Bot Taxonomy Proposal

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Abstract

Bots are used basically to automate tasks. They are tools used to perform activities that range from document edition to mimic the human behavior. This article is a proposal of how bots can be categorized. It is motivated by the desire to help studying bots properties and understand how bots may be used in the field. This work identifies a few main categories where bots may be classified. During the creation of this work it was found four of them and the majority of the studied bots seem to fall into those categories.

I. Introduction

Computers help humans to speed up computations and to automate repetitive tasks. One way to automate a task is to divide it in several subtasks and write a program that perform those subtasks. It is true that not all the tasks can be automated using those simple steps. Nevertheless, they are enough to introduce the concept of using a computer to perform automation. Software bots are computer programs that automate tasks. If the need is to modify documents then the bot will edit certain parts of a document, if the necessity is to propagate a message over a network of contacts then the bot will deliver a message and will repeat delivering the same message as many times as it is programmed for. [Ferrara et al., 2014] mentions the existence of social bots which is considered as a computer algorithm that automatically produces content and interacts with humans on social media; e.g. Twitter or Facebok.

There are bots that are able to write articles. For example, in this category falls a bot called Lsjbot. That boot created about 454,000 articles which is about the half of the articles in Swedish Wikipedia [Guldbrandsson, 2013]. Another example is ClueBot NG, which is a bot that cleans up vandalism from an article of the national supreme court.[Nasaw, 2012]. In this context the term *vandalism* means meaningless messages added to a document; for example text used to discredit an article. [Ferrara et al., 2014] mentions that early bots mainly modified content automatically, examples of that are [McDonald, 2014] and [wikipedia.org, 2014b].

Other types of bots can be used to influence a social network behavior. Some bots in this category are so sophisticated that can even answer queries by using natural language algorithms[technologyreview.com, 2014]. According with [Ferrara et al., 2014] there exist bots that are aimed to mimic humans. While there are benign bots they can be created to persuade, smear or deceive also.

When multiple social bots are controlled by a person that is called Sybil[Ferrara et al., 2014]. [Kuhn, 2015] mentions botnets which seems to be similar to Sybil. The difference seems to be that botnets are intended to be used with malware and Sybils are social bots.

Wikipedia page about creating wikipedia bots to aid article creation[wikipedia.org, 2014a] and this other to request the creation of a bot: `http://en.wikipedia.org/wiki/Wikipedia:Bot_requests`

II. Problem

Mention section Engineered social tampering of The Rise of Social Bots: `http://arxiv.org/pdf/1407.5225v2.pdf` [technologyreview.com, 2014] believes bots

may be less easy to detect as the time goes on. That reference mentions cases where bots and humans work together and the bot uses the account of a human to publish messages with Twitter; there may be cases where the human account is hacked and the bot publishes messages from a hacked account.

III. Taxonomies

Some of them are benign and, in principle, innocuous or even helpful: this category includes bots that automatically aggregate content from various sources, like simple news feeds[Ferrara et al., 2014]

I. Editing Bots

According with [Kuhn, 2015] bots can be independent pieces of software which are capable of perform small tasks like create nanoposts. That definition seems to be compatible with [Ayers et al., 2008] who defines a bot as software for making certain types of procedural edits automatically.

Table 1: *Characteristics of Editing Bots*

Modus operandi	They do not interact in a social networking. Typically process text documents.
Output	A newer version of processed documents.

Examples of this type of bots are: Swedish Wikipedia surpasses 1 million articles with aid of article creation bot: [Guldbrandsson, 2013], Wikipedia Bot Writes 10,000 Articles a Day: [McDonald, 2014] and Meet the 'bots' that edit Wikipedia [Nasaw, 2012].

II. Social Media Bots

This type of bots emerged from online social networks. They are used between several possible goals to spread information or influence targets. According with [Wagner et al., 2012] a there are three types of Twitter accounts: user, bots and cyborgs*usersassistedbybots*. From those types, this work derives two subcategories of social bots: *bot* and *cyborg*.

Some examples of the usage of social bots is: Distractors[Abokhodair et al. 2015]. Smoke screening strategies. Political campaigns orchestrated by social bots[Ratkiewicz et al. 2011a]. This malicious usage with the purpose to harm is documented by [Ferrara et al., 2014] also; inflate support for a political candidate. In fact, these kinds of abuse have already been observed: during the 2010 U.S. midterm elections [Ratkiewicz et al. 2011a]. Campaigns of this type are sometimes referred to as astroturf or Twitter bombs[Ferrara et al., 2014].

Table 2: *Characteristics of Social Media Bots*

Modus operandi	Mimic humans and/or human behavior in OSN.
Output	Spread information or influence targets.

III. Botnets

[Abu Rajab et al., 2006] refers to botnets as a network of infected hosts which are called *bots*. In this context those bots are controlled by a human operator which is called *botmaster*. That definition is similar to the definition of *Sybil* [Ferrara et al., 2014]. However, a botnet is meant to be utilized by malware. Botnets are different than malware like worms because of its manual orchestration[Abu Rajab et al., 2006]:

> "Botnets borrow infection strategies from several classes of malware, including self-replicating worms, e-mail viruses, etc."

Table 3: *Characteristics of Botnets*

Modus operandi	Scans used to recruit new victims. Infections can also be spread by convincing victims to run some form of malicious code on their machines
Output	Bot binary installation ready to execute next time the victim is rebooted.

IV. User Assistant Bots

In this category falls the bots that assist humans. Bots like Siri from Apple or Cortana from Microsoft. These bots will analyze data on demand of the end user. In this case the end user is doing a search and the generated information not necessarily will be stored in all the cases.

Another bot in this category is the Chatterbot or chatbot. An historical example of the nature of this type of bot is the Turing test.

Table 4: *Characteristics of User Assistant Bots*

Modus operandi	Receives a request directly from the human user and process it. I supports on natural language processing systems.
Output	Answer to the human request.

IV. Detection

According with [Ferrara et al., 2014] real users seem to spend more time looking at other user's contents and messaging than Sybil.

innocent-by-association strategy), ?Sybil until proven otherwise? approach(opposite to the first)[Ferrara et al., 2014]

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