Conflict Inside Out: A Theoretical Approach to Conflict from an Agent Point of View

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ABSTRACT

Conflict and conflict dynamics are phenomena intertwined with social change. The ability to detect conflict it is as important as the ability to resolve conflicts effectively because conflicts can bring attention to the problematic structures in a society. In multi-agent systems (MAS), a great deal of work has been devoted to conflict resolution, but little has been discussed regarding detection or creation of conflicts. In this paper, we argue that these processes are central to the agent's decision-making process and should be explicit in an agents' emotional architecture. Our position is that conflict is at the core of any social interaction. Therefore, we adopt a more natural approach by articulating insights from the social sciences literature to define an explicit model of conflict using an emotional architecture of agents and considering theory-of-mind reasoning. Emotions are central to conflict and its experience; hence, conflict is a dynamic process in which emotions are responsible for activating or deactivating it in a conflict loop. In a simulation of a defined scenario scenario, we become aware of the appraisal processes that are activated when the agents are subjected to conflicts, which fit well with our model of the phenomenon.

Categories and Subject Descriptors

I.2.11 [**Artificial Intelligence**]: Distributed Artificial Intelligence—*Intelligent agents*

General Terms

Theory, Design

Keywords

Conflict Theory, Virtual Agents, Emotions

1. INTRODUCTION

Social conflict is a universal and double-sided phenomenon essential to life. It can either be a catalyst of change and improvement in society or it can lead to violent atrocities, and ultimately war. In 8 decades of conflict research, sociologists, psychologists, economists and political scientists have sought to understand the phenomenon of conflict, but unsurprisingly, the findings on this complex process are still fragmentary and incomplete.

In AI, similar to human societies, conflict abound in multi-agent systems (MAS) [30]. However, a comprehensive overview of the phenomenon has not yet been developed [20]. In MAS, conflict is commonly addressed as a failure or synchronisation problem [22] and the classical approach to resolve the conflict is either to avoid or to solve it, by using synchronisation algorithms or negotiation protocols [30]. Coordination is therefore studied intensively in the field, as is the integration of cooperative mechanisms into MAS [1]. To maintain autonomy and interoperability of the agents within an *open* system, more sophisticated approaches to handle inconsistencies have been pursued, in contrast to 'out-designing' conflicts. These approaches include *a*) **joint intentions,** which intend to model collaboration between agents in the same team [13]; *b*) **mutual modelling** of the agents' minds to infer the intentions of others based on their mental models [15]; *c*) **social commitments** that enforce a contract and may be implemented by applying sanctions [25]; and *d*) **norms** that impose obligations and set prohibitions and permissions to exclude disruptive behaviour in MAS [32]. These mechanisms aim to improve coordination between agents and to tackle the ultimate goal in MAS, which is to promote cooperation and global coherence [20].

In general, principles of coordination and cooperation rely on the assumption of *benevolence* [35]. Yet, as systems grow and become more complex we can no longer assume that the agents will strive for the overall goal of the system. Agents are self-interested and they may have partial or completely antagonistic goals [28]. Hence, a less simplistic view of conflict must be adopted to capture more subtle forms of conflict.

Recently, the increasing interest in creating rich social simulations has shifted the attention to a critical phenomenon that cannot be simply avoided. Albeit considerable research has been dedicated to conflict resolution in MAS, little has been reported about conflict detection or generation. Game theory sheds some light on the analysis of multi-agent interactions in prototypical scenarios, but it fails to capture

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[1]Coordination and cooperation are two different things. A group of agents may be coordinated, but not necessarily cooperating at the same time. Conversely, cooperation do imply coordination of actions.

all the factors in complex phenomenon such as conflict detection [30]. Simulating people's motivations is much easier when considering money as the main object, whereas conflicts between friends, for example, seem to arise over seemingly trivial issues. Additionally, the state-of-the-art in AI lacks a comprehensive view of conflict, and there is no blueprint for representing and reasoning about the phenomenon.

In this paper we argue that *an explicit representation of conflict in an agent's mind is required*. Not only would it help the agent to act towards the prevention or creation of conflict (depending on its utility), but it would also increase the ability of the agent to choose the best strategy to handle the situation. However, desirable as it may be, and despite the massive research on conflict in the social sciences, there is still some uncertainty on how to translate the theory to more specific parameters that together provide an adequate description of the phenomenon. Conflict happens at different levels of the social interaction and it is not clear what actually happens during this multi-level process. What makes a fight emerge and others subside, for example, is difficult to explain unequivocally [17]. This topic has provoked discussion in various areas of research.

Our aim is to provide a more balanced view of conflict and place it in an emotional architecture of agents. A central tenet of our approach is that conflict takes place at the individual level and should be conceived of as a form of sociality and interaction [6]. It is a process internal to the agent and therefore strongly influenced by the agent's emotions, a causal link often neglected in the literature [23].

Throughout this paper, we will focus on social conflict, in general, that should not be conceived as a "breakdown in decision making" [23], but rather as a dynamic process [26] that is a form of sociality and interaction [6, 8], in which emotions have a mediating role between cognitive appraisal and conflict resolution strategies [3, 23]. This naturalistic view of conflict seems to be essential in applications that aim to create more believable agents. By way of example, these appications can be serious games that simulate social interactions to serve educational purposes or interactive storytelling that uses conflicts between the characters in the story to promote engagement with the narratives. Following this line of thought and in the wake of recent progress in conflict research, we gathered insights from the theory to develop a possible path to map conflict-related concepts from theory to practice.

2. BACKGROUND: CONFLICT THEORY

The definition of conflict has changed through decades of research and still now, it remains uncertain, vague and contextual [23]. Words such as *competition*, *tensions*, *disputes*, *opposition*, *antagonism*, *quarrel*, *disagreement*, *controversy* and *violence* [12], have been used to describe the conflict phenomenon. A thin line separates conflict from non-conflict situations because the loose meaning of the word addresses everything from a small dispute to a large-scale war [19]. Hence, throughout the literature, several competing definitions have denoted conflict in vague terms to cover a wide spectrum of situations.

Interdependence, *interference* or *obstruction* are terms frequently found in current definitions (e.g. in [10] or [31]). Although these are necessary attributes of a conflict episode they are not sufficient to define it. An often-neglected characteristic is emotion, perhaps because a large body of re-search (that contributed greatly to the field as in the case of [31]) has dealt with organisational conflict that focused essentially on structural sources of conflict [23]. It was not until recently that researchers have placed more focus on emotion and have acknowledged that conflict does not occur in the absence of it [14, 23, 4], even though this link had already been established by Pondy in the 1960s [26].

Additionally, the riddle of conflict have resulted in breaking down such complex phenomenon into five distinct levels. Conflict may occur *in a single mind*, it may be *inter-personal*, *inter-group*, *inter-organisational* or *among nations*. Interpersonal conflict has received a lot of attention in the literature and has been split according to the nature of the opposing parties or conflicting social units [12], i.e. it can occur between father and son, husband and wife, labour and management, between two friends, etc. These different forms of interpersonal conflict have been studied as self-contained topics and, more often than not, theories about a specific type of conflict are seldom influenced by studies on any other type of conflict. Although different types of conflict hold unique properties we cannot ignore the fact that they may share a similar structure.

2.1 Defining Social Conflict

Barki and Hartwick [2] define interpersonal conflict as "*a dynamic process that occurs between interdependent parties as they experience negative emotional reactions to perceived disagreements and interference with the attainment of their goals.*" K. Thomas [31], in more broad terms, also shares this view regarding conflict saying that "*conflict is the process which begins when one party perceives that the other has frustrated, or is about to frustrate some concerns of his.*"

Building on the aforementioned thoughts we make the following assumptions about **dyadic** forms of conflict.

Assumption 1 The definition above encompasses **cognitive**, **affective** and **behavioural** dimensions that can not be taken singly, when defining any form of social conflict (the authors in [2] reinforce these three dimensions).

Assumption 2 Conflict requires interdependence, but that factor is not a sufficient condition; de Dreu [9] reinforces that latent or potential conflict is intrinsic to interdependent structures, but it may, however, never become manifest.

Assumption 3 Beliefs shape the situations, and thus, it is in relation to beliefs or goals that conflicts occur [6]. Disagreements and/or interference occur "when a party *thinks* that divergence of values, needs, interests, opinions, goals or objectives exist" [2]. Note that problematic situations may be presented, discovered, created or imagined [34]. However, two parties are not in conflict if they simply hold different beliefs or goals. The difference must also be emotionally laden [14], i.e., some deprivation caused by the difference intensifies its relevance to the point of conflict.

Assumption 4 Negative emotions (e.g. fear, jealously or anger, for instance) act as triggers of cognitive or behavioural processes.

Assumption 5 Conflict is a *dynamic process* because of the interaction between the three dimensions in a continuous feedback loop. This view of conflict as a dynamic

process is also shared by other authors, such as Fink [12], Barki and Hartwick [2] Thomas [31], Kriesberg and Dayton [17], Coleman et al. [8] and de Dreu [9].

2.2 Conflict as a Dynamic Process

We can *have a conflict*, we can *be in conflict* and we can even *perceive a conflict* either from a first-person or third-person perspective. The view of conflict we adopted in our research is that conflict is a process that goes through several stages in a cycle. Therefore, conflict is not only a state of affairs, nor simply an overt manifestation of dissatisfaction.

The three dimensions of conflict, cognitive, affective and behavioural, contribute to make conflict episodes move through the following stages (in [17]), shown grafically in Figure 1 (adapted from [17, p. 8]) : 1. **Latent conflict**: all relations between potential adversaries; 2. **Emergence of conflict**: period in which at least one of the parties probe and explore the reality of her beliefs; 3. **Escalation**: expression of increasing intensity between the parties in conflict, may include threats or intentional damage between the parties; 4. **De-escalation**: intercalated episodes with escalation that tend to reduce antagonism; 5. **Settlement**: does not necessarily means resolution as conflicts may return to its latent form; and 6. **Conflict aftermath**: various outcomes of an episode that has gone through the previous stages.
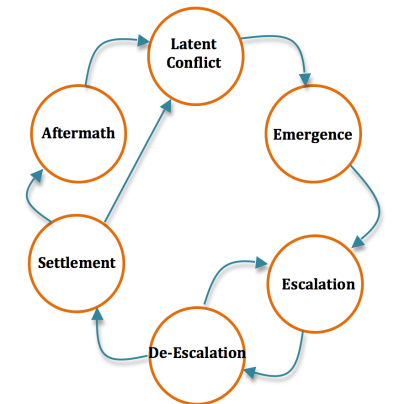

Figure 1: Conflict cycle that represents the stages described by Kriesberg and Dayton

These stages may suggest a temporal organisation of events, but it is not guaranteed that once a party engages in a conflict episode she goes through all these steps. This idea of a temporal arrangement of events was also compared to a narrative plot [18]. The way in which a conflict unrolls depends strongly on the strategies applied for its management and how those strategies may trigger escalation or de-escalation processes.

A major research topic has been the escalation of conflicts in which emotions have a prominent role. When the conflict worsens, we say that it escalates. When the magnitude of the situation decreases, we say that it de-escalates. Every conflict escalates, even if it is only unilaterally. Escalation occurs when one or both parties engage in the conflict, moving it from a less severe stage to a more contentious and heavy state [27]. This process deals also with the conflict intensity that is related to maturity, urgency and implications of party's actions weighted with his emotional state.

Campos et al. [5] addressed the issue of urgency and strategy choice when modelling escalation in virtual agents.

3. RELATED WORK

In line with the increasingly interest in rich social simulations, computational frameworks of conflict have been recently developed with particular application to games and interactive storytelling. In the latter, Ware and Young [33] defined a plan-based model of narrative conflict, inspired by narrative research, to create more engaging narratives. In their work, *conflict is broadly defined as a threat*, and occurs when an agent has difficulty in carrying out its plan. In brief, conflict occurs when one agent prevents another agent's plan from succeeding. They support their approach on the notion of causal links, which explain how preconditions between steps (in a plan) get satisfied.

Zambetta et al. [36] explored a mathematical model of conflict in the context of story-driven games to simulate real political situations. They base their work on the Richardson's Arms Race scenario using a system of linear equations. The semantic of the model was modified to favour dynamic variations in the system in terms of cooperation and competition, a variable set to 1 or 0, respectively. The stability or instability of the system is thus based on the variation introduced into the system itself based on the values of cooperation. Complexity is introduced into the system by creating different interdependent layers that may yield, e.g., personality values. Those layers act as predictors of cooperative and competitive behaviour.

The applicability of conflict in the design of social simulations that are integrated in games has also been explored. Medler et al. [21] defined a general conflict framework to incorporate conflict theoretical concepts into games. Their work is essentially based on the research of Bartos and Wehr, who define conflict in terms of *conflict behaviour*, *incompatible goals* and *hostilities*. In their framework, Medler et al. specify the conflict information that should be explicit within a game to ensure conflict emergence and thus its creation and management. The framework consists in 3 main elements: *Actor Model* that contains conflict knowledge of a single actor; the *World Model* that specifies how conflict occurs in the game and thus how actors behave within a system using this framework; and the *Conflict Behaviour Model* that defines the conflict behaviours that can be performed.

More recently, Cheong et al. [7] presented a computational approach to model conflict generation and conflict management, which will be embedded in a serious game to teach conflict resolution to children. Their approach was derived from psychology and sociology theories. The model consists of five steps to replicate the plot nature of a conflict episode, *conflict situation creation*, *conflict detection*, *player modelling and conflict strategy prediction*, *conflict management* and *conflict resolution*. Their conceptualisation of these stages is focused on simulating interpersonal conflicts that arise from goal interdependence. They rely on the user interaction with the system to trigger possible conflict situations (closely linked to learning objectives) or to detect possible conflicts as a result of the user's emotional expression. It is important to note that this game is a multi-player game in which conflicts are experienced in the first-person. Thus, conflict creation and conflict detection are two processes centred in the user and not dynamically generated by the system.

Swanson and Jhala [29] extended the work of Cheong et al. work and proposed a computational model of conflict that focusses on context and dynamics rather than the mechanics of the interaction. Their primary goal is to build a procedural model of conflict that may help game designers to create social simulations to portray real world behaviour.

The lack of a blue-print to represent conflict in such interactive settings has challenged researchers to find possible ways of representing conflict for their purposes. Our work fits in this type of approach. In the SIREN[2] project, we intend to create a serious game to teach conflict resolution to children in which NPCs continuously engage in conflict situations and the player is asked to mediate those conflicts. To create believable NPC's behaviours in this setting we explore how an agent knows that it is in conflict, which is an essential step in deciding how to adresse it. Furthermore, to take a stance on conflict formalization, we cannot ignore all the multi-disciplinary work on conflict, therefore what we propose is based on theory described in the Background and Related Work sections.

4. CONFLICT IN SOCIAL AGENTS

In multi-agent systems, conflicts are bound to emerge, either from incompatibilities in goals or inconsistent beliefs. In this work, we want to take a step further and say that conflict is a mode of relating, thus it requires interaction and emotions to regulate that interaction. A component of theory of mind is therefore essential in the reasoning process of conflict situations. By considering those features as well, agents may decide under which conditions it would be suitable to tolerate, postpone, ignore or by-pass a conflict situation [1].

4.1 Process Overview

Conflict is a process consisting of a set of stages and incorporates cognitive, affective and behavioural processes. Figure 2 illustrates the steps of the agent's reasoning process from perception, through diagnosis to resolution. In this paper, we will only consider the first part of the process up to step 4, which is often neglected in the literature.

Each component or reasoning block in the cycle is described in the following sections.

4.1.1 Baseline Conditions

Baseline conditions (in every setting) are the **fuel** for a possible conflict episode. These conditions are more or less condutive, *depending on the individual*, to the outbreak of conflict. The existence of these situational conditions *does not mean that the agent knows they exist* and some sort of **interaction**, between at least two parties, is necessary for ignition. Furthermore, a third-party may judge whether the environmental conditions are an opportunity for **potential conflict** (e.g., competition), whereas the interacting participants in that environmental setting may not see a problematic situation in and of itself.

We say that this is a state of **latent conflict**, i.e. the **conflict is inactive**. Potential conflicts may shimmer unseen at this state and never become active.

This block represents the structure of interdependence or independence in a certain situation. It may also refer to

the actual state of beliefs for both parties; this necessarily includes *mutual modelling* between the two parties.

4.1.2 Trigger 1

This first trigger sets the transition from the previous to the next state. It represents cognitive processes that take place within an agent's mind by which the agent is aware of the potential emerging conflict. An event in the world, *communication with another agent, one's actions* or *lack of actions*, may trigger and activate the next state.

4.1.3 Awareness / Conceptualization

Conflict involves awareness [17] of the issue and parties involved. At this stage **conflict is salient** or **becomes an issue**, depending on how one *frames* the situation. Within this block how one perceives conflict and feels about it is the primary factor, hence **appraisal** is central to this process as in any other social interaction. This process is full of idiosyncrasies, which can increase the potential for conflict. In other words, the conceptualisation of the situation [31] takes place. Moreover, a salient cognitive process at this phase is **attribution**, which may be a critical factor in strategy choice for conflict resolution or management. This topic goes beyond the scope of this paper and will be addressed in future work.

We make explicit the separation in two hen-and-egg parts: perception of conflict (**2.**) and felt conflict (**3.**), under the assumption that "one is not aware that one is in conflict unless one recognizes one is emotional about it." [14]. At this state, the agent is **aware** of the potential conflict situation by feeling exploited, deprived of something or perceiving a failure in its own expectations (following Castelfranchi's ontology [6] conflicts only exist in relation to goals or beliefs). Conflict at this stage is **emotionally active**, but no manifestation occurs.

If an agent is aware of a conflict or potential conflict, it can reason about the situation it is in at and make a decision that fits that emotional conflict situation. Emotions act as mechanisms that alert us for urgent response or redirect process information. In addition, emotions help the participant to conceptualise the situation and thereby generate disparate conflict situations.

4.1.4 Trigger 2

Under the assumption that emotions are a causal mechanism of conflict [23], we maintain that a trigger forces the transition between a passive coexistence to an overt manifestation that something is wrong. Some change in the world transforms the participant's perception and emotions pull the trigger, activating the conflict. More often than not, the lack of a triggering event will keep the conflict from emerging [17]. Carsten de Dreu [9] claims that the "jump" to the subsequent state occurs when a party **attributes** current or future deprivation to an interdependent party's lack of cooperativeness.

4.1.5 Emergence

Conflict emerges when at least one potential participant manifests the belief that his goals are incompatible with those of an adversary. In many social interactions, when a party reaches this state it may seem sudden, but it often results from a set of circumstances (these are not fixed and depend on each individual) produced over a certain time
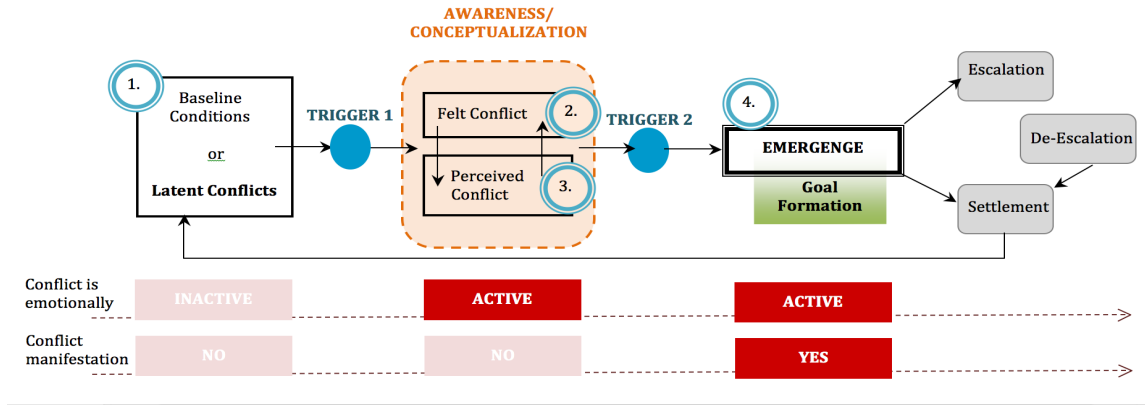
Figure 2: Conflict Process

span [17]. Arriving at this eruptive stage requires **Goal Formation**, the agent decides to manifest its beliefs, which implies that the the agent is now on the path to conflict management.

4.2 Am I in Conflict?

We are in conflict only when current or anticipated deprivation (of outcomes) is attributed to another party's behaviours (actions or inactions) [9]. Potential conflict then becomes real, but this can also occur in reverse. One may *think* she is in conflict when current or anticipated deprivation (of outcomes) is attributed to her own behaviours (actions or inactions), but this will only be confirmed if the other perceives the situation in similar terms.

The near-consensus in the literature (*assumption 5* in the definition) is that many cognitive and behavioural processes take part in a conflict process. Appraisal is thus a central element in characterising a situation as a conflict. In fact, for a conflict to be active, a pattern of appraisal must occur:

- The perception of *incompatibility* of some object of interest (belief, interest, goal or aspiration of *relevance*) occurs. Based on Castelfranchi [6] ontology three types of incompatibilities may occur:

  - $(Goal/Bel \quad Ag_A \quad p) \bigwedge (Goal/Bel \quad Ag_B \quad \neg p)$;
  - $(Goal/Bel \quad Ag_A \quad p) \bigwedge (Goal/Bel \quad Ag_B \quad q)$;
    $\bigwedge (Bel \quad Ag_A \quad (q \implies \neg p))^3$
  - perception of scarce resources.

  This item relates to *Trigger 1* illustrated in figure 2 and described in section 4.1.2

- *Interference* occurs when one party is unable to achieve her goal *independently*, and thus depends on the other's actions or non-actions to achieve her goal. This item refers to interdependence between the parties and it brings social value to the conflict phenomenon. Kelley et al. [16] refer to this type of dependence as Mutual Partner Control (MPC), or *the degree to each party is affected by the other's actions*. We believe that this reasoning process occurs in step 2 (figure 2).

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[3]Castelfranchi [6] calls it a *crucial belief*, "belief that asserts that one implies the opposite of the other".

- The object of interest was undermined by the other or the cost associated with achieving it is now very high due to the other party, known as *attribution*. This may pull the trigger (*Trigger 2* illustrated in figure 2) and cause the emergence of conflict (even if unilaterally).

5. CASE STUDY

5.1 "Cleaning the Apartment"

Consider the following situation (adapted from Kelley et al. [16]). Kim and Tom have recently moved into a nice apartment near the town centre, but both have been swamped with work and they had had little time to do anything else. As a result, their apartment reached a point in which it badly needs to be cleaned. Kim hates to live in such conditions so she deeply wants to *clean the apartment*.

Consider the following scenarios that describe two possible courses of action.

Course of action 1 On Saturday morning Tom goes out with his friends to play football, as he usually does every week. Cleaning is not his favourite thing to do, and he thinks that Kim does not care much about it either. For Kim, she would rather clean the apartment by herself than not clean it at all.

Course of action 2 On Saturday morning Tom usually goes to play football. Even though, he does not really care whether the apartment is a mess, he believes that is really important for Kim. He believes it is very relevant for her if they do it together, so he decides to help her.

The initial set-up coupled with the two different courses of action, illustrate how subtle differences in one's perceptions are reflected and how they affect in one's awareness of conflict. Tables 1 and 2 show Tom's view of both situations and the same tables describe Kim's perspective of the same setting, according to what was described above. We intend to emphasise that situational constraints of an environment are not generators of conflict per se, but how an agent appraises the situation is strongly related to conflict forms. **A component of theory of mind is essential to represent the phenomenon**.

Table 1: Tom's and Kim's perspective: *Situation 1*

TOM		
Who	Goals	Importance
He	*play_football*	+8
	clean_apt	-5
Kim	*clean_apt*	+1

KIM		
Who	Goals	Importance
She	*clean_apt_alone*	+6
	clean_apt_together	+8
Tom	*play_football*	+8
	clean_apt	-5

Table 2: Tom's and Kim's perspective: *Situation 2*

TOM		
Who	Goals	Importance
He	*play_football*	+8
	clean_apartment	+1
Kim	*clean_apt_alone*	-5
	clean_apt_together	+8

KIM		
Who	Goals	Importance
She	*clean_apt_alone*	-5
	clean_apt_together	+8
Tom	*play_football*	+2
	clean_apt	+5

5.2 How do agents behave in this setting?

To test what would happen with emotional agents given this scenario (see figure 3 in which we describe the actions available in the simulation), we ran a simulation with FA-tiMA agents with the motivation values in tables 1 and 2. FAtiMA [11] is an agent architecture that stems from the OCC cognitive theory of emotions, which defines emotions as valenced (good or bad) reactions to events [24]. The simulation feeds emotion-related information into the pre-described model and thus indicates how the model can be integrated into an emotional agent architecture. This level of granularity is what we are seeking with our work.

5.3 Analysis of Situation 1

Using the case study, we assume that the goal "*go play football*" necessarily implies "*not to clean the apartment*". Clearly, Kim and Tom have incompatible goals; however, such constraint does not necessarily imply they both are in conflict. In fact, not only does **incompatibility** have to be verified, but the perception of **interference** and subsequent **attribution of deprivation**, have to occur as well. From table 1, we can infer that Kim is not much dependent on the other party to clean the apartment. If we reduce those values of goal importance to utility, she would benefit from the situation either way, cleaning the apartment by herself or cleaning it with Tom, as her desire is to have it cleaned. Figure 4 illustrates that episode.

When Tom decides to "go play football" Kim is aware of some incompatibility between their goals. From the simulation in FAtiMA, we know that Kim immediately drops the goal *clean-together* and makes plans to *clean the apartment*
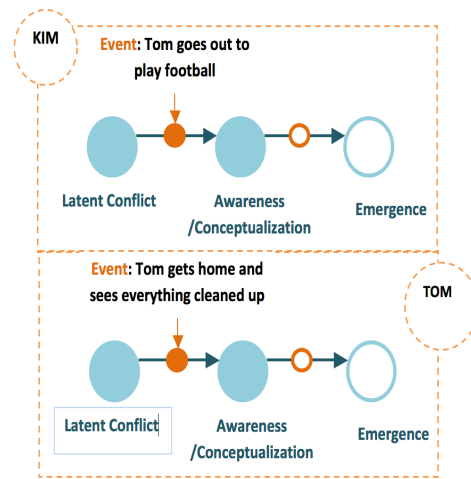

Figure 4: Events in scenario 1 and activation of the states in the model

alone. We can infer two things. First, incompatibilities (not conflict) can be detected in a similar way to how conflicts between actions or plans are detected within an agent reasoning system, i.e *from intra-agent conflicts to inter-agent conflicts* [6]. Conceptually, Kim is aware of some incompatibility and an interference of her plans, but the intensity of it is not enough to trigger some emotional reaction above a determined threshold. Second, agents do drop their goals to pursue safe choices, and one of our aims in this paper is to emphasise that agents do not need to this. Sometimes, it is useful to engage in a conflict.

5.4 Analysis of Situation 2

Considering that the event "Tom goes to play football" is very undesirable and reproachable for Kim, emotions such as distress or reproach would be activated at the reactive level (in the current simulation). With that information (but at the deliberative level), Tom can simulate his actions according to the model he has of the other. From his perspective, they have incompatible goals and if he "goes to play football" he would totally interfere with her goals for that morning. By helping her, Tom takes an action that is congruent with her goals, and therefore, Kim does not even realise their goals are incompatible. Latent forms of conflict still exist but Kim is not aware of them. Figure 5 illustrates these differences between Kim and Tom and how those differences are salient in terms of the model. The degree to which one interferes with the other's goals is related to appraisal variables (within the OCC theory of emotions) that can be translated into well-being and prospect-based emotions. Attribution-based emotions indicate whether she thinks his actions are reproachable.

6. CONCLUSION AND FUTURE WORK

In MAS current planning approaches are designed to make agents drop their goals that are no longer safe (nor apparently achievable), in order to avoid risky decisions in agent societies. However, the increasing interest in rich social simulations reveals the need to not simply avoid the conflict phenomenon. To create more natural and believable simulations, a more comprehensive view of conflict is required.
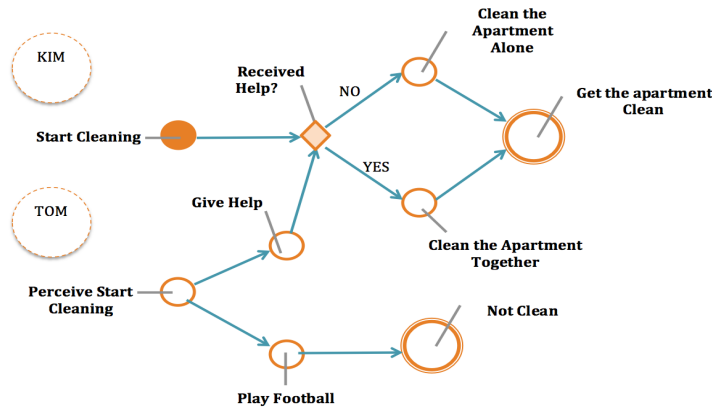
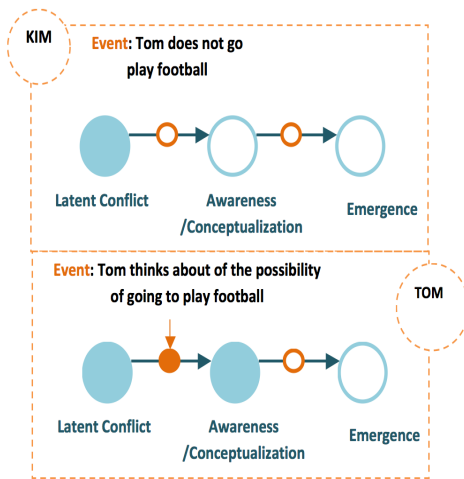Figure 3: Steps in the simulation in an emotional archiecture of agents

Figure 5: Events in scenario 2 and activation of the states in the model

The refracted knowledge through the literature in social sciences and AI yields disparate views of the phenomenon, but relevant progress has been achieved.

In this paper, we gathered insights from the literature towards a more natural representation of conflict in agents. More than a state of affairs or an overt manifestation of disagreement, social conflict may hold common characteristic across settings. For that reason, we emphasise that personal factors affect one's views of the world almost as much as circumstances do. Not only does the situation shape conflict episodes, but the cognitive, affective and behavioural processes within an individual are essential to make potential conflicts salient. Our position is that conflict is a dynamic process and transitions between states are driven by an agent's emotions. We propose that for an agent to recognise that it is in a conflict situation, it must be aware that some *incompatibility between relevant beliefs or goals* exist; some *interference* in his plans occurred and it can no longer pursue what it thought to be the best strategy; and finally that *obstruction is attributed to another*.

The scenario we present in this paper to illustrate the proposed model, calls attention to these sharp differences in one's perceptions . If an agent is aware of conflict he will be able to shift his attention and adapt to situations that were not in the plan because of "wrong realities." Furthermore, the agent can even create or decide to engage in a conflict if it thinks that would be useful to him. The simulation at the reactive level of an emotional architecture of agents allowed us to be aware of the appraisal processes that take place when the agents are subjected to the scenarios' initial configuration. Well-being emotions are related to incompatibility, inconsistency is linked to prospect-based emotions (fear/hope that a plan will succeed) and the reason of the obstruction is related to attribution related emotions (reproach and guilt).

In future work, we will address two critical aspects we left unaddressed. The conceptualisation of the conflict situation is crucial to how the subsequent phases unroll, i.e., how an agent conceptualises a conflict situation will affect how it experiences it. Moreover, the attribution assessment is a challenge by itself, and we intend to explore this component in the future, as this emotional evaluation is closely related to conflict resolution.

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