Policy Conflict Analysis in Social Network
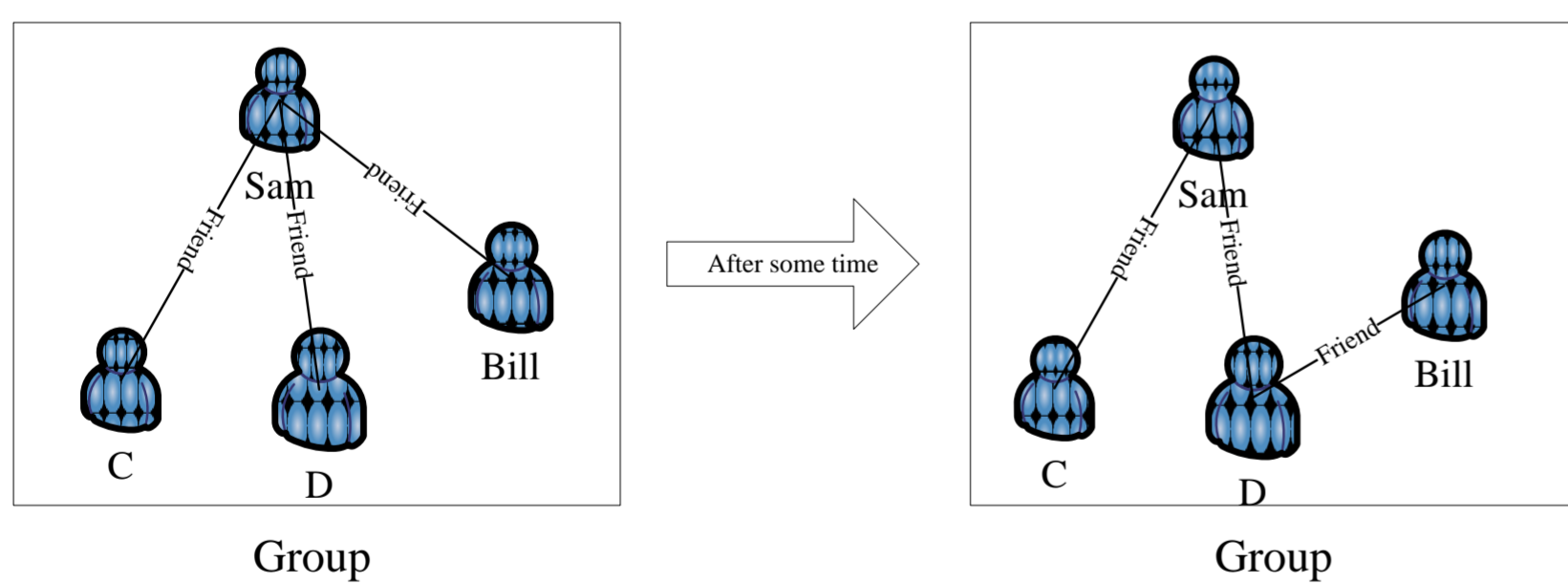
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Abstract

Temporal logic has been well studied for decades, and its logic expressions are used in many reasoning system. However, the information explosion makes logic reasoning becomes harder and harder. There are a lot of information have to be considered in logic reasoning. Relationships and related information make temporal logic cannot easily specify an information domain. Knowledge becomes a basis of information analysis. We propose a Semantic Temporal Logic, which incorporates relationships between different elements in a specific knowledge domain into temporal logic using a semantic format to represent domain elements.

Introduction

Online social networking sites are popular and exciting. People can make friends and group, follow some stars and become their fans, collaborative with others and so on. In online social networking site, there are several types of relationships: friend, friend of friend, follower, fan, group member, and colleague. However, these relationships are not strong tied, oppositely, they are dynamic, and people could change these relationships by themselves. For example, Sam and Bill are friends in Facebook. They are also in a same discussion group, so they are group members. Either Sam or Bill can cancel their friend relationship at any time and they also can quit that group to terminate group member relationship. This process can also be reversed. Of course, to make a friend relationship needs two people to commit on that relationship. However, to enter a group, may not need permission from these people. Therefore, privacy is an issue in social networking site, and privacy policies or privacy settings are important for every user. When a user set up such privacy policies, he/she always make decision according to current relationship status. There may be some conflicts when relationships change. The figure shows relationship status changing between Sam and Bill.

Policy Model & Policy Conflict Type

A: attribute	A: the attribute that limit subjects and objects
s = {A}	s: the subject of a segment
o = {A}	o: the object of a segment
A(c) = s×o	A(c): the action of a segment
Context: information	Context: the information that hide in the system
Segment ={ s×o×A(c)×Context}	segment: a part of policy

• A conflict of duty arises when the same subject performs two actions on the same object.
• A conflict of interest arises when the same subject performs each of the actions on different objects.
• Different subjects perform each of the actions on a single object, and the outcome of each action is incongruent with each other.

Semantic Temporal Logic

Semantic Temporal Logic as an extension of temporal logic includes semantic extension. The reasoning of a STL formula is based on the semantic extension in the formula. Because of dynamic attributes, the constraints cannot cover all of semantic information from different domains. We need a knowledge support to store information we will use in logic reasoning. In STL the semantic knowledge contains entities, attributes and relationships.

Definition 1: Attribute is a piece of information that describes an aspect of an object.
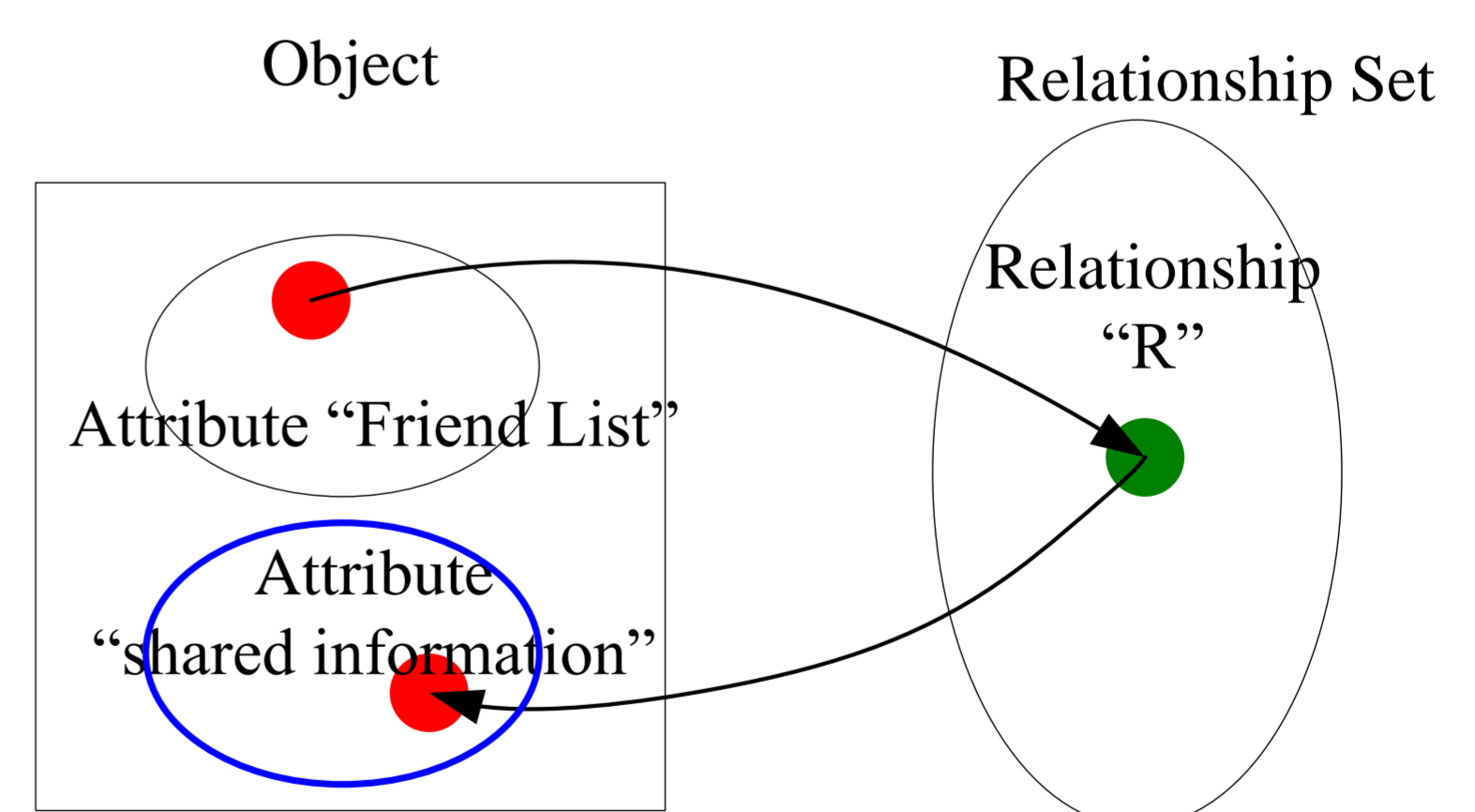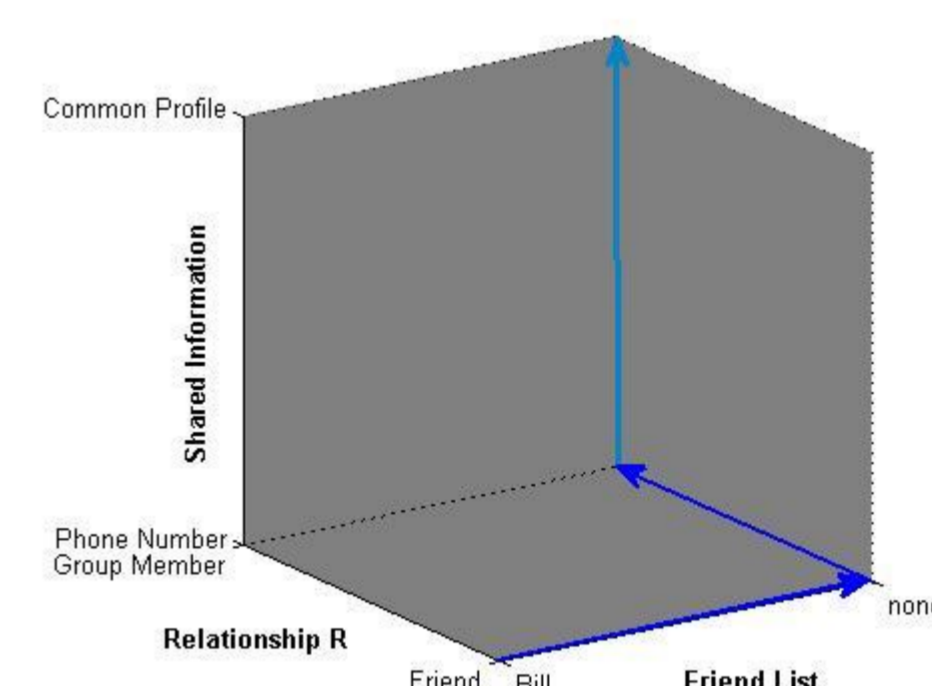**Definition 2**: Entity is an object represented by a set of attributes.
Definition 3: One relation is a subset of Cartesian product of two entities (attribute sets).
If R is a relationship between entity A and entity B, then R is a subset of A□B. For example, R is a relationship between Sam and Bill.

$$R = \{(a,b) \mid a \in Att^{Sam} \; AND \; b \in Att^{Bill}\}$$

Definition 4: Explicit attributes define a set of attributes that is an attribute that cause a relationship change.
Definition 5: Implicit attributes define a set of attributes that are created after relationships, and these attribute are affected by these relationships.

Conclusion

The logic representation and reasoning functionalities are used in conflict analysis area. However, these temporal logics do not include domain information. In this project, we build a temporal logic based on a semantic extension. The semantic extension contains structural information of an information domain. And this semantic extension is flexible and extendable. The semantic extension can reduce ambiguity of elements from different domains and increase the accuracy of logic reasoning. And also the extendable semantic extension makes collaboration and system integration easier.