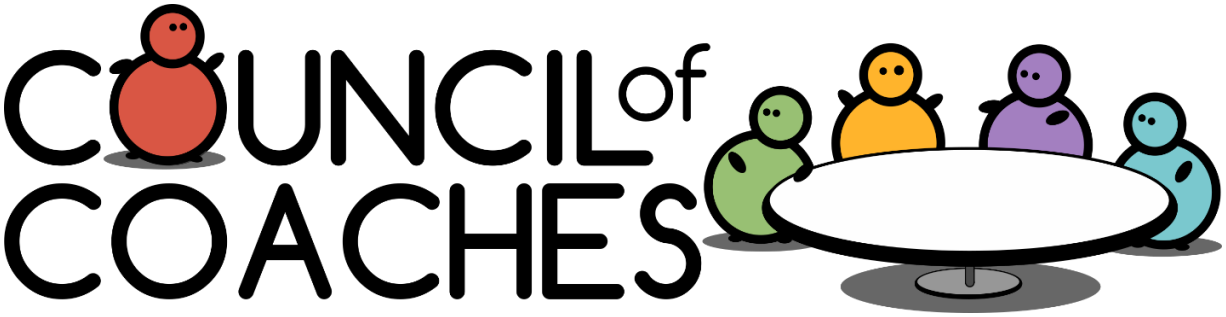

D5.2: Design of Dialogue Game

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Abstract

We present the formal dialogue game specifications that will form the theoretical basis for the computational models to be delivered in D5.3. Each dialogue game specification describes: the participants in the dialogue; the moves (locutions) those participants can make; the ordering of moves; how a participant might incur commitment to what they or others say; how a dialogue might terminate; and how we determine the outcome of a dialogue.

Corrections

v1.0.1 Correctly applied EU logo on header page.

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Symbols, abbreviations and acronyms

CMC	Centre for Monitoring and Coaching
COUCH	Council of Coaches
D	Deliverable
DBT	Danish Board of Technology Foundation
EC	European Commission
ISPRINT	Innovation Sprint
M	Month
MS	Milestone
RRD	Roessingh Research and Development
SU	Sorbonne University
UDun	University of Dundee
UPV	Universitat Politècnica de València
UT	University of Twente
WP	Work Package

P	Proposition
A(p)	Assert p
Q(p)	Question p
PQ(p)	Pure Question p
AQ(p)	Assertive Question p
PCh(p)	Pure Challenge p
ACh(p)	Assertive Challenge p
Agr(p)	Agree with p
Disagr(p)	Disagree with p
R(p)	Restate p
Arg(p)	Argue for p
Exp(p)	Explain p
DI(p)	Default Illocution

Glossary

We provide below a short glossary of terms used throughout this deliverable, and their attributed meaning as used in this document.

Proposition – abbreviated to p – a span of text with a truth value that is used as a component in an argument, usually either supporting or attacking another proposition.

Conclusion – a proposition that forms the main point of the argument that is being constructed.

Premise – a proposition which (together with other premises) is used to justify a conclusion

Graph – a structure consisting of a set of nodes connected by vertices (edges).

Directed graph – a graph in which the direction of edges is specified, e.g. A->B means there is an edge from A to B but not from B to A.

Argument Interchange Format - abbreviated to AIF; a graph-based representation format for the analysis and storage of monological arguments.

Inference Anchoring Theory – an extension to the AIF that allows for analysis of dialogical argument, retaining the statement-then-reply structure of the original discourse.

Transition – a connection between two utterances in a dialogue.

Node – a discrete component of an AIF graph.

Information Node – abbreviated to I-Node; a node in an AIF graph containing propositional information

Locution Node – abbreviated to L-Node; a node in an AIF-IAT graph that captures exact utterances in discourse, complete with speakers.

Illocutionary Node – abbreviated to YA-Node; a node in an AIF-IAT graph that connects discourse utterances (L-Nodes) to their propositional content (I-Nodes).

Transition Application Node – abbreviated to TA-Node; a node in an AIF-IAT graph that shows a dialogical transition between two utterances (L-Nodes).

Scheme Node – abbreviated to S-Node; a node in an AIF graph that shows a connection between two propositions (I-Nodes).

Rule Application Node – abbreviated to RA-Node; a subtype of scheme node in an AIF graph that shows support between two propositions (I-Nodes).

Conflict Application Node – abbreviated to CA-Node; a subtype of scheme node of an AIF graph that shows conflict between two propositions (I-Nodes).

1 Introduction

This deliverable provides formal specifications for dialogue games that will subsequently be implemented for use in the final Council of Coaches system. Each dialogue game specification describes: the participants in the dialogue; the moves (locutions) those participants can make; the ordering of moves; how a participant might incur commitment to what they or others say; how a dialogue might terminate; and how we determine the outcome of a dialogue.

2 Objectives

The objective of this deliverable is to provide formal dialogue game specifications. These specifications will feed into the development of computational models in D5.3, which will subsequently be deployed in the Dialogue & Argumentation Framework previously specified in D5.1.

3 Background

3.1 Dialogue Games

(Lorenz, 1968) and (Hamblin C. , 1970) were the first to specify dialectical interaction as a game or a set of rules governing the interaction. Since then, dialogue games have been used to describe flawed argumentation patterns (Hamblin C. , 1970); persuasion dialogues (see (Prakken, 2006) for a survey of systems for persuasion); multi-agent planning problems (Katie Atkinson, 2005) (Elizabeth Black, 2009); mathematical collaboration (Alison Pease, 2017) and in a host of further contexts (see (Walton D. , 1996) (P. McBurney, 2002), (Simon Parsons, 2002) (S. Wells, 2012) for examples of applications in other contexts).

A dialogue game has a dialogue purpose, a set A of participants and a set R of roles which participants can adopt during a game. Contents of utterances used by the players in the dialogue are expressed in a topic language L_t. At the beginning of a dialogue every player s has assigned a (possibly empty) set of commitments $C_s \subseteq L_t$ which changes during a dialogue. Every dialogue system includes a logic L consisting of a topic language L_t and a set R of inference rules over L_t. The dialogue system consists of several sets of rules, amongst which the most typically used there are: **(1)** locution rules which describe what type of utterances players can execute during a dialogue; **(2)** structural rules or protocol which determine the interaction between locutions (i.e., it specifies which locution can be performed as a reply to another locution); **(3)** commitment or effect rules which specify for each utterance j the effects which this locution makes on a set of commitments of the participant i (a commitment of i is a sentence that i publicly declared as his belief); **(4)** termination rules which determine the cases where no move is legal, i.e. they should specify the conditions under which the protocol returns the empty set; and **(5)** outcome rules which define the outcome of a dialogue, for instance, provide a criterion to decide which player wins and which player loses the dialogue.

3.2 Inference Anchoring Theory

Inference Anchoring Theory (IAT) is a philosophically grounded theory which has been developed to capture relationships between argument structures and dialogue structures (K. Budzynska, 2016), (M. Janier C. R., 2016). By considering the illocutionary force of utterances, IAT allows us to represent illocutionary structures which link locution nodes (L-nodes) to information nodes (I-nodes). Moreover, given that some speakers' communicative intentions cannot be determined without knowing the broader context of the dialogue – that is, what an utterance is responding to – IAT assumes that it is only by considering the relation between L-nodes that some illocutionary forces can be inferred. As a consequence, these illocutionary structures are anchored in transition nodes (TA-nodes) and can target I-nodes or scheme nodes (S-nodes) (to elicit inference or conflict relations between propositions) (K. Budzynska, 2016). IAT is therefore a framework developed for the analysis of dialogues in order to elicit argumentative structures.

By making the illocutionary forces of locutions apparent, the model allows us to identify argumentative dynamics which have been generated by dialogical moves. The IAT graphical representations of dialogical structures and the attached illocutionary and argumentative structures represent a valuable framework for fine-grained analyses of discourse.

This theory is very well suited to our goal of building a dialogue game from our corpus of patient interviews, since our corpus consists of natural language dialogue and IAT provides a way of linking dialogue argumentative dynamics via the analysis of speech acts.

An IAT analysis is therefore composed of several elements eliciting argument structures and dialogical dynamics via the representation of illocutionary connections, as summarized below:

- The right-hand side of a graph displays the dialogical structure with:
  - Locution nodes: the content of the utterances preceded by the speaker's identification
  - Transition nodes: the transitions between the locutions (or rules of dialogue) (TA-nodes)

- The left-hand side of a graph displays the argumentative structure with:
  - Information nodes: the propositional content of each locution (in front of the corresponding locution node)
  - Relations of inference: they connect premises to conclusions (RA-nodes)
  - Relations of conflict: they connect conflicting information nodes (CA-nodes)

- The relation between the dialogical and the argumentative structure:
  - Illocutionary forces connecting a locution node to the corresponding information node
  - Illocutionary forces connecting a transition node to scheme node (i.e. that can only be derived from the transitions between locutions)
  - Indexical illocutionary forces connecting a transition node to an information node (more details are given with the example presented below)

Illocutionary forces include communicative acts such as asserting p, asking about p, requesting p, ordering p, promising p, and so on. These are represented in IAT as *asserting* (A) p; *questioning* (Q) p (broken into types of questions, such as pure questions (PQ) or assertive questions (AQ)); *challenging* (C) p (broken into types of challenges, such as pure challenges (PC) and assertive challenges (ACh)); Agreeing (Agr) with p; Disagreeing (Disagr) with p; Restating (R) p; arguing (Arg) for p; explaining (Exp) p, or Default Illocuting (DI) if the illocution type is unspecified.

Let's consider the simple example below, taken from the Council of Coaches corpus (described in Section 4 below), and describe its IAT analysis in Figure 1. The dialogue in the example below involves Linda, a patient, and Bob, a podiatrist, who are talking about the necessity to have a monofilament done. The full annotation of the excerpt can be seen as http://corpora.aifdb.org/couch as argument maps 13748 and 13749.

[1a] Linda: *But could I have pins and needles and still be feeling everything on my feet when they do that?*

[1b] Bob: *You could have pins and needles but still feel...but the sensation would be abnormal on your feet.*

[1c] Linda: *Right, okay, I don't know what you mean.*

[1d] Bob: *So, by that I mean you could...say, for instance you were walking around barefoot, okay, or you had a pair of shoes that didn't fit properly even though you had pins and needles in your feet that's still a symptom of nerve damage [...].*

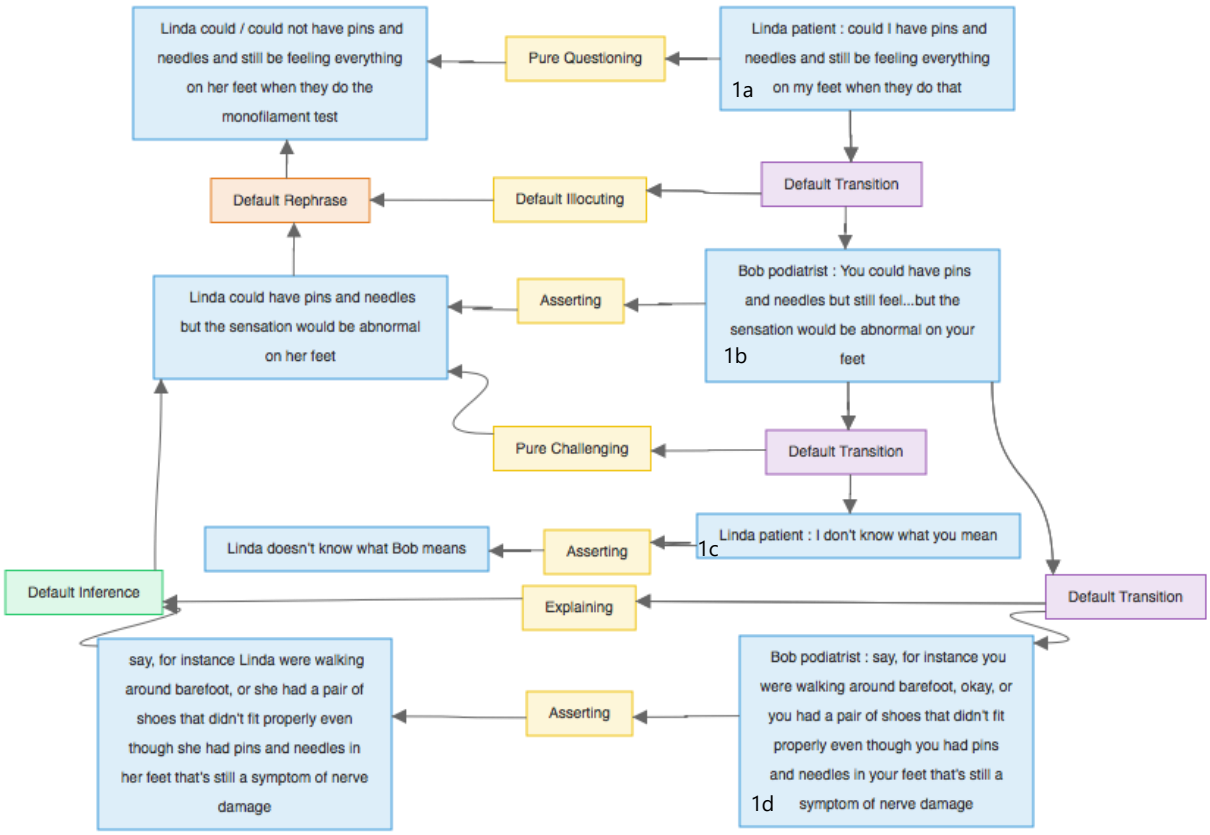

Figure 1: OVA+ analysis of "Linda" example.

The figure has been produced in OVA+, an interface for the analysis of arguments online, accessible from any web browser at ova.arg-tech.org (M. Janier J. L., 2014). It is a tool allowing what the developers of the Argument Interchange Format (AIF) have advocated, i.e. the representation of arguments and the possibility to exchange, share and reuse argument maps (Chris Reed, 2008). The system therefore relies on annotation schemes of a wide variety of theories, including IAT.

On the right-hand side of the figure, one can see the dialogical structure, with the speakers' locutions and the transitions between locutions which represent the dialogical relevance of moves, represented by Default Transition nodes (e.g. Bob answered 1d as a response to Linda's challenge in 1c).

The left-hand side of the figure represents the argumentative structure: the proposition (1) "*say, for instance Linda were walking around barefoot, or she had a pair of shoes that didn't fit properly even though she had pins and needles in her feet that's still a symptom of nerve damage*" is inferentially related to (2) "*Linda could have pins and needles but the sensation would be abnormal on her feet*"; this is represented by the Default Inference node. This means that proposition (2) is the conclusion and it is supported by one premise, (1). Here, Bob is explaining something to Linda because she did not understand (see the Pure Challenging node linking Linda's move 1c to Bob's move 1b).

As we will see with the different examples throughout this work, argumentative structures can also elicit argumentation, counter-argumentation – represented by Default Conflict nodes (when a proposition is in conflict with another) – and rephrasing, that is the relationship between propositions which have the same pragmatic meaning but may have a different linguistic surface (Barbara Konat, 2016) – represented by Default Rephrase nodes. IAT can also handle reported speech by unpacking the propositional content of a reported speech and the propositional content of a reporting speech.

Dialogical structures can make apparent argumentative structures only through the representation of the illocutionary structures, which are composed of illocutionary connections anchored in locutions and those anchored in transitions. Locutions have illocutionary connections which represent the speaker's communicative intention. In the example, for instance Linda's first move is a Pure Question. The concept of illocutionary connections is borrowed from Speech Act Theory (Austin, 1975) (John R. Searle J. R., 1969) (John R. Searle S. W., 1985); for some speech acts, it is however impossible to determine what the speaker's intention is without knowing what the speech act is responding to; IAT solves this problem by taking into account the relationship between locutions (K. Budzynska, 2016). For example, here, we know that, when he says "*by that I mean you could…say, for instance you were walking around barefoot, okay, or you had a pair of shoes that didn't fit properly even though you had pins and needles in your feet that's still a symptom of nerve damage*", Bob is explaining only because this is a response to Linda's challenge. Taken independently, the speech acts in 1b and 1d are merely claims but, considered together, they obviously perform an illocutionary act.

These illocutionary connections are anchored in transition nodes because they exist only in virtue of the dialogical dynamics. Such illocutionary connections target the corresponding schemes in the argumentative structure: here Explaining is anchored in the transition node between Linda's challenge and Bob's answer, and targets the Default Inference node which holds between Bob's Assertions. Note also that some illocutionary connections are indexical: such illocutionary connections are also anchored in TAs, however they target a propositional content, rather than schemes. In the analysis of Example 1, we assume that Linda's utterance "I don't know what you mean" shows that she wants Bob to explain[1], therefore, the Pure Challenging illocutionary connection targets the propositional content of Bob's utterance 1b. In the following analyses, argument structures do not consider enthymemes since only actual text is analysed; as a consequence, only propositions which have been uttered are represented.

Information nodes to precisely reflect the propositional contents (for instance, full names must replace the pronouns used in locutions); this is necessary to represent the argument structure more accurately.

The IAT analysis of Example 1 shows that IAT is well suited for the exploration of argument structures in dialogical contexts. It reveals the argumentative structure of the dialogue via the detailed analysis of dialogical dynamics (i.e. Linda challenging Bob's utterance 1b and Bob answering the challenge).

Not only IAT accurately reveals how dialogical acts work together to create arguments, but it also, and most of all, shows that the considering of the relationship between locutions, that is Transition nodes, is necessary to describe speakers' behaviours in a dialogue. IAT therefore indicates that argument structures are created in virtue of dialogical exchanges, and that the representation of utterances alone is not sufficient to understand the dynamics of argumentative dialogues.

Despite the inherent complexity of dialogues, it turns out that dialogical interactions contain valuable elements for the recognition of argument structures, evidenced by IAT analyses (Katarzyna Budzynska A. R., 2014). In (O. Yaskorska, 2015), the authors drew some conclusions from the analytical and statistical study of the Moral Maze dialogues. The high frequency of Assertive Questions in the Moral Maze revealed that speakers tend to present their claims under the form of questions, which is a useful mechanism for one to give her own opinion, as well as to trigger an interlocutor's agreement or disagreement. It has also been shown that the realization of argumentation does not always take the form of an Assertion being challenged and a second Assertion responding to the challenge. The information provided by the analyses have also allowed discovering that speakers mainly argue with Assertions and Assertive Questions.

[1] We make this assumption based on the observed non-verbal interactions; these non-verbal cues will be further explored Section 5, and in the future course of the project.

It cannot be concluded that such behaviours occur in all dialogues; however, they provide a hint about how speakers argue in moderated real-life dialogues. Moreover, the inter-annotator agreement of the corpus studies (k = 0:68) (Janier, 2017) shows that IAT is stable and a reliable framework for the analysis of dialogical arguments.

4 Data collection

To design dialogue games that allow for realistic interactions between patients and their virtual coaches, it is first necessary to understand how such interactions might take place between patients and real medical practitioners. By far the best way to understand these interactions is to examine them happening in real life; this, however, is almost impossible to do. First, putting real patient consultations under observation risks changing the dynamic of those consultations, thus providing inaccurate data. Second, it is unusual for consultations to take place with more than one medical practitioner, and so finding such sessions in the first instance would prove a significant challenge.

We therefore adopted a role-playing approach, in which real medical practitioners carried out a series of consultations with patients played by actors. Across the consultations, different actors played to different personas (that we specified), in consultation with different practitioners.

Note that the data collected through these sessions is being used in different contexts across multiple work packages.[2] We therefore focus here on the specific data collection methods and subsequent analysis relevant to the design of dialogue games.

4.1 Methods

Each participant in each session was equipped with an individual headset-style microphone, allowing speech to be recorded onto a separate audio tracks (i.e. one track per participant), resulting in exceptionally clear audio. The tracks were subsequently combined into a single track for each session, which was then used for transcription purposes.

The audio from each session was transcribed by a professional transcription service, then anonymised to remove the names of the medical practitioner ("patient" names did not need removed because they were fake to begin with).

4.2 Sessions recorded

Table 1 summarises the sessions that were recorded. Across the sessions, three different actors were used: "Male", "Female 1" and "Female 2". Several different personas were devised for the actors to play to, which are summarised in Table 1. All personas describe patients that have recently been diagnosed with Type 2 diabetes. The sessions recorded are summarised in Table 2.

Patient type	Description
Anxious	Is scared about their diabetes diagnosis; has a friend who recently had a limb amputated due to Type 2 diabetes.
Unengaged	Is not interested in the medical advice being given; feel they don't have enough time to follow what their doctor is telling them.
Know-it-all	Searches the web for medical advice, which they trust more than that given to them in face-to-face consultations with practitioners; believes in "fad" diets.
Normal	Listens to advice and tries their best to follow the doctors' instructions; designed as a "benchmark" patient.

Table 1: Patient personas.

[2] This dataset is also described in D2.3.

ID	Number of participants	Actor	Patient type	Practitioners involved	Duration (minutes)	Word count	Turns
S1	3	Male	Know-it-all	General practitioner, diabetes practitioner	26	4,351	141
S2	3	Male	Normal	General practitioner, diabetes practitioner	19	3,727	174
S3	3	Female 1	Unengaged	Podiatrist, general practitioner	25	5,302	294
S4	3	Female 1	Anxious	Podiatrist, general practitioner	20	4,443	332
S5	3	Female 1	Normal	Podiatrist, general practitioner	20	5,011	397
S6	3	Female 1	Know-it-all	Podiatrist, general practitioner	18	3,888	258
S7	4	Female 2	Unengaged	General practitioner, motivational interviewer, dietician	33	6,005	202
S8	3	Female 2	Anxious	Motivational interviewer, dietician	21	3,388	159
S9	3	Female 2	Know-it-all	Motivational interviewer, dietician	27	4,992	222

Table 2: Patient interview sessions.

5 Data analysis

Analyses of the dialogues during the Council of Coaches video sessions allow detecting common patterns which can then be modelled and used to define a dialogue game.

A total of 35 excerpts have been analysed in OVA+ using the IAT annotation schemes. These gave a total of 662 turns, out of 2179 total moves; around 31% of the total dialogues. In particular, a complete session has been annotated which gives a better insight into the shape and content of the Council of Coaches dialogues. The other analysed excerpts, taken from 5 different sessions, aim at being a representative sample of the wide variety of communication situations in couch dialogues. Since the topics tackled, the patients' character and the professionals' domain of expertise are different in every dialogue, the annotated data present a wide range of dialogical and argumentative dynamics which can help to refine and generalise the dialogue games. Our 35 annotated maps can be seen at http://corpora.aifdb.org/couch (see Table 3).

Table 3: List of 35 annotated maps (see also http://corpora.aifdb.org/couch).

Map ID	Word Count	Number of turns
13748	529	45
13749	352	33
13754	354	24
13757	649	63
13774	578	19
13775	213	9
13776	322	35
13777	154	13
13781	147	20
13783	168	25
13784	410	25
13785	906	27
13795	470	14
13796	443	20
13797	144	11
13798	237	16
13799	303	7
13800	217	14
13801	263	10
13802	266	16
13876	193	5
13880	303	16

13881	293	12
13883	352	18
13884	273	12
13886	239	10
13887	173	13
13889	366	21
13890	236	21
13891	260	17
13892	380	33
13893	175	20
13896	227	6
13898	97	4
13899	150	8

Full argument analytics for our 35 annotated excerpts can be seen at http://analytics.arg-tech.org/overview.php?c=couch. Here we present the complete list of speech acts seen, and the interactions between coach Alan and other participants (see Table 4).

Table 4: Overview of annotated speech acts.

Speech Act	Count
Asserting	670
Asserting in Transition	33
Asserting in Locution	637
Directive Questioning	3
Directive Questioning in Transition	0
Directive Questioning in Locution	3
Restating	177
Restating in Transition	177
Restating in Locution	0
Arguing	203
Arguing in Transition	203
Arguing in Locution	0
Assertive Questioning	38
Assertive Questioning in Transition	7
Assertive Questioning in Locution	31
Pure Questioning	91

Pure Questioning in Transition	1
Pure Questioning in Locution	90
Default Illocuting	71
Default Illocuting in Transition	71
Default Illocuting in Locution	0
Popular Conceding	1
Popular Conceding in Transition	0
Popular Conceding in Locution	1
Agreeing	90
Agreeing in Transition	89
Agreeing in Locution	1
Pure Challenging	5
Pure Challenging in Transition	3
Pure Challenging in Locution	2
Rhetorical Questioning	14
Rhetorical Questioning in Transition	1
Rhetorical Questioning in Locution	13
Explaining	31
Explaining in Transition	31
Explaining in Locution	0
Rhetorical Challenging	2
Rhetorical Challenging in Transition	0
Rhetorical Challenging in Locution	2
Disagreeing	16
Disagreeing in Transition	16
Disagreeing in Locution	0
Expressing	2
Expressing in Transition	0

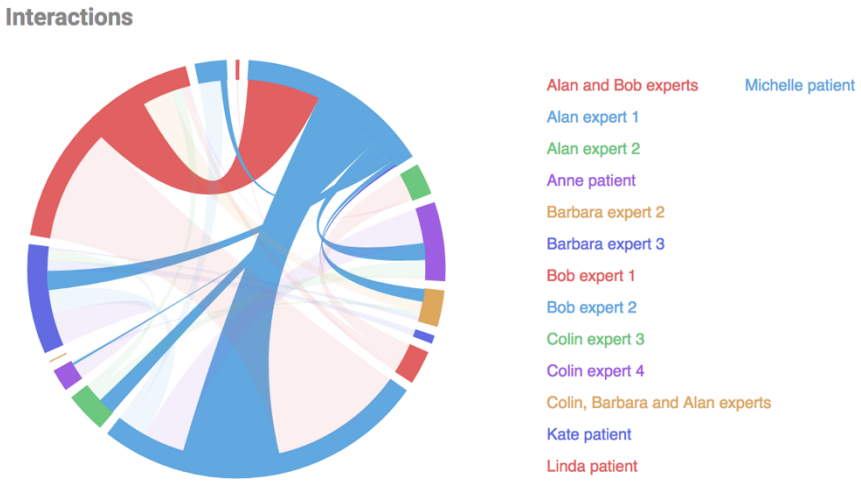

Figure 2: Interactions between coach Alan and other participants, taken from http://analytics.arg-tech.org/overview.php?c=couch

6 General Principles

In the following dialogue game specifications, a standard template will be followed in which we first provide a general description of the game, followed by descriptions of the participants, and rules for: locutions, commitment, structure, termination, and outcome. In this section, we briefly describe what is meant by each of these descriptions.

With each specification we also include a visualisation in the form of a directed graph. This provides a high-level overview of the structural rules of the dialogue (i.e. what moves can follow what). These are designed to provide an at-a-glance overview of how a dialogue can progress, and as such do not contain specific detail (e.g. the distinction between a "Lead Coach" and an ordinary coach where both can make the same move).

6.1 Participants

Every dialogue consists of a set of two or more participants, with each participant being assigned to a role. The roles in a dialogue will vary depending on the precise specification, however in general every dialogue game specified here will consist of a *User* and at least one *Coach*. Some specifications will further refine these roles (e.g. Game 1 (Goal-setting) provides for a special type of coach called the *Lead Coach*). These will be described in the specifications themselves.

6.2 Locution rules

The types of moves that participants can perform are defined by the locution rules. Individual locutions are composed of two elements: the illocutionary force; and the propositional content, which are represented by a function of the type *IllocForce(content(, content))*.

The illocutionary force defines the type of move that is being made – for instance, *Assert*, *Question*, *Argue*, *Propose* etc. The propositional content is the substantive content of what the participant is saying in that particular move.

Propositional content is not necessarily human-readable but is instead designed to be interpreted at a logical level. For instance, when making a move that discusses the number of steps a user should aim to make in a day, the move itself might be "*Propose(steps(10000))*" – the propositional content being represented as a first-order statement. This would subsequently be presented to the user with a statement such as "*I think you should aim for 10,000 steps*".

6.3 Commitment rules

As a dialogue progresses, different participants may become committed to statements they have made or otherwise agreed with. Commitments are tracked through the use of commitment stores (CS) – sometimes individual, and sometimes shared amongst many participants.

In the tables describing commitment rules in each game, for each rule, $\varnothing \in CS\{x,p\}$ (where $\varnothing$ is an unspecified formula or statement) means that $\varnothing$ is added to the specified commitment store; $\varnothing \notin CS\{x,p\}$ means that $\varnothing$ is removed from the specified commitment store.

6.4 Structural rules

The structural rules in a dialogue game specify the legal ordering of moves. This includes the initial move (i.e. who starts the dialogue, and what type of move can they make in order to do so), and the core exchange of moves within the dialogue.

In some specifications, we visualise the structural rules as a directed graph, showing what moves, said by whom, can follow others.

6.5 Termination rules

The termination rules are a special kind of structural rule that define the conditions under which a dialogue game terminate. Each specification will have different termination rules depending on the aim of the dialogue.

6.6 Outcome rules

Closely connected to the termination rules are the outcome rules. When a dialogue terminates, the outcome rules determine its success or otherwise. In many cases this is based on the content of commitment stores (e.g. a dialogue might be successful if a certain proposition is in all participants' commitment stores). As with the termination rules, the outcome rules will vary depending on the aim of the dialogue.

7 Dialogue game specifications

7.1 Game 1: Pre-interviews

7.1.1 Motivation

The Pre-interview takes place before the patient is in the room. Its purpose is for the coaches to discuss how each of them may contribute and possibly what strategies might be effective in a particular case. This follows informal practice used in medical settings.

7.1.2 General description

This dialogue game specification is designed to allow two or more coaches to discuss a patient prior to meeting him/her for a session. It may be the first time meeting the patient at all for some of the coaches.

The specification follows patterns found in the data collected from the patient interview sessions described in Section 3.

7.1.3 Participants

The participants in a pre-interview dialogue consist of a set of at least two coaches (X), where a single coach (C) is designated the "Lead Coach" (LC). The Lead Coach is the coach who has the most familiarity with the patient and who can advise on which other experts should be present at the session and on strategies that might be useful, given the patient's personality and situation.

7.1.4 Locution rules

ID	Rule
LR1	C can: 1. PQ(p) when he asks whether p is the case, i.e. if LC believes p 2. A(p) when he gives his opinion on p 4. PCh(p) when he seeks LC's ground for stating p 5. Agr(p) when he agrees on p
LR2	LC, in addition to those locutions available to all coaches, can: 1. AQ(p) when he seeks C's agreement on p 2. R(p) when he restates p (usually to summarise Patient's situation) 3. *ReportedSpeech*(s, *IllocutionaryForce*(p)) when he reports that speaker s said proposition p with a specific Illocutionary Force. *4. PatientSummaryConcluded* when the LC has concluded a patient summary

Table 5: Locution rules for pre-interviews dialogue game.

It is important to note that we do not specify a locution rule to permit players to argue or explain. As stated in (Frans H. van Eemeren, 1982) and (Katarzyna Budzynska M. J.-D., 2014), 'arguing' is a complex illocutionary force which takes shape only by virtue of the interrelation between locutions: one can build an argument by asserting p and q and showing that there is an inference between p and q, e.g. "p

because q". Hence, arguing is automatically created when support for a proposition is given and, in the pre-interviews game, PCh allows for triggering inference. Moreover, it has been shown that in some discursive contexts, AQ is more frequent than challenges to trigger argumentation (e.g. in debates, see (O. Yaskorska, 2015) or in financial dialogues (Katarzyna Budzynska A. R., 2014)). Pure Challenging indeed has a low frequency in the Council of Coaches corpus, this is explained by the fact that speakers do not necessarily wait to be challenged to support their opinion. However, formal dialectical systems' standards are followed here by including challenges which are, in the game, the only way for players to construct inference between propositions because parties cannot advance two propositions in a single turn

7.1.5 Commitment rules

ID	Rule
CR1	Following a A(p), performed by C≠LC, p is added to CSc_i
CR2	Following a Agr(p), performed by C≠LC, p is added to CSc_i
CR3	Following a Disagr(p), performed by C≠LC, -p is added to CSc_i
CR4	Following a AQ(p), performed by C≠LC, p is added to CSc_i
CR5	Following a R(p), performed by C≠LC, p is added to CSc_i

Table 6: Commitment rules for pre-interviews dialogue game.

Hamblin's view of speakers' commitments (Hamblin C. L., 1971) is followed in our game: a speaker is committed to a statement if he personally utters the statement (CR1) or when he agrees with a statement uttered by an interlocutor (CR3). As in most formal dialogue systems (e.g. DC (MacKenzie, 1979), CB (Walton D. N., 1984), PPD (Douglas Walton, 1995)), the pre-interviews game allows players to retract propositions: if a proposition is withdrawn, it is assumed that the players are no more in conflict about this proposition and consensus is reached on this particular proposition (CR2). Commitment rules in the pre-interviews game however differ from those in other dialogue games since propositions are added to a commitment store only if they have been asserted or agreed with. In many dialogue games, indeed, a stated proposition is added to all players' stores; if a player is not committed to this proposition, he has to explicitly withdraw it. In the pre-interviews game, on the other hand, a proposition is solely added in the store of the player who asserted (or agreed on) it. This is defined in CR1 and CR3. CR4 specifies that if a proposition p is disagreed with, then the opposite proposition (-p) is added to a store (see also (S. Wells, 2012)). This rule allows *M* to deploy a strategy: when :p is added to a player's commitment store after he disagreed with p, M is able to ask him whether his disagreement with p means that he is committed to :p. This is to ensure the relevance and consistency of dialogues: a player cannot simply disagree on p; he has to agree with :p, provide reasons for :p or withdraw :p.

7.1.6 Structural Rules

ID	Rule
SR1	LC moves first with *PQ(p),* where p = "have a moment"
SR2	After LC OR C≠LC performs *PQ(p)*, C≠LC OR C must perform: 1. *A(p)*; or 2. *A(-p)*
SR3	After LC OR C≠LC performs *AQ(p)*, C≠LC OR C must perform: 1. *Agr(p)*; or 2. Dis*agr(p)*
SR4	After C≠LC performs $A(p_1)$,*either*: 1. C can perform PQ(p), or 2. *LC can* perform a sequence of locutions asserting some finite number of propositions about S, many of which are rephrases (because he summarises S): $Assert(p_i)$..., where $1 \leq <= i \leq n$ for some n ∈ Natural Numbers (S=Situation) and then 3. *LC* end the summary of the situation by saying: *PatientSummaryConcluded*
SR5	After LC asserts *PatientSummaryConcluded,* LC can perform*:* *ReportedSpeech*(P, *IllocutionaryForce*(p)) to report propositions p that the patient P has said in previous sessions
SR6	After *LC* performs *ReportedSpeech*(P, *IllocutionaryForce*(p)), C≠LC can perform: 1) a sequence of locutions asserting some finite number of propositions, with inferential structure between them: $A(p_i)$..., where $1 \leq i \leq n$ for some n ∈ Natural Numbers
SR7	After C≠LC performs $A(p_i)$... with inferential structure between them: C can perform PQ, where: 1. C≠LC performs PQ(s), where s=situation, or 2. LC performs PQ(p), where p=proposition
SR8	After C≠LC performs $A(p_i)$, LC performs: 1. AQ(p) where p = "see Patient P"

SR9	After LC performs AQ(p) where p = "see Patient P", all C≠LC must perform: 1. Agr(p)
SR10	After all C≠LC perform Agr(p) where p = "see Patient P", C≠LC can perform 1. PQ(p), or 2. AQ(p) where p is a strategy for dealing with the patient

Table 7: Structural rules for pre-interview dialogue game.

7.1.7 Termination rules

ID	Rule
T1	A dialogue terminates if any C≠LC performs: 1. *A(-p),* where p = "have a moment" Or All C≠LC performs: 2. Agr(p), where p = "see Patient P" And, if C≠LC performs 3. if C≠LC performs PQ(p), then the LC performs Assert(p), or if 4. if C≠LC performs AQ(p), then the LC performs Agr(p) where p is a strategy for dealing with the patient.

Table 8: Termination rules for pre-interview dialogue game.

7.1.8 Outcome rules

Outcome	Conditions
Don't agree to see Patient P	any C≠LC performs *A(-p),* where p = "have a moment"
Agree to see Patient P (no strategy for dealing with the patient)	All C in C/LC Agr(p) where p = "see Patient P"
Agree to see Patient P (and strategy for dealing with the patient)	All C in C/LC Agr(p) where p = "see Patient P"

Table 9: Outcome rules for pre-interview dialogue game.

7.1.9 Visualisation

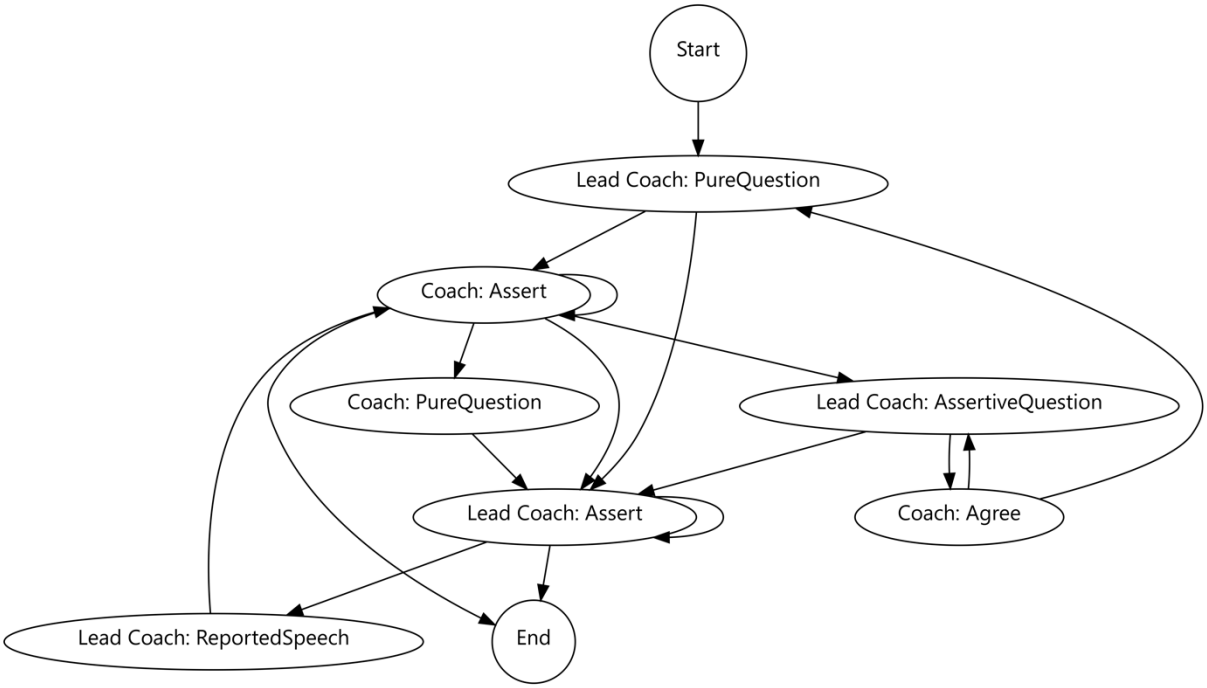

Figure 2: Visualisation of the pre-interview dialogue game.

7.2 Game 2: Patient interview

7.2.1 Motivation

The patient interview is the main consultation between the patient and multiple coaches – the core dialogical aspect of the Council of Coaches system.

7.2.2 Description

This dialogue game provides a broad framework for one or more coaches to engage in a consultation with a patient.

As with the pre-interview game, this specification follows patterns found in the data collected from the patient interview sessions described in Section 3.

7.2.3 Participants

A (possibly unit) set of coaches, and a patient. Note that there is no "Lead Coach" in this dialogue game – where there is more than one coach, all are given equal standing.

7.2.4 Locution rules

ID	Rule
LR1	All participants can: 1. PQ(p) when they ask whether p is the case, i.e. if the hearer believes p 2. A(p) when they give their opinion on p 4. PCh(p) when they seek hearers' ground for stating p 5. Agr(p) when they agree on p 6. R(p) when they restate p (to exemplify, generalise, paraphrase, repeat, etc) 7. AQ(p) when they seeks the hearer's agreement on p 8. *ReportedSpeech*(s, *IllocutionaryForce*(p)) when they report that speaker s said proposition p 9.RQ(p) when they grammatically state a question, but in fact are just conveying that they do (or do) believe p and do not wait for the other participants to answer the question 10.Backchannel when they want the previous speaker to continue 11. Disagr(p) when they disagree on p

Table 10: Locution rules for patient interview dialogue game.

7.2.5 Commitment rules

ID	Rule
CR1	Following a A(p), performed by X, p is added to CSx_i
CR2	Following a Agr(p), performed by X, p is added to CSx_i
CR3	Following a Disagr(p), performed by X, -p is added to CSx_i
CR4	Following a AQ(p), performed by X, p is added to CSx_i
CR5	Following a R(p), performed by X, p is added to CSx_i
CR6	Following a RQ(p), performed by X, p is added to CSx_i
CR7	Following a Disagr(p), performed by X, -p is added to CSx_i

Table 11: Commitment rules for patient interview dialogue game.

7.2.6 Structural rules:

ID	Rule
SR1	[After greetings] The dialogue starts with C performing PQ(p) addressed to P
SR2	After X performs *PQ(p)*, the answerer must perform: 1. *Assert(p)*; or 2. *Assert(-p)*
SR3	After P performs Assert(p): 1. Any participant can Assert(q) where p and q form either a rephrasing structure or an inferential structure, or 2. Any participant can ReportSpeech(s,(IF(q)), or 3. Any participant can ReportSpeech(X,(A(p)), or 4. Any participant can AQ(p), or 5. Any participant can AQ(q), or 6. Any participant can RQ(p), or 7. Any participant can PQ(q), or 8. Any participant can PCh(p), 9. Any participant can Agr(p) 10. C can Disagr(p)
SR4	After C performs Assert(p): 1. Any participant can A(q) where p and q form either a rephrasing structure or an inferential structure, or 2. Any participant can ReportSpeech(s,(IF(q)), or 3. Any participant can ReportSpeech(X,(A(p)), or 4. Any participant can AQ(p), or 5. Any participant can AQ(q), or 6. Any participant can RQ(p), or 7. Any participant can PQ(q), or 8. Any participant can PCh(p), 9. Any participant can Agr(p) 10. P can Disagr(p)

SR5	After P performs Assert(-p), 1. Any participant can A(q) where -p and q form either a rephrasing structure or an inferential structure, or 2. Any participant can ReportSpeech(s,(IF(q)), or 3. Any participant can ReportSpeech(X,(A(-p)), or 4. Any participant can AQ(-p), or 5. Any participant can AQ(q), or 6. Any participant can RQ(-p), or 7. Any participant can PQ(q), or 8. Any participant can PCh(-p), 9. Any participant can Agr(-p) 10. C can Disagr(p)
SR6	After C performs Assert(-p), 11. Any participant can A(q) where -p and q form either a rephrasing structure or an inferential structure, or 12. Any participant can ReportSpeech(s,(IF(q)), or 13. Any participant can ReportSpeech(X,(A(-p)), or 14. Any participant can AQ(-p), or 15. Any participant can AQ(q), or 16. Any participant can RQ(-p), or 17. Any participant can PQ(q), or 18. Any participant can PCh(-p), 19. Any participant can Agr(-p) 20. P can Disagr(-p)
SR7	After P performs ReportSpeech(s,(IF(p)), 1. Any participant can Assert(q) where p and q form either a rephrasing structure or an inferential structure, or 2. Any participant can ReportSpeech(s,(IF(q)), where p and q form an inferential structure, or 3. Any participant can AQ(p), or 4. Any participant can AQ(q), or 5. Any participant can RQ(p), or 6. Any participant can PQ(q), or

	7. Any participant can PCh(p), 8. Any participant can Agr(p) 9. C can Disagr(p)
SR8	After C performs ReportSpeech(s,(IF(p)), 10. Any participant can A(q) where p and q form either a rephrasing structure or an inferential structure, or 11. Any participant can ReportSpeech(s,(IF(q)), where p and q form an inferential structure, or 12. Any participant can AQ(p), or 13. Any participant can AQ(q), or 14. Any participant can RQ(p), or 15. Any participant can PQ(q), or 16. Any participant can PCh(p), 17. Any participant can Agr(p) 18. P can Disagr(p)
SR9	After P performs AQ(p) addressed to C_i , C_i can: 1. C_i can Agr(p), or 2. C_i can Disagr(p), or 3. C_i can R(q) where q is a rephrase of p For $i \neq j$, $1 \leq i,j \leq n$ where n is the number of coaches
SR10	After C performs AQ(p) addressed to P, P can: 1. Agr(p), or 2. Disagr(p)
SR11	After C performs AQ(p) addressed to C_i, C_I can: 1. Agr(p), or 2. R(q) where p is a rephrase of p
SR12	After X performs RQ(p), X can: 1. A(q) 2. PQ(q) 3. AQ(p)

	4. AQ(q) 5. PCh(p) 6. R(q) where p and q form either a rephrasing structure or an inferential structure
SR13	After X performs PCh(p) addressed to C_i, 1. C_i can A(q) where p and q form an inferential structure, or 2. C_i can R(q) where p and q form a rephrasing structure addressed to X_i
SR14	After X performs Agr(p), any participant can: 1. A(q) where p and q form either a rephrasing structure or an inferential structure, or 2. ReportSpeech(s,(IF(q)), where p and q form a rephrasing structure or an inferential structure, or 3. AQ(q), or 4. PQ(q), or 5. Agr(p)
SR15	After P performs Disagr(p), 1. P can A(q) where -p and q form a rephrasing structure or an inferential structure 2. P can ReportSpeech(s,(IF(q)), where -p and q form a rephrasing structure or an inferential structure 3. P can PCh(p) 4. C can PCh(-p)
SR16	After C performs Disagr(p), 1. Any participant can PCh(-p) 2. C can A(q) where -p and q form a rephrasing structure or an inferential structure 3. C can R(q) where -p and q form a rephrasing structure or an inferential structure 4. C can AQ(-p) addressed to C_i 5. C can PQ(q) addressed to any other participant 6. C_i can Agr(-p)

Table 12: Structural rules for patient interview dialogue game.

7.2.7 Termination rules:

ID	Rule
T1	A dialogue terminates if: 1. All participants agree on p, where p= "all issues have been raised and resolved"

Table 13: Termination rules for patient interview dialogue game.

7.2.8 Outcome rules:

Outcome	Conditions
Plan of action and/or further session have not been agreed	P Agr(p) where p= "plan of action/further session
Plan of action and/or further session have been agreed	P Agr(p) where p= "plan of action/further session"

Table 14: Outcome rules for patient interview dialogue game.

7.2.9 Visualisation

Due to the expressivity of the patient interview dialogue game, in all participants share the same set of locutions and (mostly) structural rules, any visualisation is highly complex and difficult to read. We therefore do not provide such a visualisation for this game.

7.3 Game 3: Post-interview

7.3.1 Motivation

The Post-interview takes place after the patient interview. Its purpose is for the coaches to debrief and discuss how the session went. This follows informal practice used in medical settings.

7.3.2 Description

This dialogue game specification is designed to allow two or more coaches to discuss a patient after meeting him/her for a session.

The specification follows patterns found in the data collected from the patient interview sessions described in Section 3.

7.3.3 Participants - just C (not patient)

The participants in a Post-interview dialogue consist of a set of at least two coaches (X), where a single coach (C) is designated the "Lead Coach" (LC). The Lead Coach is the coach who has the most familiarity with the patient.

7.3.4 Locution rules:

ID	Rule
LR1	C can: 1. A(p) when he gives his opinion on p 2. Agr(p) when he agrees on p *3. ReportedSpeech*(s, *IllocutionaryForce*(p)) when he reports that speaker s said proposition p *4. ArgumentConcluded* when the C has concluded an argument

Table 15: Locution rules for post-interview dialogue game.

7.3.5 Commitment rules:

ID	Rule
CR1	Following a A(p), performed by C ∈ X, p is added to CSc_i
CR2	Following a Agr(p), performed by C ∈ X, p is added to CSc_i

Table 16: Commitment rules for post-interview dialogue game.

7.3.6 Structural rules:

ID	Rule
SR1	LC moves first with: 1. a sequence of locutions asserting some finite number of propositions: *Assert*(p_i)..., where 1 ≤ i ≤ n for some n ∈ Natural Numbers with inferential structure between them, and then *2. ArgumentConcluded*
SR2	After any coach performs *ArgumentConcluded*, any other coach can perform: 1. *Agr(p), or* 2. *ReportedSpeech*(P, *IllocutionaryForce*(q)) to report propositions q that the patient P has said in previous sessions
SR3	After *Agr(p)*, any coach can perform: 1. a sequence of locutions asserting some finite number of propositions: *Assert*(q_i)..., where 1 <= i <= n for some n ∈ Natural Numbers with inferential structure between them, and then 2. *ArgumentConcluded*

SR4	After *ReportedSpeech*(P, *IllocutionaryForce*(p)), any coach can perform: 3. a sequence of locutions asserting some finite number of propositions: *Assert*(q_i)..., where 1 <= i <= n for some n ∈ Natural Numbers with inferential structure between them, and then 4. *ArgumentConcluded*

Table 17: Structural rules for post-interview dialogue game.

7.3.7 Termination rules:

ID	Rule
T1	A dialogue terminates if no-one performs a move.

Table 18: Termination rules for post-interview dialogue game.

7.3.8 Outcome rules:

Outcome	Conditions
End of session	Post-interview is concluded

Table 19: Outcome rules for post-interview dialogue game.

7.3.9 Visualisation

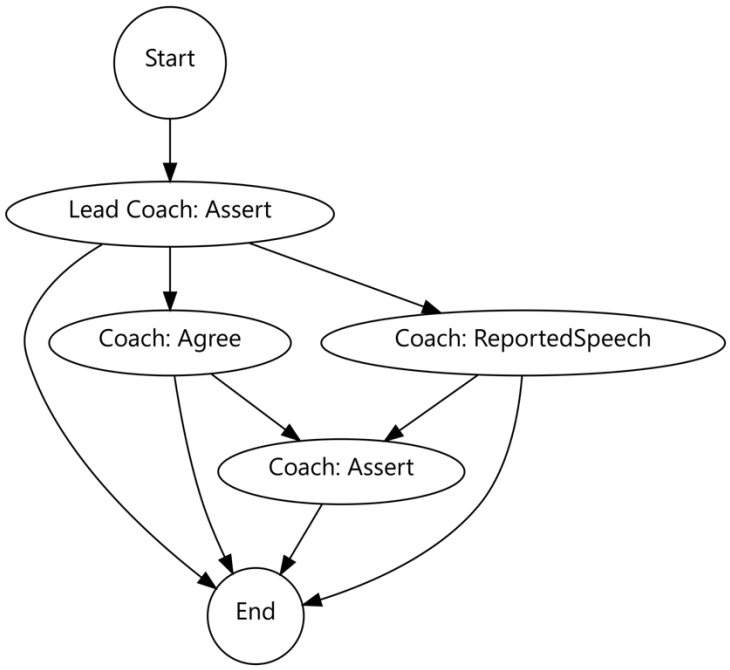

Figure 3: Visualisation of the post-interview dialogue game.

8 Dialogue games based on observation

In addition to the dialogue games based on IAT analysis specified in Section 7, we also provide a game specification based on observation.

During the recording of the sessions, they were simultaneously observed via an additional camera and microphones that were providing a live audio/visual feed to a second room. This allowed the researchers to make immediate observations as to the structure of the dialogues; these observations were then followed-up by closer examination of the transcribed audio.

While this method of analysis is somewhat simplistic, it is highly effective in identifying specific patterns that can be generalised into dialogue game specifications, and can extract naturalistic nuances of dialogue that are difficult to fully capture via formal analysis.

8.1 Game 1: goal-setting

8.1.1 Motivation

This dialogue game specification was motivated by combining principles of goal-setting theory (Locke & Latham, 2002; Michie, et al., 2013) with observations from two different recorded patient interview sessions.

Consider the following truncated excerpt from one session:

Colin (motivational coach):	*OK, so you don't see any relation between your low-carb diet and your blood sugars dipping?*
Kate (patient):	*Is this your way of trying to get me to take carbs?*
Barbara (diet coach):	*Maybe more focus should be put on the types of carbohydrates we're having rather than whether we have them in our diet or not… wholemeal granary breads, wholemeal pasta, wholemeal rice, beans and pulses.*
Kate:	*Now, that's something I would try…beans and pulses.*

This is a relatively straightforward exchange where Colin has previously suggested to Kate that she eat more carbohydrates to try and stabilise her blood-sugar levels. Kate, being on a "low-carb" diet, is wary of doing this. Barbara therefore proposes alternative foods that incorporate a different type of carbohydrate; Kate accepts trying beans and pulses. At a more general level, this demonstrates a goal being proposed, the patient expressing uncertainty, causing the goal to be revised then accepted. Important to the acceptance is the patient taking ownership of the goal – they, without further prompting, chose a specific goal from a list of options.

Now consider the following excerpt from a different simulated session between a patient, Linda, and two health coaches:

Linda (patient):	*But I'd probably have two [chocolate bars] a day and I just sort of crave that sugar rush…I look forward to that.*
Jane (diet coach):	*…if you're having that at the same time every day, what you're developing there is a habit. And don't get me wrong, habits are pretty easy to develop, but actually to break them is a really, really tricky thing.*
Alan (general practitioner):	*So, are you suggesting…you just cut [chocolate bars] out? Because that seems a bit harsh!*

Jane: *It does seem a little bit harsh, I suppose...we could have a discussion about what would be a realistic target for [Linda].*

These two exchanges provide short examples of goal-setting in practice, and while they are taken from different sessions with different patients and coaches, they could realistically occur in a single coaching session; consider the following constructed example:

Helen (patient): *I eat snacks at the same time every day.*

Florence (diet coach): *That's a habit that should be easy to break.*

Ben (diabetes coach): *Are you suggesting she stop eating snacks? That seems harsh!*

Florence: *It does seem a little bit harsh; we can discuss a realistic target.*

Helen: *Is this your way of trying to get me to stop snacking?*

Florence: *Maybe look at the types of snacks...you can have healthy snacks such as nuts, apples, carrots and protein shakes that are still tasty and filling.*

Helen: *Now, apples, that's something I would try.*

This exchange combines the two previously illustrated aspects of coaching: a coach expressing concerns about another coach's proposed goal, with new goals being suggested; and the patient taking ownership of the goal.

8.1.2 General description

This dialogue game specification is designed to allow one or more coaches to negotiate with a user towards setting some goal for that user to aspire to. The specification takes influences from goal-setting theory, as well as the data collected from the patient interview sessions described in Section 4.

8.1.3 Participants

The participants in a goal-setting dialogue consist of the patient (P), and a set of coaches (X), where a single coach (C) is designated the "Lead Coach" (LC). The Lead Coach is the coach whose expertise is most closely aligned with the specific issue for which a goal is currently being determined; for instance, a goal related to activity a coach with sports expertise (e.g. a fitness coach, activity coach etc.) would be designated the Lead Coach.

8.1.4 Locution rules

The locution rules for the goal-setting dialogue game are shown in Table 20.

ID	Rule
LR1	C can: 1. *Justify(g,r)* when they justify the goal *g* with reason *r* 2. *Revise(g,g`)* when they revise the goal *g* to new goal *g`* 3. *Challenge(g)* when they challenge a goal *g* proposed by another coach or the patient 4. *Accept(g)* when they accept a goal *g* proposed by the patient
LR2	LC, in addition to those locutions available to all coaches, can: 1. *Propose(g)* when they propose the goal *g*

LR3	P can: 1. *Accept(g)* when they accept a goal 2. *Unsure(g)* when they are unsure about a goal *g* 3. *Revise(g,g`)* then they revise the goal *g* to a new goal *g`*

Table 20: Locution rules for goal-setting.

8.1.5 Commitment rules

Two commitment stores are used in the dialogue game: one for the patient, denoted *CSp*, and another for the coaches as a collective, denoted *CSx*. We choose a single commitment store for the coaches because while one coaches can potentially challenge a goal proposed by another, it is still necessary for all coaches to ultimately be in agreement; thus the commitment store represents everything to which the coaches are jointly committed. The commitment rules are shown in Table 21.

ID	Rule
CR1	Following a *Propose(g)* by LC, g $\in$*CSx*
CR2	Following a *Justify(g,r)* by C$\in$X, r$\in$*CSx* and r->g$\in$*CSx*
CR3	Following a *Revise(g,g`)* by C$\in$X, g`$\in$*CSx* and g$\notin$*CSx*
CR4	Following a *Challenge(g)* by C$\in$X, g$\notin$ *CSx*
CR5	Following an *Accept(g)* by C$\in$X, g$\in$*CSx*
CR6	Following an *Accept(g)* by P, g$\in$*CSp*
CR7	Following a *Revise(g,g`)* by P, g`$\in$*CSp*

Table 21: Commitment rules for goal-setting.

8.1.6 Structural rules

The structural rules are shown in Table 22.

ID	Rule
SR1	All players can perform only one move per turn
SR2	LC moves first with *Propose(g)*
SR3	After LC performs *Propose(g)*, P can perform: 1. *Accept(g)*; or 2. *Unsure(g)*
SR4	After P performs *Unsure(g)*, C$\in$X\{C1}, where C1 is the (possibly Lead) Coach to whom the challenge is aimed, can perform: *Challenge(g)*; or C1 can perform *Justify(g,r)*
SR5	After C$\in$X\{C1} performs *Challenge(g)*, where C1 is the (possibly Lead) Coach to whom the challenge is aimed, C1 can perform: 1. *Justify(g, r)*;or 2. *Revise(g, g`)*
SR6	After C1 performs *Justify(g, r)*, C$\in$X\{C1} can perform: 1. *Challenge(r); or* 2. *Revise(g, g`)* Or P can perform: 1. *Accept(g)*; or

	2. *Revise(g, g`)*
SR7	After C∈X performs *Revise(g,g`)*, P can perform: 1. *Accept(g`)*; or 2. *Unsure(g`)* Or C1∈X\{C} can perform *Challenge(g`)*
SR8	After P performs *Revise(g, g`)*, C∈X can perform: 1. *Accept(g`)*; or 2. *Revise(g`, g``)*

Table 22: Structural rules for goal-setting.

8.1.7 Termination rules

A goal-setting dialogue can terminate at any time, regardless if a goal has been accepted by the patient or not. Informally, we impose a constraint that a dialogue cannot terminate if P is the last speaker – in other words, a coach will always respond to what the patient says. This constraint will be enforced at the application-level rather than the logical-level.

8.1.8 Outcome rules

The outcome of a goal-setting dialogue is determined by whether or not a goal is accepted by both the patient, and the coaches as a collective. Acceptance (non-acceptance) is determined by the presence (non-presence) of the goal in either commitment store. Since the patient can choose to terminate a dialogue at any time, it is possible for a dialogue to terminate without them accepting a goal. Depending on precisely when the dialogue terminated, this can take one of two forms – either the coaches accept a goal that the user did not, or the user accepts a goal that the coaches did not (insofar as the coaches did not have an opportunity to agree with a goal suggested by the patient).

The outcome rules are summarised in Table 23.

Outcome	**Conditions**
Goal (g) agreed	g∈*CSp* and g∈*CSx*
Goal (g) not agreed	g∉*CSp* and/or g∉*CSx*

Table 23: Outcome rules for goal-setting.

8.1.9 Visualisation

The visualisation for the goal-setting dialogue game is shown in Figure 4.

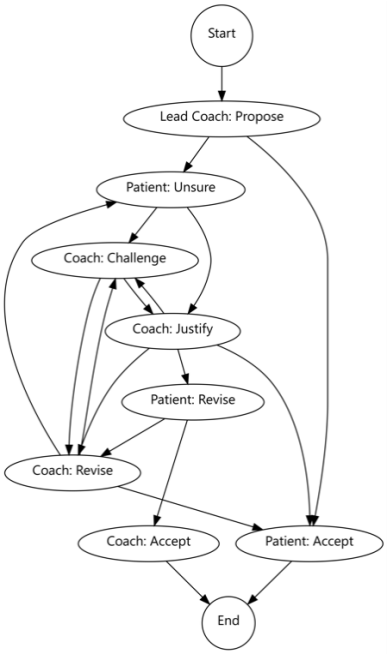

Figure 4: Visualisation of the goal-setting dialogue game.

9 Conclusion

We have provided a set of formal specifications for dialogue games. These are based on (i) our analysis using Inference Anchoring Theory of a corpora of patient interviews between various healthcare professionals and a patient (Section 7); (ii) real-time observation of the patient interview dialogues (Section 8). Each dialogue game specification describes: the participants in the dialogue; the moves (locutions) those participants can make; the ordering of moves; how a participant might incur commitment to what they or others say; how a dialogue might terminate; and how we determine the outcome of a dialogue. These specifications will feed into the development of computational models in D5.3.

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