutilier, 2004).
Definition (CP-net): A CP-net is then a directed graph $G$ over a set of nodes $(X_1, \ldots, X_n)$ corresponding to a CPT (Boutilier, 2004).

To illustrate, consider the following situation: B, A’s boss, would like to ask him to answer the phone by yelling at A from his office. B prefers that there is no one around but A when he does this. If there are people around (formal setting), B prefers to use an indirect request (e.g. 'Could you please answer the phone?'); if there is no one around but A (informal setting), B prefers to use a direct request (e.g. 'Answer the phone!'). The CPT is shown in Table 1. $S_F$ and $S_I$ refer to formal and informal settings respectively; $R_D$ and $R_I$ refer to direct and indirect requests, respectively. Figure 1 shows the CPT and CP-net for this scenario.

\[
\begin{array}{c|c}
S_I & R_D > R_I \\
S_F & R_I > R_D \\
\end{array}
\]

Figure 1. A representation of a CPT (a) and CP-net (b). Arrows in the CP-net represent relations in preferences directly derived from the CPT, e.g. $S_F \land R_D$ is less preferred than $S_I \land R_I$, with $S_I \land R_D$ being the most preferred combination.

9.2 Uses in Conversation

In his paper 'Extracting and Modelling Preferences from Dialogue', Asher uses CP-nets to analyze preferences in a conversation (Asher and Lascarides, 2010). His focus is on ambiguity in dialogue, specifically two people determining a location to meet.
If the Hearer knows the Speaker's preferences, then she may choose the best move possible for her given the Speaker's preferences. This may be done using CP-nets. In many situations, however, the Hearer won't know what the Speaker’s preferences are, so she will need to use extra-linguistics factors to determine which move to make.

9.3 Uses as Comparative Utilities

When used in terms of deciding on a best strategy, CP-nets work exactly like utilities in a game. Each participant has their own set of preferences as depicted by a CP-net. The preferences create an ordering on their strategies in the game, for example consider the following conversation between Alice and Humpty Dumpy from *Through the Looking-Glass*, Chapter VI (Lewis Carroll, 1991):

>'In that case we start fresh,' said Humpty Dumpty, 'and it's my turn to choose a subject--' (He talks about it just as if it was a game!' thought Alice.) 'So here's a question for you. How old did you say you were?' 'So here's a question for you. How old did you say you were?'

Alice made a short calculation, and said 'Seven years and six months.'

>'Wrong!' Humpty Dumpty exclaimed triumphantly. 'You never said a word like it!'

>'I though you meant "How old ARE you?'" Alice explained.

>'If I'd meant that, I'd have said it,' said Humpty Dumpty.

In terms of a signaling game, there are two ways in which to interpret utterances in this conversation – 'riddle' (assume that everything spoken is meant as a riddle) and 'serious' (assume direct, or literal utterances). The misunderstanding here is occurring because Humpty Dumpty is playing a riddle and Alice is answering his question as if it was a serious question. Humpty Dumpty is clearly playing 'riddle' Alice does not know that he is doing this. Alice had noticed the fact that Humpty Dumpty was riddle-oriented, but had chosen to act as if he weren't. So, without knowledge of Humpty Dumpty's
preferences. Alice's preferences were to interpret questions in their 'serious', or contextual sense and not in their literal sense. Therefore, Alice is 'losing' the game in this conversation, and is not understanding what Humpty Dumpty wants from her, and thereby creating frustration in Humpty Dumpty which presumable she wants to avoid. If Alice had known Humpty Dumpty's preference of riddles and literal meaning (as she had apparently suspected), she may have been able to play along. Below is a possible game for this situation – the assumption is that 'winning' is when both Humpty Dumpty and Alice are on the same page (i.e., both prefer Riddle or both prefer Serious). The CPT for each player is also shown in Figure 2.

<table>
<thead>
<tr>
<th></th>
<th>R</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>(win, win)</td>
<td>(lose, lose)</td>
</tr>
<tr>
<td>S</td>
<td>(lose, lose)</td>
<td>(win, win)</td>
</tr>
</tbody>
</table>

A's preferences: S > R

HD's preferences: R > S

Figure 2. Representation of the game with Alice's and Humpty Dumpty's CP-net preferences. From here is it clear that Humpty Dumpty always prefers 'riddle', while Alice prefers to abide by Humpty Dumpty's choice. Row represents Humpty Dumpty's moves and column represents Alice's moves.

In this signaling game, in order for successful communication between Alice and Humpty Dumpty, there needs to be some signal that lets Alice know what Humpty Dumpty is playing. Otherwise, if Alice always chooses Serious and Humpty Dumpty always chooses Riddle, there will never be a 'win' situation.
X. Unified Theory

10.1 Elements of a Language Game

The following are the three elements of a language game for each participant:

1. Commitment Set (CS). This is a set of possible worlds. This is the information that the speaker knows. The commitment set also includes social and contextual information the speaker considers to be public knowledge. For example, if a boss is talking to her employee, she may include in her commitment set the fact that she is on a higher social standing than her employee and believe that the employee is aware of this standing.

2. Question Under Discussion. (QUD) This is a set of answers (set of sets of possible worlds). Participants in the conversation are expected to address this list of answers and determine which one applies.

3. To-Do-List (TDL). This is a set of actions (set of pairs of possible worlds) the speaker temporarily commits to perform. A CP-net corresponding to the participant's preferences serves as a function from the participant's TDL to itself, ordering the sets. This results in a TDL containing sets of actions in order of preference.

4. In addition to the personal scoreboard of each participant in a conversation, there is also a Common Ground (CG) that is mutually
resolved. This is a reconciliation of all of the scoreboards, if a request was uttered and fulfilled this new information goes onto the CG. If an FTA is performed, or there is a misunderstanding, this also goes onto the CG. Conflicts arising from different and un-aligned scoreboards are settled with game theory, using the individual scoreboards of each participant as their preferences.

10.2 Utterance Interpretations

When the Speaker utters and utterance, the Hearer must decide where to place it on the scoreboard in order to address it. The Hearer does this by using Franke’s IBR method (Section 8.5) in conjunction with CP-net preferences. The proposition here is that the focal point will be the direct interpretation. For example, when hearing ‘I order you to sit down’, the Hearer will initially assume this to be a (true) declarative. This is the focal point of the IBR. Next, she will evaluate this assumption based on the context. If the Speaker is in a position of authority over her, she will need to pose the questions ‘Is this something the Speaker wants done?’ and ‘Is this something I am willing to do?’. The Hearer will then rank the answers to these questions using CP-nets, and make a decision accordingly as to whether or not the utterance was indeed meant as a request. If yes, the utterance will be placed onto her TDL, and she will need to reason further as to how to respond. This is the next step in the iterated process. She will then need to weight the pairs of possible worlds presented to her and rank them accordingly. To summarize these steps, the following is an outline of the IBR method of how a Hearer interprets an utterance:
1. Assume the direct meaning (this is, in many cases, the literal meaning).
   This is the focal point.

2. Evaluate context and social relations – is the Speaker in a higher social position? Is the utterance something the Speaker would want done? And is this something the Hearer would consider doing for the Speaker? CP-net of preferences: rank answers to these questions, and choose the one most preferred.

3. Based on preference in Step 2, label the utterance as an 'assertion', 'query' or 'request'.

   For example, in cases of high imposition between in unequal social relationship, a Speaker may utter something like this: 'Is there any way you would possibly be able to please drive me?'. There are many layers that need to be unraveled here. The direct interpretation is that this is an interrogative question of ability, requiring a 'yes' or 'no' answer. The Hearer must iteratively reason as to whether the Speaker would want her to do something, and whether or not she would be willing to. In some cases, the Hearer may choose to interpret such an utterance as an interrogative, if, for example, she is unwilling to perform the action. If the Hearer labels an utterance an imperative, she must then reason how to respond by updating her TDL and CP-net of preferences accordingly – this is the next iteration in the process.

   For example, considering the following simple conversation between Alice and the Red Queen from Section 8.3.

   Red Queen: Where do you come from? And where are you going?
   Look up, speak nicely, and don't twiddle your fingers all the time.

   The uptake step for Alice is as follows: The direct interpretation (the focal point) is that
the queen is issuing an order by saying 'Look up' etc. Context also helps Alice determine that these are imperatives – after all, she is talking to a queen, a queen fond of giving orders and being obeyed. Once Alice has labeled the Queen's utterance as an imperative, she can be fairly sure that the Queen would indeed like her to perform the requested actions. These actions are now on Alice's TDL. The commitment step involves Alice determining whether or not she wants to perform these requests, or remove them from her TDL. She chooses to perform them, as she is in a foreign world and speaking to a queen.

Additionally, the QUD is updated for both participants when an interrogative is raised; when the participants have moved on, any unanswered interrogatives are 'forgotten about' and cleared from the QUD. The same holds true for the TDL. This example also does not go into detail as to how Alice knew that the Queen's requests were indeed imperatives.

When updating a part of the Scoreboard that consists of a set of propositions (set of possible worlds), like the CS and KB, nothing can be added to that set that contradicts with information already in it. If contradicting information is brought up, presumably the Hearer would either not include it in her CS and KB, or raise a question. In the case of an interrogative, it is resolved and off the QUD, the declarative (set of sets of possible worlds) corresponding to the answer is placed onto the participants' CS. The participant answering the interrogative may have a different KB. If an imperative is raised, after the Hearer has decided upon what to do with her TDL, the resulting proposition will be added to the CS and KB of the participants. Once information is on an individual’s CS, the CG may be updated.
To summarize:

<table>
<thead>
<tr>
<th>Type</th>
<th>Place on Individual Scoreboard</th>
<th>Resolution – Common Space</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assertion</td>
<td>CS, KB</td>
<td>Common Ground</td>
</tr>
<tr>
<td>Query</td>
<td>QUD</td>
<td>CS, KB</td>
</tr>
<tr>
<td>Request</td>
<td>TDL</td>
<td>CS, KB</td>
</tr>
</tbody>
</table>

Table 2. Summary of scoreboard component for each type of utterance.

![Flow chart](image)

Figure 3. Flow chart depicting a conversational scoreboard.

10.3 Santa Barbara Corpus of Spoken American English

One example from the Santa Barbara Corpus (Du Bois, 2004) is analyzed below:

(1) Sherry: Ooh this is what I want. ... A mud pie. Can I have that for an appetizer?
    Rosemary: No, but you can have it for dessert.
In this example, Rosemary is Sherry's mother (Sherry is in her late 20s) and the two are at a restaurant deciding what to order. When Sherry asks her mother 'Can I have that', she is asking for permission, i.e. 'Will you allow me to have that' or 'Would it be alright with you if I ordered that'. This is not a request for Rosemary to give Sherry anything. This segment is in contrast to the following segment, where their waitress Jamie arrives and the following conversation takes place:

(2) Rosemary: Can I have clam chowder for my soup?
Jamie: Mhm

In this context, when Rosemary asks 'Can I have ..' of Jamie, she means 'Will you order (and bring) this to me', this time 'Can I have' does not have the same meaning as it did previously. Doing out the scoreboard for each situation:

<table>
<thead>
<tr>
<th>Speaker</th>
<th>Utterance</th>
<th>Scoreboard Rosemary</th>
<th>Scoreboard Sherry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sherry</td>
<td>Ooh this is what I want. ... A mud pie. Can I have that for an appetizer?</td>
<td>This utterance is an interrogative*&lt;br&gt;QUD = {Sherry can have a mud pie for an appetizer, Sherry cannot have a mud pie for an appetizer}&lt;br&gt;CS = {Sherry wants a mud pie. You cannot have dessert for an appetizer}</td>
<td>CS = {Sherry wants a mud pie for an appetizer}</td>
</tr>
<tr>
<td>Rosemary</td>
<td>No, but you can have it for dessert.</td>
<td>CS = {Sherry does not have Rosemary's 'permission' to have a mud pie for an appetizer, but rather for dessert}</td>
<td>CS = {Rosemary does not want Sherry to have mud pie for an appetizer, but rather for dessert}</td>
</tr>
</tbody>
</table>

Table 3. Scoreboard of Santa Barbara Corpus example.
*Rosemary comes to the conclusion that Sherry's utterance is an interrogative as follows:

(1) Focal point = direct interpretation. 'Can I have X' is a question about ability.

(2) A question about ability is inappropriate in this context, because clearly Sherry is able to order and eat a mud pie. Nor is it a request - Sherry cannot be asking for Rosemary to bring her a mud pie because they are at a restaurant. Therefore, it is definitely an interrogative, and appears to be a question about permission. Even though Sherry does not need her mother's permission to order a mud pie, this is what she appears to be asking.

(2) This is the reasoning behind labeling this utterance as a request:

Rosemary: Can I have clam chowder for my soup?

(1) Focal Point = direct interpretation. For a 'Can I have X' questions, this is a question about ability.

(2) Clearly in a restaurant context, the customer is able to order any item on the menu. However, there is still a possibility that they ran out and this is a question about ability. Jamie is a waitress at the restaurant, her job is to place customers' orders and serve the food to their table. Therefore, this is most likely both a query as to the availability of the item, as well as an order, or a request for her to order and deliver clam chowder for Rosemary. There is an action requested here, which will be place on Jamie's TDL.

(3) Jamie's 'Mhm' = yes we have it, and yes I will bring it to you. In agreeing
to perform the requested action (that of serving the item), Jamie has also positively answered the question of its availability.

From this example we can see that context is essential in interpreting utterances. Amongst family members, because the social distance is very small and power relationship is many cases is not a factor, face considerations are not very relevant. However, in the conversation with the waitress, even though indirect requests are conventional, FTAs need to be taken into consideration.

10.4 CP-nets and Game Theory

CP-nets are used several times in a conversation to rank a participant's preferences. CP-nets are used to order the Speaker's preference of type of utterance – whether saving face is a priority, or saving an FTA from happening, or not. Once the Speaker makes the utterance, the Hearer uses CP-net preferences to determine how to interpret the utterance, starting from the focal point. Once the utterance is interpreted, if it is a request, the Hearer must use CP-net preferences to order her TDL and decide how to respond. Every aspect in which preferences are needed, they in fact act as utilities for actions in a game. Every step in a conversation is a step in a language game, in this case a signaling game. For the sake of simplicity, every participant can be seen as being 'polite' or not, i.e. trying to save their own or the other participant's face, or not. In the examples above, in the mother-daughter conversation, politeness was not a large consideration, but when speaking with the waitress it was. For example, in a conversation with two participants, this is how the first two moves would be made:

Step 1: Speaker decides which utterance to make. This decision is based on her
CP-net (based on her strategy type – 'polite' or not). Move 1 in the game.

Step 2: Hearer interprets Speaker's utterance. This decision is based on IBR with focal point and Hearer's CP-net.

Step 3: If interpreted as a request, Hearer adds it to her TDL, goto Step 4. If not interpreted as a request, it is added to her CS or QUD, goto Step 5.

Step 4: Hearer's CP-net is used to order her TDL, Hearer acts accordingly. Move 2 in the game.

Step 5: CG is updated based on participants’ CSs.

CP-nets are based on a participant’s preference of 'polite' face-saving considerations. If participants CP-nets are mis-aligned, or their CSs do not match up, misunderstandings may occur. This would generally be considered a lose-lose in the game, with equilibrium being achieved in a successful communication.
XI. Conclusion

Indirect requests are very common constructions in the English language. Native speakers of English don't need to think twice to know that “Could you pass the salt” is a request to pass the salt and not a question on one’s ability to do so. However there is a disconnect between the semantic and pragmatic meanings, and generally when the two don't match up there is a reason for it. The reason in this case boils down to concepts of politeness and face. There are many degrees of politeness and FTAs that could potentially exist, and a speaker as well as the hearer need to carefully consider many contextual clues in every conversation. In different contexts different indirect requests are used, and the responses change as well. In an attempt to rationalize when different requests are used and what the most beneficial responses are, game theoretic strategies and utilities may be applied to such a situation.

A sequential game of partial information is intuitively applicable to a conversation, and IBR with focal point will help define the relative utilities used to classify various responses. These pieces are tied together by the conversational scoreboard. There are three elements of the scoreboard for each individual participant: the Commitment Set (CS), the Question Under Discussion (QUD) and the To-Do-List (TDL). These are pieces previously introduced and utilized separately by various linguists and philosophers (Gunlogson, 2003; Roberts 1996; Portner 1997). Combining them all together allows for one cohesive theory of conversational analysis, and creates
the perfect backdrop for the study of indirect requests. Each element of the scoreboard is able to accept utterances of a certain type – the CS accepts sets of possible worlds (declaratives), the QUD sets of sets of possible worlds (interrogatives), and the TDL sets of pairs of possible worlds (imperatives [including threats and promises]). In addition to this framework, when a conversation is taking place each participant must first decide where to place an utterance. This is the first step in the IBR process – deciding of what type an utterance is, and consequently where it belongs on the scoreboard. This process is done by first identifying the focal point as the direct meaning of the utterance. From here context and politeness factors are brought in to help identify meaning.

In the case of a request being placed on the TDL, there are two distinct steps necessary – uptake and commitment. Uptake starts of the IBR process by understanding the utterance and placing it onto the scoreboard. Commitment involves analyzing requests placed on the TDL – using her CP-net preferences, the Hearer decides whether or not to perform the actions on the TDL. She does this by ordering the sets of possible worlds on her TDL using the CP-nets. Those ‘after’ worlds (the second world in each pair) are being ordered by the CP-net in order for her to make a decision. Actions she decides not to perform are dropped off of her TDL.

Every step of the conversational process is also a step in a game. When an utterance is made by the Speaker, a move is made. The Hearer then responds with her own move – if it is a signaling game, she gets cues from the Speaker as to how best respond. For example, if the power relationship between the Hearer and the Speaker is known to the Speaker, she may make it known to the Hearer by her choice of utterance. It is then in the Hearer's court to decide how to respond and make a counter-move. CP-
net preferences and IBR are used in order to make every move in this game, and all the results are reflected on the scoreboard itself.
XII. Discussion

12.1 Overview

This paper suggests that convention alone is not enough to determine if an utterance is a request. Requests come in many forms – sometimes in the form of a declarative ('You should help me move') or an interrogative ('Can you help me move?'). Other examples of requests from the Santa Barbara Corpus of Spoken American English include utterances starting with 'Aren't you going to...?' or even 'So, ... wash it with that cloth or something?'. It would be very hard to catalogue every possible form of a request, because it can take almost any form in the right context. Imperatives, however, are slightly more rigid in structure. Using an algorithm to pull imperative utterances from a corpus was fairly successful because of this inherent structure. The ambiguous structure of clause types and the fact that clause types do not correspond directly to the intended illocutionary force makes it necessary for a theory of how utterances like this play into the scoreboard of a conversation. In this paper, the IBR method was used in the interpretation of and response to indirect requests. IBR, being an iterative method, lends itself well to the algorithmic process. If the direct interpretation (one of the basic clause types – declarative, interrogative, imperative) can be algorithmically determined (based on syntactic cues in the English language), and if context is known, it may be possible to create an algorithm to interpret indirect requests.
12.2 Direct vs. Indirect Meaning

As discussed in this paper, indirect speech acts have two meanings that need to be addressed – the literal, or direct meaning, and the indirect, or intended meaning. When responding to an indirect speech act, the Hearer is in many cases expected to act on the indirect meaning, but in some cases it is important that they address the direct meaning as well. For example, there is a difference between a request such as (1) 'Can you pass the salt?' and (2) 'Can you give a presentation tomorrow?'. Both of them are literally questions about ability, but in (1) the Speaker is usually sure of the Hearer's ability to pass the salt, hence the literal sense is not taken seriously, while in (2) the Speaker may not be aware of the Hearer's ability to give a presentation tomorrow, and therefore the literal meaning is meant seriously (in addition to the intended request). In his paper 'Responding to Indirect Speech Acts' (1979), Herbert Clark discusses the various degrees to which an indirect request is meant to be taken seriously by the Hearer. The IBR process discussed in this paper lends itself well to explaining various degrees of seriousness and how the Hearer understands and responds to them. In the IBR process, when the Hearer hears an utterance, her immediate interpretation is the direct meaning. From there, she can context to further analyze the utterance. Using the direct meaning as the focal point allows the Hearer to keep it in mind and respond to it if necessary, in addition to potentially acting upon it if it is indeed a request.

12.3 Future Work

This paper specifically hones in on the interpretation of indirect requests. Interpretation of all statements is analyzed in an attempt to provide a universal theory of
interpretation and the language scoreboard.

Using the theory presented here, it would be possible to construct an algorithm to identify indirect requests as well as identify possible responses. This would involve building a system that would take context as well as an utterance as input, and from there be able to determine the type of utterance made, and possible relevant responses.
XIII. References


