A Novel Framework for Users' Accountability on Online Social Networks

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Abstract. Social networking sites are a rage among public now a days. Individuals' keep themselves abreast of latest developments around them through these Online Social Networks (OSNs). With so many activities on OSNs, many a times users tend to reveal the information that may not be appeasing or morally acceptable by other users. Quite possible, though unknowingly, any user may enter into malpractices of spreading hatred among people by posting unethical and unacceptable material. Through this paper, the author has tried to resolves zooming issues of socially unacceptable postings by providing a new framework for controlling the user's actions on OSNs and thereby trying to minimize the menace of notorious activities.

Keywords: Social networks, security, privacy, spamming, phishing, malpractice, credibility.

1 Introduction

The face of technology is observing a frequent change in current scenario of globalization. Every new technology concept opens a lot many areas of research and have been a trust area of many researchers like Yager [1], Adar and Re [2], and Borgatti, Mehra, Brass and Labianca in [3]. The Online Social Networks (OSNs) open a new vista for individuals to interact with virtually anyone across the globe depending on certain conditions as set forth by the particular service provider. According to a report presented by Madden and Zickuhr [4], almost 65% of adults use online social networking sites in day-to-day routine; this clearly reflects how far these online social networking sites have reached in influencing our daily life.

The users of OSNs are provided with various facilities to share personal and other information such as date of birth, residential address, marital status, personal photographs, interests, hobbies, thoughts and much more. Such information as posted by the user is made viewable to other persons who may or may not be part of the OSNs. Interestingly, a user usually tends to share what he or she perceives from the surrounding world and develops thinking accordingly. Sometimes users post various types of information (on online social networks) according to their interest and mentality that may not be appeasing to the viewers of such post. Additionally, as per

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known human psychology described in McRaney [5], users seek information from outside world to confirm themselves before taking any decision. Quite realistic, mostly individuals rely on online resources to collect information before taking big decisions of their lives. Many big organizations and people from different domains and age groups such as politicians, business tycoons, technicians, educationists, teenagers and even children depend on online information.

Today's scenario brings variety of people to a common platform of social networking to gather information that can be useful for their personal, professional and social spheres of life. Such conglomeration of variety of people develops a social culture of a particular social networking website. Many social websites, such as Facebook, allow users to connect and interact globally for their social fellowships, business purposes, ecommerce, fun and many more purposes. The ultimate idea behind all such interactions is Information Exchange (IE), not just to serve livings personally, professionally but also to move along with the varying scenario of society and technology.

Let's consider a common scenario of the democratic government wherein politicians are elected and ruled based on choice of people. The politicians may need to know or change views of general public before planning to join any political party for their safe play in the contemporary political system. This can be done mainly through online social blogs or social networking sites that may provide information posted by various groups of people regarding their needs, choices and thought processes. Certainly, the social networking sites can be joined by any person or political party or oppositions to influence public by delivering more impactful messages for themselves and for others' as stated in Gorshkov[6].

Undoubtedly, the information posted by anybody when spread among public creates a common belief that turns out to be menacing, peacemaker or just informatory for people. Further, many people post their personal experiences in the form of videos or text messages that can influence many who seek practical insights of the related matter at hand. However, for any information seeker, finding genuine information and relying on the found information is a real challenge.

Typically, users tend to hide their actual personal information from public viewing or write fake information that poses wrong impression of such users on viewers of the profile and thus the viewers of such fake profile can take wrong decisions. For example, if an individual such as a marketer or a recruiter spends considerable time to find target users with a particular profile then such fake profiles (of the users) provide no guarantee that the individual will take correct decision in selecting target users. Thus the online available information is hard to be trusted and if breached once, then the level of trust is difficult to regain.

Many times, users post inflammatory material under the pretext of freedom of speech that can bring in legal action because of such post. This may not only lead to embarrassing social predicament for the user who is responsible for such post but also for the service provider of the social networking site who allowed such free content on the social website. A popular case held at Delhi court issued summons to various foreign-based social networking sites, including Facebook and Google, to face criminal charges for allegedly hosting objectionable contents and directed them to

appear before the court. It asked the ministry of external affairs to get the summons served on these companies. The court direction came after the counsel, appearing for Facebook India, said over ten out of 21 companies named as accused in the case were foreign-based and that the court would have to issue process to serve the summons on them.

The court was hearing a private complaint filed by a journalist Vinay Rai against these firms for allegedly web-casting objectionable contents. The summons was issued to the sites including Facebook, Microsoft, Google, Yahoo and YouTube. "Let the process (to serve the summons) on (foreign-based) accused be sent through the MEA as per the process," Metropolitan Magistrate Sudesh Kumar said in [7].

An additional woeful plight is that many clean-handed users who are at no fault may also need to bear the consequences of judgment that may be laid by the court due to web-casting of obnoxious contents.

Further, due to ever increasing dependency on online information pool, reliability on web information, such as information available on many online social networking sites, is an extreme necessity. As per a report ***"less than 10% of India's population of 1.2 billion is online, according to the Internet and Mobile Association of India trade group. A Google executive said last year that the company expects India's Web user base to grow by 200 million people to reach at least 300 million by 2014, largely driven by increased Internet use on mobile phones"*** [8].

Author conducted a survey on 460 persons. Survey contains 20 questions ranging from general information of persons regarding social networking site viz. their frequency of usage of online social network sites, style of password setting, any compromise with security in existing environment to detect their interest for the new environment having more security and trust. Persons include from different professions, areas and age. The findings of survey is presented as below:

Q1. Have you made "User Category List" in your OSN site? If yes, please specify it?
A. 3% of the persons made their list according to the age group, 71% persons prepared the list according to friend relevancy such as family, classmate, college mate, neighbor etc. and 26% persons told about any other criteria but not specify that.

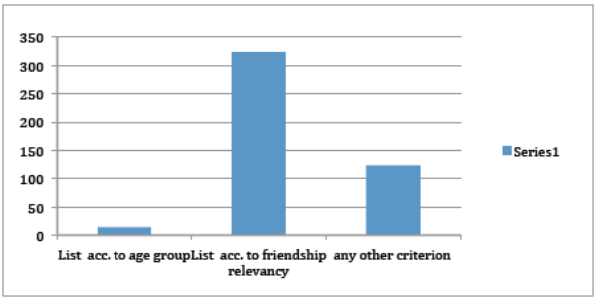

Fig. 1. Reflecting Response of Q1

Q2. How open you are to register (one time) for a central repository that will have control over whole web and will protect you from any repudiation or identification theft?
A. 10% of the persons said YES, 20% of persons said NO, 40% persons said SOMEWHAT and 30% persons said DONOT KNOW.

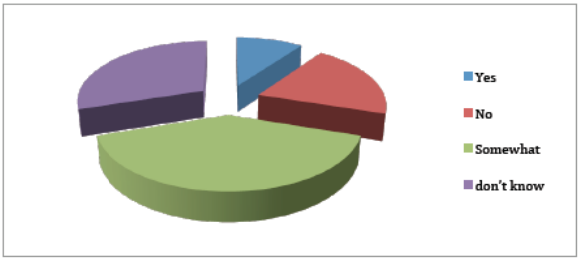

Fig. 2. Reflecting Response of Q2

Q3. Would you prefer a technology that enables more authentication and non-repudiation on websites?
A. 30% of the persons said YES, 37% of persons said NO, 33% persons said DON'T KNOW.

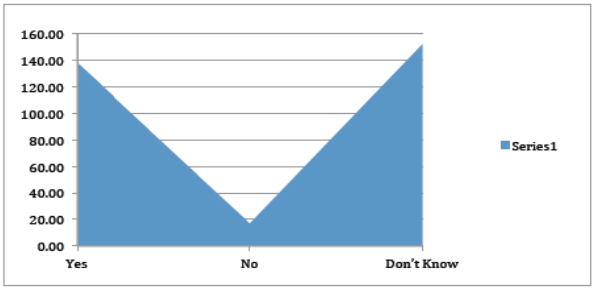

Fig. 3. Reflecting Response of Q3

Based on the aforementioned challenges, it is concluded that an efficient novel system needs to be provided to enhance trustworthiness of online information by safeguarding user interest and fundamental rights. Also, such novel system should be able to make a user, who posts information, accountable for his/her post by protecting the interest of the service provider (Online Social Networking sites) and other users of the networking site. Further, the users who post information should be trustworthy for viewers to believe on the information posted by such users. Thus, the novel system should efficiently be able to determine the trustworthiness of any user. To present such a system with aforementioned features and to enhance reliability of social networks, the author proposes a novel framework as explained below in subsequent sections

2 Proposed Framework of OSNs

An online social networking site is based on a structure that enables users to interact with each other by sharing their profile, pictures, and information with other users and also to post comments on other users' profile. Any social networking site can be defined as a hub for individuals to establish social relationships with each other. Each user of the social networking site makes social relations by starting with creating connections and making friends on the social networking site. Friends are considered as trusted users of the networking site who may share their personal information, professional information, interest and hobbies and can post other information related to real or virtual world. Not just friends (who are connected), other users (i.e., both registered and unregistered users) are also facilitated to spread or view any information through the social networking sites.

Social networking sites can facilitate users with wide range of tools for people to build a sense of community in an informal and voluntary way. Online users interact with each other, contribute information to the common information space, and participate in different interactive activities (e.g., photo uploading, tagging, etc.). Further, the Online Social Networks (OSNs) contain specific components that allow people to: define an online profile, list their connections (e.g., friends, colleagues), receive notifications on the activities of those connections, participate in group or community activities, and control permission, preference and privacy settings. Specifically, proposed framework corresponds to a novel system that can be implemented for online social networks.

The novel system facilitates each user of an online social network to bucket information (that the user is willing to post on the social network) into a suitable category. The suitable category is the category that relates majorly with the content of the information (that the user is willing to post) and intent of the user. Such facilities not only help users to organize information but also help information seekers to find suitable information in minimum span of time. Not only this, the current system enhances accountability on the user's part for the information posted by the user and thus, the user who posts information will be more careful about the content for posting on the online social network. Due to this, advantageously, the social network shall not be held liable for the reprobate acts (such as posting objurgatory information/remark) of any of the users of the social network. Additionally, the system can be an easy aid in legal field and can provide an insight for legal workers to reduce cyber crimes by following the user who is responsible for any illegal or anti-social activities on social sites.

The aforementioned and various other advantages of the proposed system are explained along with the implementation of the system in further sections of this paper. Further, the Online Social Networks (OSNs) contain specific components that allow people to: define an online profile, list their connections (e.g., friends, colleagues), receive notifications on the activities of those connections, participate in group or community activities, and control permission, preference and privacy settings. Specifically, proposed framework corresponds to a novel system that can be implemented for online social networks. The novel system facilitates each user of an online social network to bucket information (that the user is willing to post on the social network) into a suitable category. The suitable category is the category that

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A unique architecture of the proposed system is depicted in Figure 4. The following layers have formed the entire system:

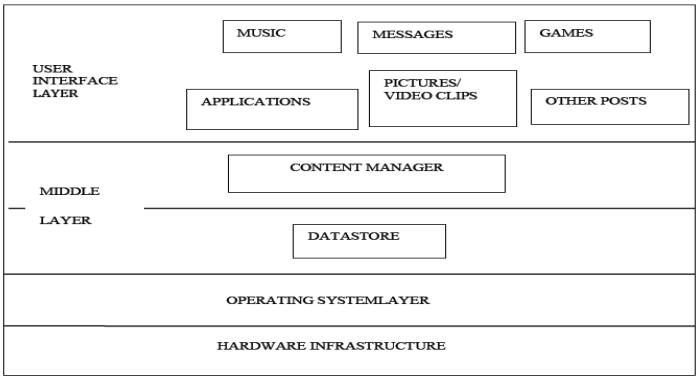

Fig. 4. Proposed Framework

- **A user interface layer:** This layer provides an interface to users for enabling users to interact with services offered by the social networking website. For example, the user interface layer facilitates users to post messages, pictures, videos, comments information and so forth. Further, users of the social networking sites can be facilitated to play music, interact with various applications, such as games. Typically, the user interface layer controls a display for enabling the user to interact with other users, post information (such as audio, video or text) and share information with other users of social networking website. The input provided by the users (of the social networking website) is managed/processed by a middle layer of the architecture.
- **Middle Layer:** Middle layer comprises mainly two components: content manager and data store. The content manager is for analyzing the content (information) when the user starts entering it in an input box that is made visible (on a display page) by the user interface layer. Based on the characters that the user types in an input box (provided to the user through the user

interface layer), one or more suitable categories can be determined and displayed as suggestions, to the user, so as to enable the user to select at least one category from the suggested categories.

Further, the suggestions for the suitable category can be provided based on intent of the user behind posting the information. The intent of the user can be determined based on the profile of the user and past record of activities of the user.

The data store is responsible for two main tasks: one task is for efficiently storing the information of social graphs and for handling increased database loads. Another main task includes storing information items of a social networking site. Data Stores can be Multimedia Databases, User Profiles Databases etc. The middle layer can also be referred to as data management layer.

- **Operating system layer** provides support system for implementation of functionality of other layers. Further, this layer provides an interface between users' activities and the hardware infrastructure.

Thereby, if the user selects wrong category (from the provided suggestions) for the information then an administrator of the system corrects the selected category and accordingly provide ranking (trust score) to the user. If the user posts any information in any wrong category or receives complaint about the posted information from any other user of the social network, then the administrator provides a low rank or negative trust score to the user. The trust score of the user provides an insight about the credibility of the user. Further, such insight about the credibility of the user helps other users to decide whether to add the user in their contact list or not. Also, the content posted by any user with low rank (trust score) may be considered as less credible for other users of the social network. Further research is going on to enhance the system's functionality so as to make the system more efficient in providing ranking or trust score to the user.

According to the proposed framework, it has been made mandatory for a user to login to any system using his global id such as being provided by OPENID. The OPENID will help in recognizing the user since it is the single id through which user can login to majority of the service providers like email, social networking sites and other online services. The OPENID is a concept by which the users don't have to remember multiple usernames and passwords since single username password combination provided access to various different sites. Further, a universal id concept also helps in recognizing the user in a much more credible way than that the conventional login systems as mentioned by Thibeau[9], Maler and Reed[10].

Once a user enters his or her login credentials as per the proposed framework, the credentials are matched to a central database so as to decide whether to grant access or not. Once the credentials are found OK, the user proceeds to access the service. The framework has been designed in a way to make user more accountable for his/her activities online. The user has to select an appropriate category for the message post that he/she is posting online. This concept is explained further in implementation section of the proposed system.

3 Implementation of the Proposed System

For any information (such as free information that a user may put on any social networking website), the user himself/herself has been made accountable (in the proposed system) by relieving the service provider (or the social networking website) from receiving blames due to anti-social or illegal posts of one or more users of the social networking site. The system corresponding to proposed framework is implemented by an online social network as shown in Figure 5.

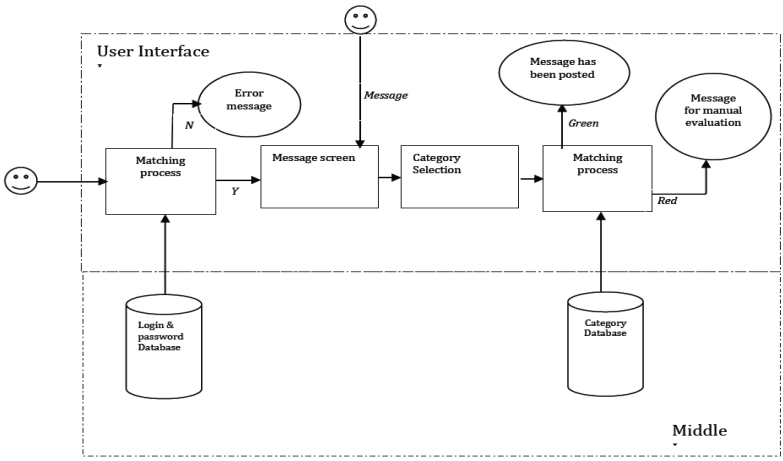

Fig. 5. Flow of Data in Proposed Framework

Assuming a user is registered with the online social network and possesses necessary details, such as user name and password, to login into the system to gain various services of the social network. The user name and the password of each user of the system can be stored, along with profile information of the user, in a database of the middle layer. Initially, any registered user needs to pass through an authentication stage. As shown, a user can provide authentication details that need to be matched with the details stored in the database for enabling the user to enter into the system of the social network. In case, the user is unable to authenticate himself/herself, the user cannot enter into the system to gain services corresponding to the social network and accordingly, an error message is displayed to the user.

On entering into the system, the user is provided with an input box on a display page wherein the user can enter message details that the user wants to post. When the user starts entering characters of the message in an input box (can also be referred to as 'message box') then a crawler might be utilized to index suitable information on the World Wide Web (WWW) and in the database of the system in order to determine suitable categories for the typed message (or any number of characters of the message that the user is willing to post). In this, the context of the message may be analyzed, semantically, to provide suggestions for categories. Specifically, the information indexed on the WWW and in the database can further be analyzed in light of the

entered characters (related to the message), profile of the user, past record of the activities of the user, to determine suitable categories and accordingly suggestions for relevant categories can be provided to the user.

Additionally, further categories can be determined based on the intent of the user that are determined from the profile of the user and the past records of the activities of the user.

Further, the following categories, Table 1, are utilized by the system and stored by the database of the system. These categories are ever evolving based on the new content and information that a user posts or is willing to post.

The user selects one of the suggested categories that are provided as the suggestions to the user. For example, the user get many categories 'on the fly' while typing in the message box. Such categories allow the user to select one of the suggested categories. Additionally, the user may be provided with some other categories that may be less related to the content typed (by the user) in the message box. If the user selects any of the 'other categories' other than main suggested categories (of the system) for the message typed (in the message box) by the user then the message is analyzed by the system administrator to determine if the category suits to the context of the message.

Table 1. Various categories utilized by the System

Academic	Government	Sports
Adult Themes	Hate/Discrimination	Television
Adware	Health	Travel
Alcohol	Humor	Video Sharing
Auctions	Jobs/Employment	Visual Search Engines
Automotive	Movies	Tobacco
Business Services	Music	Weapons
Dating	News/Media	Religious
Drugs	Non-profits	Research/Reference
Ecommerce/Shopping	Nudity	Sexuality
Educational Institutions	Politics	Software/Technology
Games	Pornography	Email

Further, it is determined if the user has chosen a correct category, by matching the selected category from the suggested categories. If the selected category for the message is not matched with the suggested categories, then the message undergoes a manual evaluation. In one case, an administrator provides a trust score that may define the credibility of the user. Otherwise, the administrator may give a negative score for the user if the user has categorized his/her message wrongly by selecting a wrong category for his/her message. This trust score makes the user accountable for his/her postings and thus restricts him/her from posting any illicit or vulgar post that may be banned from public distribution.

4 Conclusion

Based on the above solution as provided by the proposed system, a user may be able to post the content (information) in an appropriate category by selected the appropriate category from the suggested list of categories. Thus, the user himself or herself is not required to spent time in thinking and deciding much about creating a suitable category for the information that the user is willing to post. Also, due to categorized information, the information seekers can easily select the target category to find any required information.

For example, due to such facility of categorization a student can easily find suitable categories to seek relevant information without requiring any filtering work from all the posts of different categories. Further, based on such categorization, users of a particular age group may be barred from entering into a specific group. For example, students below the age of 18 may be barred from accessing the category related to adults. Also, due to strict categorization of the information based on various factors, such as analysis of the content (that the user types in the provided message box/input box), profile of the user and the past records of activities related to the users (as mentioned above), the user is held liable if the information is posted explicitly in any unsuitable category which is not suggested. Accordingly, the system administrator may rate the user negatively and provide a negative trust score that may be viewable by the other users. Due to this, any user and his/her content can gain or lose credibility in the eyes of other users based on selection of correct or incorrect category by the user. Moreover, in case of any post by an anti-social element, the service provider may not be held liable and can easily catch hold of the responsible user for the related anti-social activity on the social network. This further, provides an insight for legal workers to keep an eye on anti-social elements from the social network websites.

It may be appreciated that the applications and advantages are not limited to the above explanation and many more applications may be understood while implementing the proposed system. Further, the research work is still continued to make the system further more efficient.

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