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## Formalization of criteria for social bots detection systems

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### Abstract

Due to the development of social networks in the Internet, the programs providing automatic users' actions imitation obtained a wide circulation. Common usage of these programs causes informational noise. The research considers a possibility of fuzzy logic mathematical apparatus application for the recognition of these programs' activity in social networks.

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### 1. Introduction

Rapid development of popular social networks ("Facebook", "LinkedIn", "Twitter", "VKontakte" and etc.) continues in present time (Drevs and Svodtsev, 2014). There is a common feature for all of them that accounts registered not always correspond to real persons and can be "fake"-ones. Due to the absence of serious technical restrictions on new accounts creation in the most of all Internet-resources, specialists in social media management (reputation management, advertisement, spam distribution and etc.) have an opportunity to prepare a huge amount of "fake" user accounts to execute coordinated virtual activities and thereby distort natural bulk information available. All this also helped by usage of special programs, that imitate human behavior while operating social networks and called *social bots*.

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## 2. Work statement

The task is social bots detection. Consequently, it is necessary to exclude them from consideration while carrying out social media data analysis. The objective of present work is a selection of an approach for a formal description of the social bots detection criteria.

In most cases, the statistic abnormality in social networks accounts' activity gives an opportunity to recognize them.

## 3. Methodology

To the solution of bots detection task fuzzy logic mathematical apparatus can be used. This mathematical tool was offered in sixties years of the previous century by Lotfi Zadeh professor from the University of California (Drevs, 2005).

One of the fundamental concepts of traditional logic – is a concept of set and subset as a part of it. The set consists of separate elements and each separate element can be either included into the set or not included. It is said that to be binary relation of inclusion. The fuzzy logic based on a fuzzy set concept that defined by non-binary relation of inclusion. That not only means whether the element is included into the set or not but also degree of its membership, that varies from zero to one  $0 \leq \mu(f) \leq 1$ , where  $f$  – is a parameter, measured in weighted factors. Weighted factors can be used because it is impossible to say for sure whether all parameters  $f$  are of one scale or not.

The description of a checklist of actions that users registered in the social networks able to perform is as follows.

Virtual users registered in the social networks have a possibility to perform the following actions (their availability is defined by specific social network's features):

- authorize on social network main site and enter personal page;
- adjust personal page settings using graphic interface of the social network by specifying personal data (full name, virtual communities of interest, educational institutions, list of employers, vacation destinations, area of interests, hobbies, musical and other preferences);
- edit (set, alter or delete) current "status" bar's value on personal page (usually contains current activity, mood or geographic location specified by the user or device used by him);
- publish text, photo or audio materials on social network's personal page;
- to establish or cut off friendly relations (one-way as well as two-way – mutually confirmed by the user);
- send personal messages to a specific social network user, that are invisible for other users;
- comment on text, photo or audio materials published by other users by posting text messages immediately below them;
- express an approbation or disapproving attitude to other users' publications or comments by marking them positive or negative using graphic interface of the social network;
- finish the operation in social network as a registered user at any time, breaking the authorization session and using "Log out" soft key in the social network graphic interface.

Suppose there is an access to the open information aggregated on random social network users, including personal details available on their social network accounts, registration date and time, actions performed in certain time points, set of published text messages in open access, set of open friendly relations established by social network users and stored in a relational database. By virtue of the fact that friendly relations between the users can be represented in a form of oriented graphs' arcs, connecting corresponding nodes of the graph, then these relations can also be described as a vertex matrix.

Distinguish formal indicators characterizing a presence the social bots subset in the social networks is also takes place.

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