Using Conflict Theory to Model Complex Societal Interactions

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ABSTRACT
Conflict theory can be used to explain the interactions between societies during times of turmoil and change (i.e. revolutions, strikes or everyday debates). Games have been produced that make use of different aspects of conflict theory; however a common framework for organizing a system to produce realistic conflicts has not been created. This paper presents one such framework, based upon principles of conflict theory, which describe a generalized way of organizing a system to produce realistic conflict situations among societies. With our framework, we present how current commercial games represent conflict and how our framework can be implemented by these games in order to increase the system's flexibility and accuracy in representing conflict.

Categories and Subject Descriptors
K.8.0 [Personal Computing]: General—Games

General Terms
Design, Theory

Keywords
Conflict Theory, Social Modeling, Digital Games

1. INTRODUCTION
Games are often defined as systems that express conflict within a safe, structured environment [16]. Having a better understanding of how humans and societies act through conflicts may help create enhanced game systems by providing realistic, flexible conflict experiences that are based on general principles and theory as opposed to specific, hand-tailored content. We have created a framework that uses conflict theory to simulate realistic conflicts to explore how these principles can be integrated with digital games in the future.

Conflict theory is a collection of multiple theories from different

fields including sociology, psychology, and economics that attempts to understand how humans begin, maintain, and end conflicts. Bartos and Wehr contend that conflict occurs when "… actors use conflict behavior against each other to attain incompatible goals and/or to express their hostility" [3]. How and why conflicts occur can be explained by defining *conflict behavior*, *incompatible goals* between societies, and what it means to express *hostilities*. Defining these terms has allowed others to create research tools which simulate conflicts [14, 15] and has been utilized by many systems in order to determine intelligent character behaviors [5, 12, 17]. However, beyond their use for research these conflict models can be combined with digital games to provide flexible and extended experiences by exploring how artificial intelligent (AI) agents can simulate realistic *conflict behavior* together with human players.

This paper describes how creating a generalized framework of conflict allows us to reproduce interactions between simulated societies which resemble real world societal interactions during times of conflict. We begin by describing conflict theory, a set of theories that seek to understand how conflicts function. Next, we describe how conflicts are handled in three current commercial digital games. We then present our computational conflict framework, which includes descriptions of what knowledge a social system must have, and what additional needs must be attained in order to achieve the goal of modeling societal conflicts. Finally, considering the three commercial games we review in this paper, we offer guidance as to how our framework may be implemented by these games.

2. CONFLICT THEORY
In [3], Bartos and Wehr describe a generalized picture of conflict theory by reviewing over a hundred different sources rated to how conflict function. In this section we review this generalized picture and supplement it with other related research within conflict theory [1, 2, 10, 18, 20, 21]. While this is not an exhaustive explanation or study of conflict theory, which has many theories and interpretations, these works have provided a starting point for us to build an initial conflict framework for developing games that mimic real life conflict (see Section 4).

Bartos and Wehr present the following terms in their definition of conflict, "… actors use conflict behavior against each other to attain incompatible goals and/or to express their hostility" [3]:

- *Actor* means one or more individuals that have their own goals and are participants in a conflict.

- *Conflict behavior* is any behavior that helps actors achieve their goals or desirers against, or express *hostility* towards, another actor. (also called conflict styles [21])

- *Incompatible goals* between actors occur when an actor tries to achieve goals that compete against another actor's goals.

- *Hostility* is irrational behavior, meaning actors do not asses all conflict behavior possibilities properly due to heighten emotional state, anger, revenge, etc. [21].

In summary, actors are groups of individuals that conflict when they have incompatible goals with other actors. During a conflict, actors use conflict behavior against one another to achieve their goals which may cause hostilities between the actors to grow. Conflicts do not necessarily have to be negative or violent [20], however using violence is a form of conflict behavior. The rest of this section defines and describes possible incompatible actor goals, how conflicts begin, and how the dynamics of on-going conflicts work.

2.1 Incompatible Goals

There are three types of actor goals which may be incompatible with another actor's goals: resources, roles and values. *Resource incompatibilities* occur when actors compete for: wealth, power, and prestige. These resource types can be defined as:

- *Wealth* is anything tangible that holds value to actors.

- *Power* is the ability of actor A to force actor B to perform, even to a minimal degree, in a way deemed by actor A. For example, a boss has the power to force their employees to work on projects which the boss deems necessary [3, 20, 21].

- *Prestige* is the "ability to live up to a group's ideals" [3, 20].

These resources can cause conflicts through their deprivation (an actor is left without a resource), illegitimate power (an actor takes power illegally) or through belligerent action (an actor acts aggressive to steal resource).

Role incompatibilities occur between actors in a vertical or horizontal hierarchy [20]. Incompatibilities between hierarchies are conflicts in which one actor maintains power over another actor (vertical) or both actors have equal levels of power (horizontal). Historically, Karl Marx theorized vertical hierarchical differences between capital holders and the working class cause conflicts [11] which can be characterized as a "Whole vs. Part" conflict [3]. Horizontal conflicts cause task conflicts, for example a conflict that occurs between a programmer and a designer on how a feature should be implemented in a game.

Value incompatibilities occur when actors are separated from one another or differences in their size and technology exist. National borders are physical examples of separation between two actors and cause different societies to form with their own set of values. For instance, some separated societies may hold different values when it comes to handling conflicts, defined as the belligerence of the society (belligerence may cause resource conflicts between societies but belligerence itself is a personal or cultural value). Other separation differences in size and technology can also affect a society's values; the contrast between values in industrial and nonindustrial countries is an example of incompatibilities between size and technology.

2.2 Emerging Conflict

For actors to engage in conflict, it is generally required that they have *free communication* and *conflict solidarity*. Homans's theory of free communication states that when two or more individuals begin to communicate with one another both begin to homogenize their interests and form groups (or actors) [9]. Other theories also mark communication as a key element in any conflict [1, 2, 3, 20, 21]. Having free communication, meaning communication is not obstructed between individuals, leads to *conflict solidarity* which is a set of similar hostilities or incompatible goals that a group of individuals share. For instance, conflict solidarity is needed for a workers union to strike. Strikers have a common grievance against their employer and thus form an actor that has solidarity. Solidarity will break down if other factors force an actor's individuals to change their goals that go against the actor's goals, financial strain on the strikers for example. However, once an actor obtains solidarity, it may begin to *organize*, *mobilize* and perform *conflict actions* against another actor in an attempt to achieve their common goals.

A *conflict organization* is created by actors in order to handle conflict. An army is a conflict organization that has been created to handle a country's foreign conflicts. Mobilizing an organization, like an army, requires the actor to possess enough *conflict resources* (food, money, equipment) and have the ability to use them. Groups do not need conflict organization to mobilize, however actors are able to enter into *conflict action* once mobilization becomes possible.

A *conflict action* has the same definition as conflict behavior, as stated above; however conflict action expresses only rational actions as opposed to both rational and irrational actions (caused by hostilities). In this paper we will refer to conflict behaviors and actions interchangeably because we separate hostility from behaviors when we describe our conflict framework. Conflict actions include non-coercive actions (compromising, cooperation [21]) and coercive actions (attacking, being assertive [21]). Conflict actions can also occur on varying "level of analysis" including individual, nation state, and inter-nation state levels [18]. However, for this paper we will treat each level of conflict in a generalized format, reviewing the commonalities between the range of individual to inter-national level conflicts.

2.3 Escalation, Deescalation, and Moderation

A period of *escalation* and *deescalation* occurs once actors have entered into conflict. Escalation is an increase in the intensity of the conflict while deescalation is a decrease in intensity. This period of escalation and deescalation can occur over a varying amount of time. Conflicts can be escalated as long as actors have the ability to sustain their solidarity and resources. As time passes, changing conditions, such as the loss of resources or loss of conflict solidarity within an actor, can deescalate a conflict.

Finally, moderation is used to effectively mediate conflict and prevent serious unnecessary conflicts. Peace talks between countries and the signing of treaties are examples of moderation. Having effective communication, peaceful negotiation, and promoting trust are methods of preventing conflict or creating a resolution which ultimately deescalates a conflict [20].

3. CONFLICT IN CURRENT GAMES

In order to analyze how effectively our conflict theory, and our framework, can be implemented in digital games it is important to understand how current digital games simulate conflict. We have chosen to use three popular digital games to represent the field of current games which either use conflict to drive elements of their gameplay or simulate conflicts between entities. The games we have chosen to analyze are Civilization IV, The Sims, and World of Warcraft. These games represent a wide spectrum of games which utilize elements of conflict theory in order to drive both minute and crucial gameplay mechanics at different conflict levels [18].

Civilization IV (Civ4) is a turn-based-strategy game which utilizes elements of conflict in many of its gameplay mechanics [7]. The players of Civ4 take control of a civilization which they must build from scratch. Their goal is to expand their nation while contending with rival nations. Each nation must carefully consider how they can use: the geography of the map, their civic policies (e.g. caste system verses universal suffrage), and foreign relations, to benefit their gathering of resources while concurrently encouraging their nation's scientific and cultural progress in order to develop a cohesive national infrastructure. Diplomacy and combat are the two main mechanics of the game which govern relations between civilizations. The AI automated civilizations, who operate on the same rule-set as human players, consider diplomatic actions taken by the player and act accordingly to the hostility of those actions. However, this is a very simple process however which does not factor in the advancement of the civilization's goals or the cost of conflict. Civ4 accurately draws upon elements of conflict theory which shows how the incompatible goals of neighboring civilizations create resource incompatibilities, which causes conflict. However, although the rules for developing conflict are sound, the rules of the actual conflict that ensues between civilizations are based on unrealistic processes and assumptions [19].

The Sims is a life simulation game driven by the strategic actions of the player which controls the daily activities of one or more virtual characters [6]. In the game the player takes control of a set of artificial humans called sims. Building a family of sims from the ground up requires the player to move their sims into a home, buy household items, as well as find a job to support their item purchases. Each sim contains a series of survival values (hunger, boredom, bladder, etc.), represented by fluctuating status bars stating if the sim's needs are met. Sims have other status gauges including their relationships values with other sims and their aspirations in life. Relationships between sims can fluctuate within the spectrum between enemy and lover while a sim's aspirations give the player "aspiration goals" they must achieve in order to get special bonus resources (e.g. a sim with family aspirations may have a goal to have a child). These mechanics cause conflicts to arise by allowing each sim to have their own personality and goals to achieve and thus causes incompatible goals between sims.

World of Warcraft (WoW) is a massively multiplayer online role-playing game (MMORPG) in which millions of players from around the world gather in persistent digital realms to explore the landscape, fight monsters, complete quests and interact with other players [4]. Wow is an example of a game in which algorithmic conflict theory rules are not heavily written into the game's mechanics because the game focuses on human players who control the game's structure and narrative not non-players characters (NPC) with intricate conflict knowledge. Within the game world, players control avatars which they customize and advance with skills and items. There are many factions and guilds which make up the culture of NPC and player characters (PC's) within the game world. Avatars gain favor of, or become an enemy of, specific factions by performing actions that either agree with, or conflict with, the faction's goals and beliefs (as set by the game's developers). Gaining and losing faction points is a fairly simple scripted process which is not governed by a dynamic system however. Guilds are similar to factions, in that they represent the allegiance of a group of players; however guilds are completely player run and therefore devoid of any algorithmic principles of conflict theory to determine their conflict actions.

4. A CONFLICT FRAMEWORK

In order to employ conflict theory within games, a common framework must be created. This section will present our conflict framework (Figure 1) that uses conflict theory, as we have previously reviewed, to structure and organize conflict information inside a game. Our framework consists of three main elements: an actor model, a world model and a conflict behavior model. These three models are guidelines stating how a game should organize its conflict system in order to facilitate conflict between multiple actors over a period of time. After discussing these three models the next section will describe how this framework would be implemented by the games we reviewed in previous section.

4.1 Actor Model

Conflict theory states that actors are formed when one or more individuals, working toward similar goals, are able to interact and have conflict solidarity [3]. Actors and individuals are meant to be either players or AI agents in a game, however players will not need a model to represent their conflict knowledge since they are not controlled by the game (yet, our framework can be used to structure a player's conflict variables or rules a player must follow). The actor model contains the functionality that governs the conflict knowledge of a single actor. Additionally if an actor contains more than one individual, each individual within the actor will use their own version of the actor model called an individual model. For example, in the game Civ4 a civilization would have an actor model while each of its cities and units would have their own individual model. The type of information held in both the actor and individual model are identical in their structure. The difference between the models is that the actor model represents the entire group of individuals and will have different information values compared to the individual model (as explained later). Each individual is meant to have an individual model because conflicts may cause individuals to seek different goals then their parent actor and allow for internal conflicts within actors [3].

A game designer implementing this framework has to decide how each individual's individual model will affect their parent's actor model. For example, one way this interaction between the two models can occur is to use Homan's free communication theory [9]. This theory states that individuals average their beliefs and goals together to form a conflict actor. In a game this would be

implemented by averaging the individual model's knowledge (as described next) to form the parent's actor model, effectively giving the actor an average value of its individuals. Yet another way the individual models can affect the actor's model would be to create influential individuals, where only a small number of charismatic individuals in the game affect the parent's actor model (e.g. a game where a king has control over his subjects). These actor and individual model interactions are possible by altering the conflict knowledge of the two models. An actor and individual model's conflict knowledge consists of: a set of conflict variables, knowledge about incompatible goals, and a list of hostilities toward other individuals or actors.
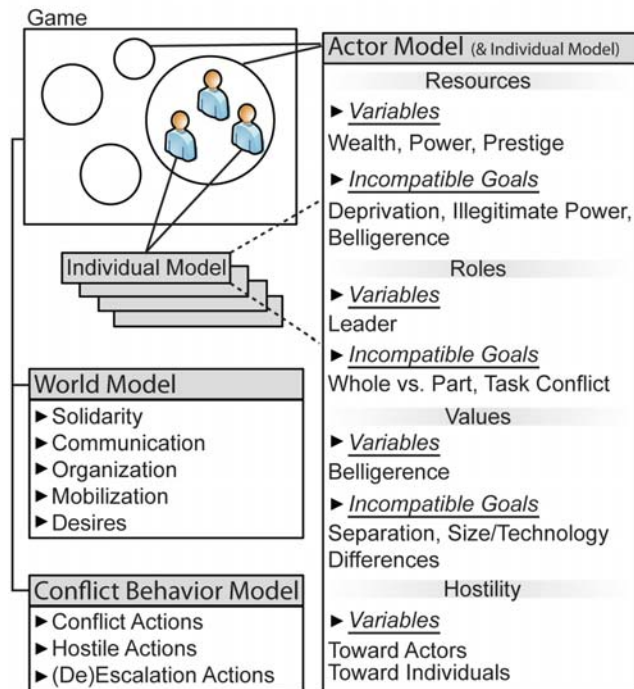

Figure 1. A conflict framework based on the structure of conflict theory.

4.1.1 Variables

An actor's conflict variables are represented by a set of values, or data elements, that relate to how incompatible goals are represent. Conflict theory presents three categories where actor goals can conflict: resources, roles and values (see section 2). Each actor model variable will fall into one of these three categories.

First, each actor must possess resource variables that help them perform conflict actions. As mentioned earlier, resources fall into one of these three areas: wealth, power or prestige. Using Civ4, an actor would be a civilization that had wealth (money), power (influence over another civilization) and prestige (being ranked the greatest civilization). Each individual may have different versions of these resources, for instance a unit in Civ4 may not have money but they may have prestige because they have experience points.

Next, under the role category, actors have variables that represent their role in the game. In The Sims a player, while controlling a

sim family, would take the actor role and each family member would fulfill the roles of father, daughter, etc. The framework does not limit the number of roles possible and the only requirement is that an actor must specify a leader. The reason for this is when an actor enters into conflict even unorganized individuals look towards someone influential within the group to temporarily act as a leader [3]. The leader will have an individual model of their own but will also work towards fulfilling their actor's model goals. This framework allows game designers to decide how much a leader works towards their parent actor's goal or if leaders work towards their own goals, i.e. acting as a selfish/corrupt leader or if the player is in control. A designer also decides how a leader is chosen and how other roles affect the leader, which is part of the World Model (discussed later).

Finally the prestige variables state how actors and individuals "live up to a group's ideals" [3]. In The Sims the number of friends a sim has would be a prestigious variable, it states what other sims hope to achieve. Our framework requires one prestige variable, belligerence, which determines how easily an actor enters into conflict. Belligerence is required because conflict situations may be escalated or deescalated based on how an actor reacts towards conflict. The Sims has a variable that states how nice a sim is, which is an example of a belligerence variable.

Each conflict has the potential to need these three variable categories and will need variables associated with each category. The variables that are stated as required are the basic variables that should be used for modeling conflicts based on conflict theory. However, given the fact that games implementing this framework will have different needs, these variables may be altered or expanded upon.

4.1.2 Incompatible Goals

In Civ4 if one civilization attacks another civilizations then that opponent must understand that they are in a conflict. This can be achieved by creating a rule stating that if a civilization's is attacked then they enter into war with that attacker, representing that the two civilizations now have incompatible goals. Each actor in this framework must have a set of rules that are used to determine when an actor's goals are incompatible with each other.

Figure 1 includes possible incompatible goals that are laid out in [3]. Each incompatible goal is listed under their respective conflict category, for instance, deprivation is under the resource category because deprivation means the lack of resources. One rule in The Sims to represent deprivation would be keeping a sim awake until their energy bar is empty and thus causing them to instantly fall asleep where ever they are located. Thus incompatible goal rules state the situation when an incompatible goal is formed. These rules can be expanded upon by the designer and allow the actor to rationalize which conflict behaviors are beneficial by avoiding unnecessary incompatible goal situations.

4.1.3 Hostility

Actor hostility represents the level of aggression an actor has toward other actors. Within an actor, each individual record their hostilities toward other individuals and actors, meaning individuals within an actor can have different hostility values compared to their parent actor. Hostility values can be affected by incompatible goal rules that state when negative, or positive,

actions have occurred against the individual or actor. For example, in WoW when a player kills an NPC that is part of a faction, that player loses points within that faction. This could easily be switched around and instead have the faction record a hostility value towards the player.

Furthermore, since an actor is made up of multiple individuals (unless there is only one individual) internal hostilities in the actor can occur in our framework. Individuals may gain hostilities toward one another within the actor which can cause actors to break into multiple actors [3]. Our framework only explains how hostility values between actors should be implemented but the rules which cause hostilities to occur between actors would be game specific.

4.2 World Model

The world model and the conflict behavior model are rule-sets in our framework that state how conflicts occur in a game. While the actor model records how an actor sees a conflict the other two models express how actors create, cause, or handle conflict. The world model consists of rules to simulate the conflict concepts of solidarity, communication, organization, mobilization and desirers (or what is valuable to actors), all of which have been stated as key factors in how conflicts function [1, 2, 3, 20, 21]. These five areas govern the basic rules for how actors behave within a system using our conflict framework.

Solidarity contains the rules that determine if individuals agree with the decisions being made by their parent actor. While incompatible goal rules state when a conflict occurs, the solidarity rules state how effectively those conflicts should occur. Conflict solidarity rules govern if an actor has enough similarity between all of its individuals to perform conflict actions effectively. For example, in Civ4 if each city and unit has separate individual models one city may be focused on furthering the civilizations science agenda but a nearby tank unit may want to attack a neighboring city. In this case, a game could implement a solidarity rule stating that the tank unit cannot attack while the city is not focused on war. The solidarity rules also govern what happens if the actor's conflict decisions defy their individual's goals. For instance, a civilization goes against the will of one of its cities and attacks another civilization. Using the incompatible goal rules, that each individual has, the city understands that the leader of the civilization is causing a belligerence incompatible goal, since the leader has a higher willingness to fight than the city. A solidarity rule would state what happens in this situation, the city now has a higher chance of revolting because the city's belligerence value was challenged by their actor.

Communication is a set of rules that state how actors can communicate or share information with one another. The Homan's free communication concept is an example of a communication rule where the individual models of an actor are averaged to form the actor model. This could happen at a more physical level such as in The Sims. When sims communicate they are in the same room and perform different interaction behaviors which then alter those sim's relation points. In that way they are affecting one another, each type of behavior would be a communication action that governs how each sim's relation points are altered. These rules may not apply to players in other games, where third-party communication means may be used, but could

function as the rules that structure the flow of gameplay information from player to player.

Organization rules allow actors to form internal structures (placing individuals into different roles, such as choosing a leader), or internal actors, and allow individuals to break away from their current actor. One example organization rule would allow individuals to leave their actor because they have high hostility towards their parent actor. Additional rules would be needed that set the conditions necessary for these individuals to leave and to calculate their chances of survival without their parent actor. Guilds in WoW can be considered organizations where the main actor is one of the two factions, alliance or horde, and the individuals are the players. Each guild must follow faction rules as to how to form a guild and have internal ranking structures they must follow, guild members can organize themselves as they wish. While not all games will have as many concurrent players as WoW does, AI agents could be given similar organization rules that allow them to create NPC guilds.

Mobilization rules allow actors to perform actions in preparation for conflict behavior. For example, in Civ4 units must be near a city in order to attack, so they move to within striking distance. In The Sims, a sim must have a negative relations score with another sim in order to start a fight between them. Conflict mobilization, as well as the other five factors, would depend heavily on the content domain of the system that uses our framework. For instance, a war game would have different mobilization rules than a city planning game.

Desires are the rules that govern what are important to the actors in a system. Resources, money, honor, are all things that could be set as desirers for actors or individuals. Desires state what is worth starting a conflict over and what drives actors into conflict. Stating desirers is exactly the same as using AI architectures that allow developers to state which goals AI agents must work towards [13].

4.3 Conflict Behavior Model

The final section of our framework, the conflict behavior model, explains which conflict behaviors can be performed by actors or individuals within the game. Conflict behaviors are behaviors that help actors to achieve their goals against, or to express hostility toward, an opponent [3]. Behaviors refer to any tangible action that an actor can perform which can affect other actor models, or the world model. The very act of attack another player in WoW or in Civ4 would be a conflict behavior rule. This conflict behavior model represent the sets of rules that state: what coercive and non-coercive actions are available (and their effects), how actors react to hostilities and how escalation and deescalation occurs.

The first rule-set, coercive and non-coercive actions can occur between actors or individuals. Attacking a city in Civ4 is an example of a coercive action and would include: checking to see if the attacking force has sufficient strength to win, giving the city to the winner, and moving the attacking forces into the city. This action would also set off multiple other rules such as: causing the hostility between the civilizations to grow, increase the solidarity of the losing civilization, and take away the resources that city provided from the losing civilization. On the other hand, compromising with a civilization instead of attacking their cities is a non-coercive action. This action would fire other rules such as

decreasing the hostilities between the civilizations and increase both of their resources. These are examples of how rules from one model can trigger another model's rules. Each of the three models should affect one another within a game that uses our framework.

The second rule set includes how groups deal with irrational conflict behavior caused by hostility. One hostility rule would be setting a hostility threshold that an actor must cross before it would begin attacking their opponent for no beneficial reason. An example of this would be setting when a WoW NPC tries to attack a player who is significantly stronger because that player has a negative faction rating against the NPC. If the faction rating is extremely negative then the NPC may attack the player as soon as possible but if the rating is less negative then the NPC may take longer to attack the player.

Last, the rule-set for determining when to escalate and deescalate a conflict would allow conflicts to fluctuate overtime based on the will and resources of each actor. One theory states that individuals will escalate a conflict when they notice they have the upper hand [3]. Using this theory, a rule in Civ4 could state that if a civilization acquires a large amount of money quickly they should buy units to attack their opponent, if they are of equal strength, because they have a better chance of winning. Moderation also exists as a means to deescalate a conflict [3]. Moderation will not be discussed as part of this conflict behavior model because conflict actions take the role of most moderation. For example, non-coercive actions, compromising for instance, can be considered moderation. While moderation is not discussed in this paper our future work on this framework will include the incorporation of moderation and conflict resolution.

5. APPLYING OUR FRAMEWORK

Exploring how our conflict framework may be implemented in games this section will discuss how the three games we surveyed: Civ4, The Sims, and WoW, might employ our conflict framework. This is not an exhaustive implementation description but examples of each game's conflict oriented mechanics will be placed into the three models from our conflict framework. What we have found is that these three games do have mechanics that can fulfill most of our frameworks sections. This may mean that our framework can be easily inserted into these current commercial games

5.1 Civilization IV

Starting with the actor model, the leaders of civilizations in Civ4 are the game's actors. This means that the player is also an actor because they play the role of a civilization's leader. Individuals are represented by each civilization's cities and units. Cities are the only individuals that can react towards an actor's decisions, such as revolting if they do not have enough food to survive. Units on the other hand blindly follow the actor's commands.

Civilizations contain all three kinds of variables an actor can have: resources (money, trade goods), roles (leaders, units, cities), and values (civics, religion). The game also has incompatible goal possibilities in each of the three areas. Resource conflicts are common in games [16] and in Civ4 the player is consistently trying to gather wealth and material goods. Role conflicts occur between the cities that want their citizens to be happy and the leader who needs the city to contribute as much as possible to the

civilization's wealth. Finally, the values of a civilization (e.g. free trade, caste system, etc.) will also cause conflict because civilizations think less of other civilizations that do not share their civic values. Each of these incompatible goals would lead to conflict actions that cause hostility variables for each actor and individual to increase. For example, if a leader continues to ignore a city that is unhappy then a rule would state that this increases that city's hostility value and thus the chance that the city will revolt.

The world model would contain the rules of the five areas stated in Section 4. First, solidarity rules would state that individuals always follow their civilization's commands. Additionally, there would be other rules stating when solidarity is lost, such as when a city does not have enough food (it will revolt) or if certain units in a city defect if the city get's taken over (they become the conquering civilization's units). Communication between actors and individuals happens instantaneously and include: telling units to move, giving a city an order, or contacting a civilization's leader. There are few organizations in Civ4 because each individual is only a part of one civilization actor. One organization that does occur is the United Nations which allows actors to vote together on global resolutions involving conflict and values (e.g. no nuclear weapons, free trade everywhere, etc.). Next, the mobilization rules includes how far units can move on the map and the transfer of goods, for example both are made easier by having roads. Last, the desire of each civilization is to win the game. Winning the game takes many forms: conquering everyone else, amassing a large score, constructing a space ship, or being elected as the U.N. leader. The desire rules would state that any one of these goals is sufficient to win the game and that actors should work towards the easiest one.

Finally, the conflict behavior model includes actions that a civilization can take against another civilization: attacking, bribing, making peace with, trading, ignoring, etc. Each civilization in Civ4 (except for the player's civilization) keeps a running total of all the positive and negative actions that happen to them. This means that each action has an escalation (negative) or de-escalation (positive) value associated with it. These values would represent the hostility values for each actor and determine if conflict actions can occur between actors. For instance, civilization A may not trade with civilization B because A's hostility towards B is too high.

5.2 The Sims

An actor in The Sims is the player, while the sims themselves are the individuals. One key difference between The Sims, as compared to Civ4 and WoW, is that the sim individuals can operate independently and therefore become their own actors. This occurs when the game or the player allows their sims to act autonomous. In these cases sims have no need for the player and try to fulfill their own desirers and goals. This means that while the player takes on the role of the leader of the individual sims, a sim's individual model needs conflict information for them to act alone.

A sim's resource variables contain the eight variables that govern their survival (energy, hunger, bladder, etc.). Deprivation, a resource incompatible goal, will occur when one of these survival variables drops too low. If too many of these variables drop too low the sim may die. Other resource variables include: money and

items which can be used to affect each sim's survival variables. Sims also have resource variables that govern their relationships with other sims (e.g. having hostility towards other sims). Role variables in The Sims are either age (adult, teenage, etc.), or business oriented (job titles). Each of these roles allows other conflict behaviors to be performed, such as an adult scolding a child. Finally, the value variables are those that govern each sim's desirers and their overall personality. A sim's desirers, such as being family oriented or business oriented, affect which aspiration goals sims will receive. A sim's goals, when fulfilled, give them influence and aspiration points (both resource variables) that can be used to influence other sims or buy special items, respectively.

The world model of The Sims would begin with varying rules about solidarity. In The Sims each household combines their total earnings and shares all of the items in the house. This means that a household always has solidarity even if the sims in the household are hostile towards one another. Communication rules are setup into two types: the player's communication with the sims, which can take time to operate and may be ignored if the sim's survival needs are not met; and communication between sims, which occurs when two sims converse. Organization rules cover how the sim's job and households are setup (e.g. one adult must be in a household). Mobilizing sims for conflict means they must move to the location of the conflict since two sims that are not in the same location cannot conflict with one another. Last, a sim's desirers have already been discussed, each sim will try to fulfill their survival resources (if acting autonomously) and it is up to the player to fulfill their relationship and value goals.

For the conflict behavior model, each behavior a sim can take, generally, affects the conflict variables. Behaviors such as eating or sleeping will affect a sim's survival variables, while conversing or fighting will affect their survival and relationship variables. Finally, achieving their value goals will affect their influence and aspiration points which can be used to perform other conflict behaviors or to add to a sim's resources (i.e. buying items). Internally within the game other intrinsic conflict behaviors also occur. These rules cause a sim's resource values to fluctuate and include: setting the time it takes for survival variables to decrease to zero, the cost of items that a sim can buy, or setting the affects each item has on a sim.

5.3 World of Warcraft

The Wow's actor model would not be used to represent players but instead would represent the factions that exist in WoW. Factions in WoW are organizations that are created by the game's developer. Each player belongs to either the horde or alliance faction as an individual. Non-player characters (NPC) also represent individuals and belong to a similar faction, or have no faction title but follow the same general behavior rule-set. Players can never compete on the same level as factions but can become actors by creating conflicts between each other.

Since players would generally exist as individuals their individual model is much more intricate than a WoW actor model. An actor model for a faction would contain: which territories are owned by the faction (resource), a leader role that the game itself would fulfill (role), and a list of enemy factions (value). These variables would allow faction members to know which territories are safe in the world and their enemy factions. Individual models would consist of all the player and NPC variables that are needed within

the game. This model would include: resource variables (health, items, money, etc.), role variables (faction standing, class, guild affiliation, etc.), and the value variables (belligerence). WoW is a resource conflict game where everything that players and NPCs conflict over are resources. Even though role and value variables exist the game itself does not use these to cause purposeful conflicts but the variables can help to fuel conflicts between players. Finally, an individual model's hostility variables would not exist for players (since player's have their own hostilities) and only exist as a binary value for NPC individuals, meaning NPCs will always attack an enemy regardless of the situation.

Moving on to the world model, solidarity is strictly enforced within WoW. A player is always part of their main faction meaning solidarity is absolute. Communication is also instantaneous. Since a faction is run by the game NPC individuals operate automatically. Players are also given text communication so they can talk to anyone within their faction at any time, though this ability also works as a social function and therefore is not strictly for conflict purposes. Organizations exist as either smaller sub-factions that are made up of NPCs or guilds that players create themselves. Guilds allow players to organize a group of players together so they can work towards common goals. In another game, guilds could be considered the main actors in the game except in WoW they still follow faction rules, such as not attack their own faction's players. Mobilization occurs similar to the other games, players and NPCs must be close to one another to conflict and to accomplish this WoW has different means of traveling (walking, riding, flying, etc.). Finally, the desirer rules for NPC individuals and factions are to attack anything that is an enemy, each player has their own desirers.

Last, the conflict behavior model consists of attacking enemies in the game. There are no diplomatic behaviors that occur in WoW's gameplay. In fact, NPCs only have a hostile attack behavior because they will always attack an enemy even if they are weaker than that enemy. For players, even though attacking is their only conflict behavior they can also escalate and deescalate an attack by controlling their target's threat score. Threat is a value variable (representing belligerence) that only NPC individuals have and state how threatening a player, or similar enemy, is to the NPC. When attacking a group an NPC will attack the target that is causing the most threat. Players have certain abilities that can increase or decrease their threat level and hence escalation or deescalate their stance in battle.

6. FUTURE WORK AND CONCLUSION

Ideally, our conflict framework can be used in conjunction with current game engines to provide a representation of social conflict among game actors, whether AI or human. Many games already have rules that govern how individuals interact towards one another and as this paper has shown games already make use of many components from our framework. Shifting to our framework would not necessarily mean creating whole new rules, but altering that system's rules to mimic conflict theory principles. We believe this will allow games to create flexible and scalable conflict systems for larger game systems, however evaluation of our framework is still required.

A portion of our framework was implemented in a small prototype called the More Power to the People (MP2P) simulation. This simulation gives us a test-bed to review our

conflict framework and to explore how it may be incorporated into games. MP2P was built using Processing [8] and is played on a two dimensional square grid where actors conflict with one another as they try to maximize their area and wealth. While this is a small simulation the same conflict principles apply to other games such as Civ4 where civilizations try to maximize their geographical area and wealth.

Our future work will include: bringing together scholars that specialize in conflict theory, completing a full implementation of our framework in a game, testing our final implementation and reevaluating our framework and rule-sets. Currently the openness of our framework allows developers to use it as an initial guideline for developing a conflict system. Our next task will be to refine our framework by implementing it within a larger system, preferably inside a game. Civ4 [7] uses conflict mechanics which resemble our MP2P system but on a larger scale. The game also allows players to modify how the game's mechanics work which would provide the means for our framework to be implemented within the game. We would then be able to test Civ4's current conflict AI against our own framework to see whether players notice a difference.

Finally, we are interested in adding moderation to our framework of conflict theory. The ability to model effective moderation practices for mediating conflict and preventing serious unnecessary conflicts would render our system an invaluable tool for training students in foreign policy and business moderation. For a system like this to be created using our framework we would look towards previous work that has created believable characters and autonomous individuals [5, 12, 17] in order to give students a realistic environment in which their moderation skills can be tested against actors that model human conflict behavior.

Throughout this paper we have focused on looking at how a few large scale games represent conflict. These games have diverse systems and are used to express conflicts at different levels of interaction [18]. This paper reviews how these implemented conflict systems can be combined with conflict theory, the study of how conflicts arise, are maintained and end. Conflict theory is a very large research area and has plenty of potential for developing games that can imitate real world conflicts.

We are exploring this potential through developing our conflict framework using guiding principles covered in conflict theory. This framework can be used in conjunction with games to provide a realistic representation and therefore an understanding of how conflicts function. We also give examples of how our framework may be implemented into current commercial games. These implementations will allow games to bridge the gap between inferior and adequately realistic representations of the evolution and sustainability of conflict. Further work and analysis will hone our framework's abilities and make it more usable in other games.

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