Privacy Norms in Online Social Networks

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Online social networks (OSNs) have gained worldwide acceptance over the last decade and enable their users to share tremendous amount of content. A group picture is an example of OSN content. However, a group picture might contain private information of several people, either explicitly or implicitly. Thus, a collaborative decision of sharing or not sharing a content is required by the related users. Previous work explain that human societies are guided and controlled by the norms [1]. Since privacy decisions over OSNs are correlated with the society behavior; identifying the emerging norms from privacy actions could make them applicable for future privacy decisions.

In this paper, we summarize our work where we employ normative multiagent systems for collaborative privacy [4]. The decisions are taken based on the norms that are generated from the privacy decisions in the system. We adopt Tuomela's categorization of norms with moral norms (*m-norms*) and social norms (*s-norms*) [2]. *s-norms* pertain to social behavior, while *m-norms* contain individual privacy requirements.

The agents' personal privacy expectations are stored in a personal *m-norm* base, which can only be changed or updated by the agent itself. The *s-norm* base is managed by the OSN itself, and contains the social norms, which emerge based on the privacy decisions of the individual agents. The normative decision mechanism process progresses with every new content. Initially, agents only have *m-norms*. *s-norms* emerge over time based on the actions of the agents. All types of norms have a lifecycle, where they are created, updated, or removed from the respective norm base.

When an agent wants to share a content, which is co-owned by other agents, the *uploader* agent checks if it is desirable for all the co-owners to share the content, considering the norms. This is done by considering the context of the content and the relationship with other co-owners. With two types of norms, there can easily be conflicts among the norm-bases. For example, an agent's *m-norm* might permit sharing a content publicly, whereas the *s-norm* in the system might prescribe otherwise. In this work, we assume *s-norms* dominate the *m-norms*, since we are interested in understanding the benefits of making privacy decisions using societal norms. Using this ordering, the uploader agent checks its *s-norm* base to see if a norm matching the content type exists. If so, the norm is used to make a decision. It might be the case that none of the norms in the social norm base are applicable to make a decision. In that case, the agents use a decision mechanism, such as auctions [3], which makes use of *m-norm* bases of all co-owner agents. In the latter case, the outcome of the mechanism also updates the *s-norm* base of the OSN, where new norms can be formed for future co-owned content.

It is crucial for norms to be identified and managed accurately. *m-norms* are private to each user and thus managed individually. The management of *s-norms* is more chal-

lenging because they emerge and die based on the interactions of the users. *s-norms* reflect the privacy choices of the society as a whole and emerge based on the previous privacy decisions that are taken by the users on a given content type. Since the OSN provider has access to all the privacy decisions in the system, the lifecycle of an *s-norm* can be managed by the OSN provider. To achieve this, we develop an algorithm which generates the norms from decisions using the intuition that we place all content over a multidimensional space according to their content type matrix dimensions and the relationship type of the co-owner agents. This space contains all the decisions considering its various properties as dimensions. Next, we cluster this space such that each cluster contains content that has similar attributes. Then, the clusters can be assigned as *s-norm* classes, and can be checked for normative behavior. When a new content comes, agents find the most similar cluster, according to its content type matrix and the relation between the co-owners. If this is a normative cluster, then agents can decide according to the related normative action.

We study the emergence of norms through multiagent simulations in an environment we developed in Java. We evaluate an OSN, where software agents represent users for privacy decisions and decide for sharing or not sharing co-owned content, according to our normative decision mechanism. We measure how many decisions can be made according to social norms, thus reducing the need for more complex collaborative privacy decision mechanisms. We introduce several homogeneity levels to represent communities that differ in how similar individuals are in their understanding of privacy. Our results show that even with very limited homogeneity, our system can provide social normative decisions for a significant number of decisions. When the homogeneity is closer to half of the community, we reach more than 90% decisions overall with social norms, reducing the need to use a decision mechanism to a trivial amount.

Employing norms for privacy decisions opens up some interesting directions. One of our future goals is to study dynamism in norms. Privacy expectations of the agents can change over time as they gain more experience in the environment or as their relationships change, causing a need to update their individual norms. Another direction is to enable agents to judge the social norms based on their own privacy values. Agents can decide to comply with the social norms according to their understanding of privacy or how much time has passed since a norm is established. These additions would bring us closer to accommodating groups with different privacy norms to coexist in a society.

References

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