Designing a software for digital forensic investigations of e-petitions voting falsifications

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Abstract

E-petition is a relatively new tool for expressing community demands and influencing on the legislative process. An issue of voting falsifications detection is rarely considered in e-petition analysis reports. Within this research, an illegal petition falsification service has been examined and some methods of voting fabrication detection have been suggested and implemented in mobile app. To illustrate the discussed techniques, some suspicious activities regarding two popular petitions to the president of Ukraine were detected.

Keywords

e-petition, falsification, voting, president, Android

1. Introduction

In 2015, the changes to the Law of Ukraine "On Citizens' Appeals" [1] were introduced, according to which the Internet-based petitions acquired the legal status as a tool for influence on the legislative process. Thus, an e-petition allows, with insignificant limitations, to make an online appeal to Ukrainian authorities, e.g. president, parliament, local governments etc. It should be noted that e-petition has no absolute power, it only obliges the authority to examine the issue and deliver the official verdict. Petitions therefore announce the wishes and demands of the citizens. On the other hand, this relatively new tool may be illegally mishandled in behalf of influential individuals or groups.

Since there are no tools for public control of voting process, we are working on creating a software for detecting possible falsifications. In this report we analyze e-petitions to President of Ukraine, but our approach may be generalized for other e-petition services and even for social media voting.

2. Overview

First, e-petitions may be abused by corrupted representatives of authorities to force their self-seeking decisions under the guise of society will. Indeed, they may have access to some personal

data of citizens, so it is possible to produce fake votes for profitable petitions. The access to e-petition Internet platform makes it possible to reduce the number of votes if it is beneficial to certain individuals. For example, such activities may have been carried out by related to Kryvyi Rih city council persons when e-petition service accidentally turned off just before the resonant petition gained few last votes [2].

There are other issues related to e-petitions cheating. For example, there even exist illegal services to trade votes for petitions to the President of Ukraine, e.g. [3]. We have contacted (figure 1) the representatives of the service via chat and they confirmed that it is possible to buy some voices for a petition to the president of Ukraine. The also assured us that they pay to real people for signing petitions and it is possible to buy a test package of 50 votes for $25. We have also found out that their Telegram account is @redzona and the Skype account is god19952.

We have checked the domain and discovered that it belongs to Danesco Trading Limited [4] which is a registered at Cyprus domain name provider [5]. At the same time, the specified at the website social network user profile leads to the page of Nikita Kuznetsov [6] who is registered as a resident of Moscow. This example represents another threat to e-democracy. While corrupted local authorities technically might be brought to justice, it is not easy to resist external voting intrusions.

3. The analysis of existing solutions

An example of an organization that analyzes the gain of online petitions votes is the "League of Interns" NGO [7], which has been examining electronic petitions to the Verkhovna Rada of Ukraine with the support of the USAID RADA Program [8] carried out by the Eastern Europe Foundation since March 2017. During this time, e-petitions have monitored and a number of information and training materials were prepared. For three years in a row, e-petitions concerning the activities of the Verkhovna Rada of Ukraine, the President of Ukraine, and the Cabinet of Ministers of Ukraine have been in the lead.

An analysis the "League of Interns" community activities lets us spot a serious approach to data collection and a significant amount of data processed. The organization's task is to analyze the operation of the mechanism of online voting, its efficiency and popularity. They do not detect possible cheating on the site.

Another statistics on e-petitions that could be found is one provided by the "Communication for Change" center [9]. This statistics show that Ukrainians are quite active in exercising their right to influence the government and consistently submit petitions to address pressing issues in the country. The statistics covers the hot topics of submitted petitions, the rate of president's replies and so on. However, it does not consider any kind of vote gain cheating.

As for foreign e-petition researches, there is an analysis of five years operation of White House e-petitions platform, which is called "We the People" [10]. But it generally discusses the impact and most common subjects of e-petitions. Quite interesting, however, that Russo-Ukrainian War takes the second place in the top list of foreign policy petitions right after Middle East issues.

Another report by Janne Berg [11] addresses the problem of anonymous e-petitions in Finland and why people decide to conceal their names while signing e-petitions. It mention the fake
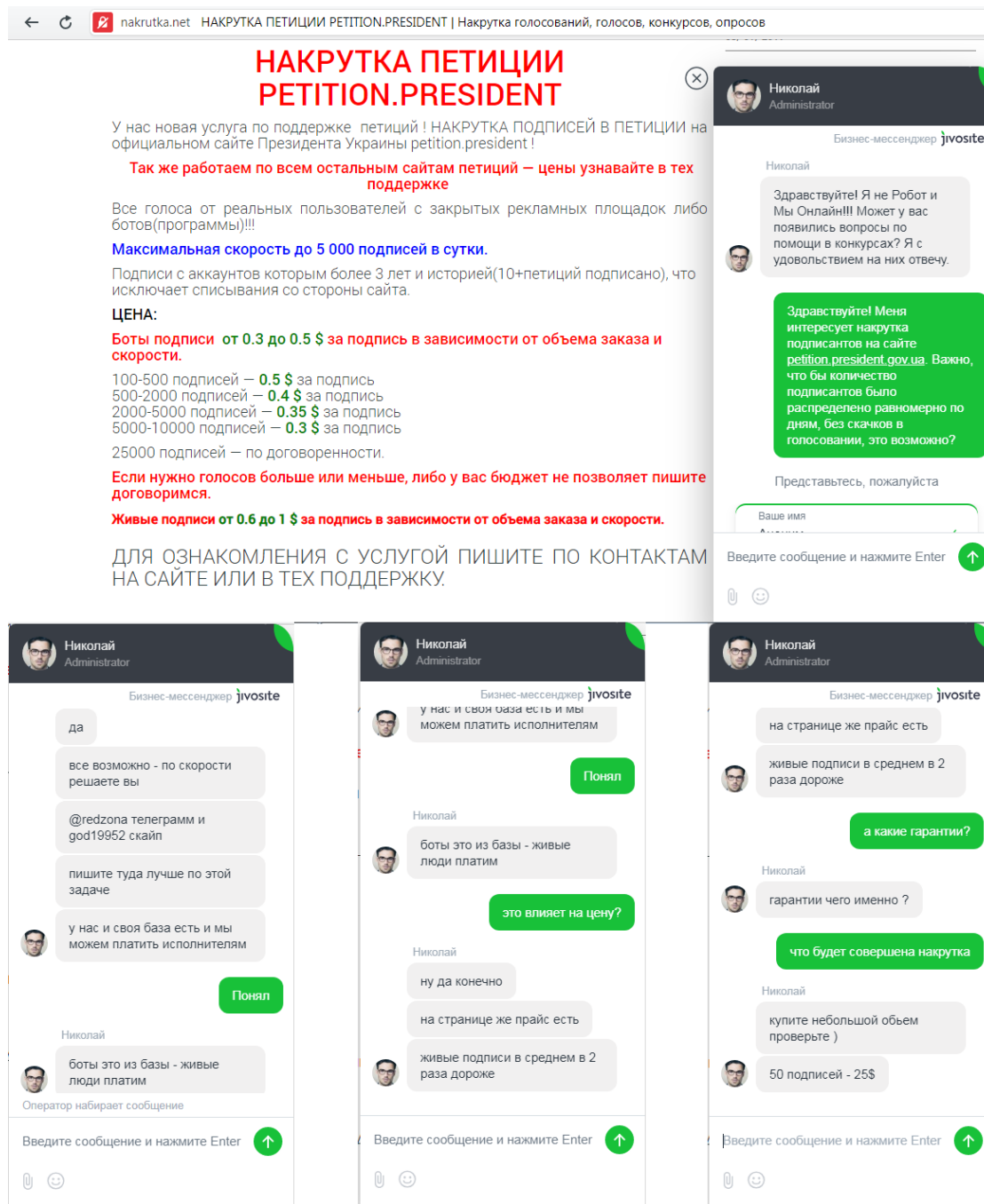
Figure 1: Communication with nakrutka.net staff.

signatures problem, but it is basically out of the research scope.

Taking into account the aforesaid, it could be seen that e-petitions indeed play a significant role in public life, but there are no monitoring tools available in Ukraine. The NGOs who

analyze e-petitions do not even take into account possibilities of falsifications. So there is a need for a tool to detect suspicious activity on particular petitions to attract public attention to possible falsifications.

4. Implementation

We decided to implement our service as a mobile application since it would allow users to monitor e-petitions they are interested in, and such decentralized approach makes our system less vulnerable. It is shown on the figure 2. The application consists of active windows and a service for obtaining up-to-date information about voting on the e-petitions website and comparing groups of signatories from different petitions. For further analysis of the obtained data, the table with comparison results is also exported. The program has several active windows (Activities), which may be switched by user.
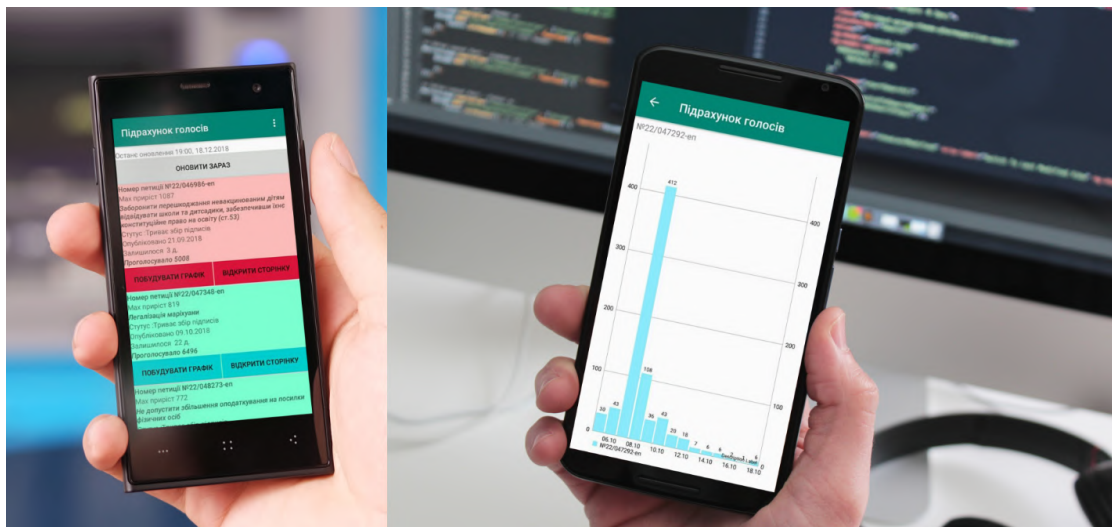

Figure 2: The e-petition falsification tracking mobile application.

After launching the client, one would see a window with a button to manually update the list of petitions. Main menu is at the top right corner. It includes a button "About the program", "Comparison" and buttons to open a list of petitions "Under consideration" or "With answer". The first upgrade process takes about 30 minutes. The service runs in the background, which does not require to keep the application window open during the entire update time.

Once one have obtained the list of petitions, it is possible to view the voting plot or visit the petition webpage. The list is arranged according to the number of votes per day. Petitions with more than 1,000 votes per day are highlighted with red and are at the top of the list. The petitions, with more than 100 votes a day are also highlighted, but they are not so interesting, because such vote bursts are common, especially for important petitions. An example is shown on the figure 3.

After clicking the "Plot" button, the user will see the Activity with a chart of daily votes.

Figure 3: Suspicious petitions highlighting.

"Open page" button leads to the petition webpage. An example is shown on the figure 4.

To compare the signatories of different petitions, it is necessary to select the date on the petition plot from which the signatories will be analyzed. It could be done by clicking on a specific day of the histogram. The minimum number of petitions to compare is two, but it is possible to select more.

After selecting the days, one need to open the comparison Activity. It could be done by clicking "Comparison" in the menu. An example of collecting the lists of signatories is shown on the figure 5.

This activity shows a list of selected petitions, selected dates and number of votes. A long press on the petition removes it from the list. To start the comparison, one should click "Comparison" in the menu, then if necessary, it is possible to export the data by clicking the "Export" item in the menu. An example of the comparison process and its result is shown on the figure 5.

If matches were found, it is be possible to export the table with the list in csv format.

The application is similar to a log in which everyone can view a list of petitions and choose

Figure 4: Petition chart activity and a petition webpage.

one to view statistics, as well as go to the webpage where it is possible to vote. The data is updated periodically by timer event, but if one wants to update the list themselves at a convenient time, there is an update button.

When the application is started, the MainActivity is being created and the AppDatabase database is being connected. Afterwards, in the basic global class, OnBootReceiver and Alarm-Reciver broadcast receivers and the intentService service (ForegroundService) are being created. An adapter PetitionListAdapter for communication with the database is being created to load data into the PetitionViewModel through the application observer.

The update algorithm looks like this: the parser performs page-by-page analysis of the petition webpage while there is data. When the information is collected, the analysis of each petition begins separately and the votes data is obtained.

After information accumulation is completed, the data is being written to the database with page number marks, which is necessary to avoid full webpage parsing next time.

Having data from the petitions, namely the number of votes by date and the list of signatories
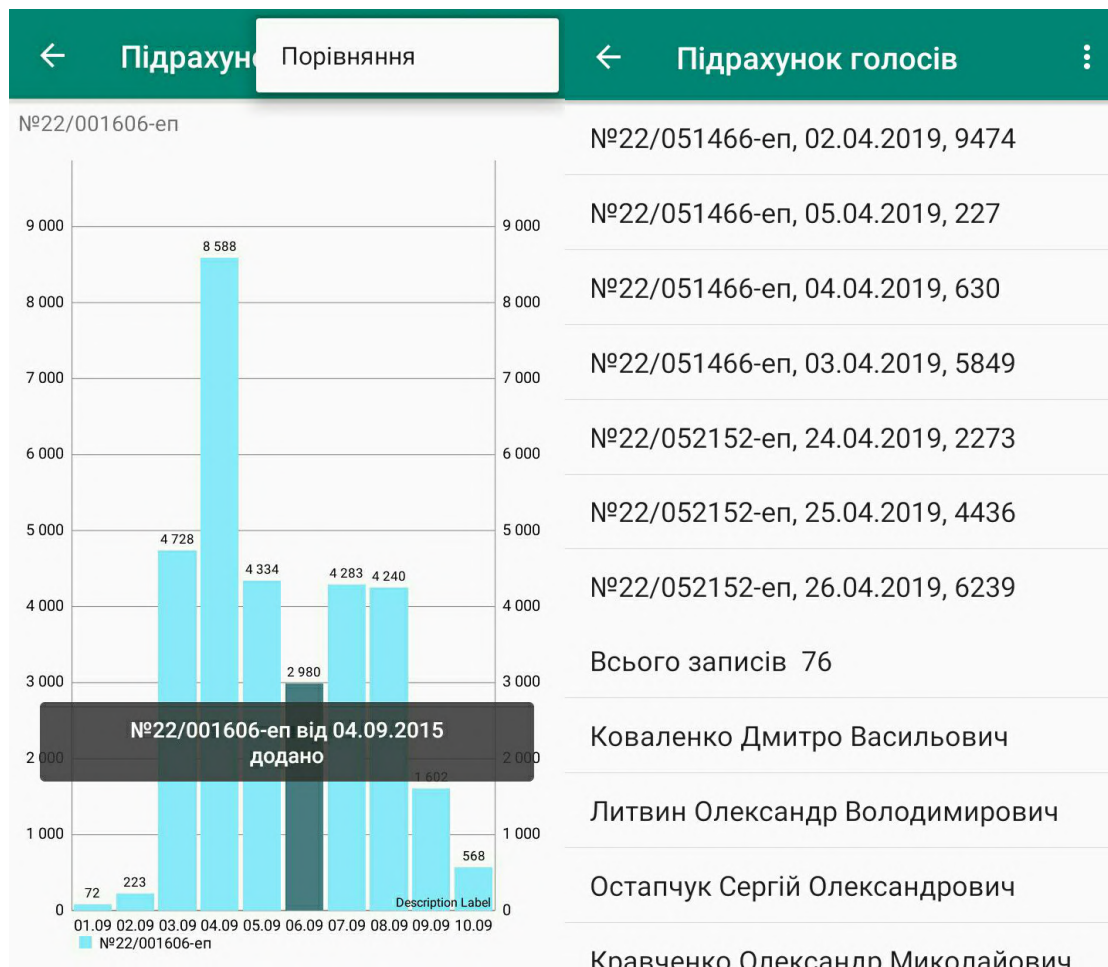
Figure 5: Comparison range selection and comparison results.

who voted for the petition these days, it is possible to compare the lists of people who voted on specific dates for different petitions. If matches were found, the obtained information might be taken into account. For example it might look suspicious if same persons regularly vote for different petitions within short periods of rapid votes bursts. CompareActivity is responsible for all this process.

5. An example of use

Although the research is not finished yet, we would be glad to share and discuss our interim results. The most interesting case is two opposite petitions for and against the resignation of the president Volodymyr Zelenskyj [12, 13]. Our software helped to detect over 500 persons who signed both of them during just few days. About half of these matches were detected in only two most active days of these two petitions (figure 6). Such indicators give reason to think

about the possible cheating and interference in the voting process. It may be a result of personal data stealing or votes trading.
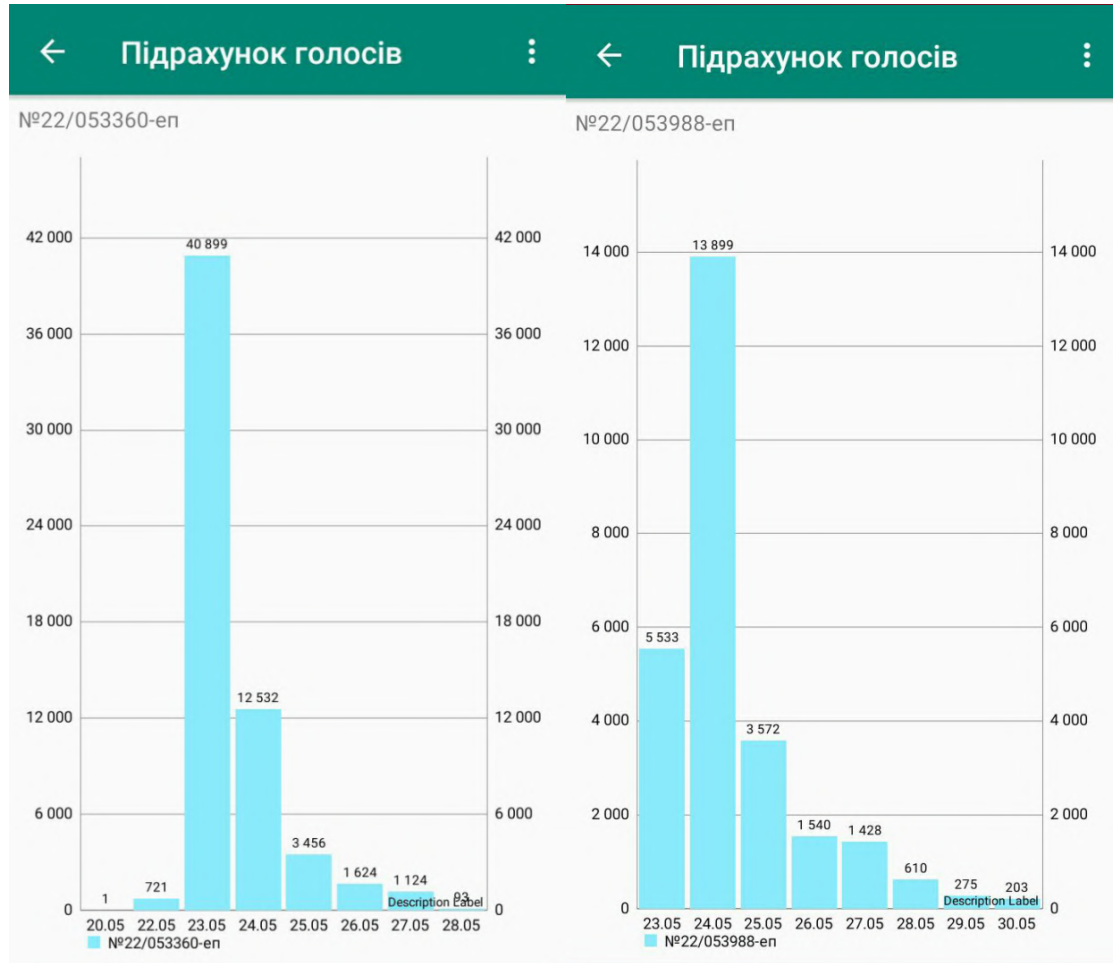

Figure 6: A comparison of vote gain dynamics of petitions 53360 and 53988.

6. Conclusion

Since there are no efficient tools for e-petitions cheating revealing, we developed an application for voting dynamics analysis. We are planning to build a mathematical model to detect suspicious voting gaining intervals, but due to the lack of completed petitions, we currently use a simplified model which might be improved in the future. It is possible to extract names of petitioners who signed petition within time intervals marked as "suspicious" and automatically name-by-name compare these lists for different petitions. The proposed software does not give a final verdict but may be used as a tool for detecting evidences of possible falsifications.

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