Malay SMS Spam Detection Tool Using Keyword Filtering Technique

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Abstract. Message Service (SMS) Spam is one form of mobile device attack that can affect mobile user's security and privacy. This study developed a Malay SMS Spam detection framework specifically for Malay language. The paper discusses about the spam word detection using keywords filtering technique and security question to enable authorized user reset password when forgot the password. The development of the detection tool is done using the Object Oriented Methodology (OOM). There are four phases in OOM which is Requirement Phase, Analysis Phase, Design Phase and Coding Phase. This detection tool is then further analyzed to evaluate the functionality. This project also compares the existing tool to know the lack of current existing tool. Most of the existing spam tools are capable of identifying English text-based messages but there are close to none to filter the Malay language text-based SMS spam. It is expected that the developed tool is able to detect the SMS spam by using keywords filtering technique in Malay language.

1. Introduction
One of the common ways of communication among people is SMS (Short Messaging Service). Variety of information that user can send such as advertise, promotion and spread news can with SMS. SMS is a reliable service. Therefore, subscribers comfortable with using it for confidential information exchange. However, these attacks have mistreated the use of mobile phones. There are two types of SMS which is ham a legitimate message and spam message [1]. The main problem addressed in this paper is there are lot of Spam programs available. However, the amount of SMS spam is still on the rise [2]. According to Kaspersky Lab Spam rates have increased 300% in 2017 [3]. There are anti-Spam programs available to be installed on mobile devices for security. Unfortunately, it is still lacking to detect SMS Spam in the Malay language [4]. The Malay language is the main language in Malaysia. It is used in formal and informal communication throughout Malaysia. Moreover, abbreviation words are frequently used when sending the SMS instead of proper language. This is because of the limited text length for writing the message. Existing methods are used to extract a certain word [5]. However, a good detection must consider several words to prove it is SMS spam.
2. Literature Review
This section explained about the literature reviews that have been conducted for this research. Short Message Service (SMS) is still relevant nowadays due to popular communications technology in developing countries and mobile phones. Variety of information that user can send such as advertise, promotion and spread news can with SMS. SMS is a reliable service. Unfortunately, the effectiveness of SMS also in-creases information security risk.

2.1 Spam
Spam is referred to something that is mostly unwanted and unsolicited bulk messages [6]. By using spam, unwanted information is posted to user. This information contains some sort of advertisements, tricks and cheating information. Example of spam are including comment spam, messaging spam and Voice Over Internet Protocol (VoIP) spam, comment spam and messaging spam.

While messaging spam, also known as Spam over Instant Messaging (SPIM). SPIM is a commercial junk that would be received over an instant messenger application. This project will focus on one of the types which is SMS spam because of its severe impact that has been recorded requires serious attention. Other than that, a SMS spam often contains some indicative keywords, such as “free”, “awards”, or unusual distribution of punctuation marks and capital letters, such as “BUY!!”, “MONEY.”

2.2 Feature Selection
For this developed tool was provided with a datasets consist of SMS spam in Malay language from previous study. This dataset has undergone feature selection by pay-load features [7]. Payload Features is based on the SMS content. The Payload Features or Bag of Words is a list of frequency of words that had been applied in the document classification study. This dataset will be implement in SMS Spam Detection Tool. Table 1 shows example of SMS spam in Malay language.

| No | SMS Spam                                                                                       |
|----|-----------------------------------------------------------------------------------------------|
| 1  | CONGRATULATION!!! Anda memenangi 1 buah kereta dari DiGi. Info sila hubungi perkhidmatan DiGi 006281399994933. http://www.digi.com.my |
| 2  | Tahniah Simcard anda memenangi hadiah Cek Tunai dari RM5000 dari AFM Akademi                    |
| 3  | Tahniah anda memenangi wang tunai RM7000 dari DiGi. Sila hubungi 006281334093111/ 00628133615011    |

2.3 Classification Method
According to previous studies, the Classification Method was using that Naïve Bayes [7]. The reason Naïve Bayes was used is because this technique has good accuracy, good precision [8]. The previous re-search used three types of features to examine the Classification phase which is the Payload features, Generic features and combination of both features.

2.4 Content Based Method
Content-based filtering is used on the side of user terminal and network. This method is focused on analyzing the textual content of messages. Each message is searched for the features of spam such as the key words of “Free” or special symbols like “BUY!!!”. Before being used in SMS spammer detection, Content-based methods are widely used in the unwanted email filtering.

2.5 Keyword Filtering Techniques
Keywords filtering technology makes identification and processing through key-words matching on spam SMS content adopting some simple, or complex word list related to spam SMS such as “free”, “hot selling” and “voucher” [9]. Other than that, a SMS spam often contains some indicative key-
words, such as “free”, “awards”, or unusual distribution of punctuation marks and capital letters, such as “BUY!!”, “MONEY” [10]. Besides, spam SMS senders will often misspell some words filter via misspelling some words, or adopt variant words, and homophonic words to escape from words filter such as “cl@im”, “st0p” and “0ffer”. Therefore, words filter should be upgraded frequently and add keywords alteration.

2.6 Comparison of Existing Tools
Table 2 shows the comparison between existing tools with developed Malay SMS Spam Detection Tool.

| Features/ System       | Key Messages [11] | VeroSMS [12] | SMS Antispam [13] | SpamHound [14] | Anti-Nuisance [15] | Malay SMS Spam Detection Tool |
|------------------------|-------------------|--------------|-------------------|----------------|-------------------|-------------------------------|
| Register and Login     | ✓                 | ✓            | ✓                 | ✓              | ✓                 | ✓                            |
| Security Question      | x                 | x            | x                 | x              | x                 | x                            |
| Awareness Module       | x                 | x            | x                 | x              | x                 | ✓                            |
| SMS Language           | English           | Tamil        | Russian           | English        | English           | Malay                         |
| History                | Online            | Online       | Online            | Online         | Online            | Offline                       |

3. Object-Oriented Methodology
For this research, the approach selected is Object-Oriented Analysis and Design methodology. This approach is basically breaking down the software development large application into smaller pieces. Figure 1 shows the Object-Oriented Analysis and Design Model.

Figure 1: Object-Oriented Analysis and Design Model [16]
3.1 Requirement Phase
In order to collect data for requirements, a comparison of existing had been made. The purpose of this comparison is to know the lack of current existing tool. Most of the existing spam tools are capable of identifying English text-based messages but there are close to none to filter the Malay language text-based SMS spam [4].

3.2 Analysis Phase
In this phase, the required objects and functionalities that are required are analyzed in order to build the solution for user issues and the most suited software coding needed for the development of this project. Other than that, the analysis of existing tools in the market is also done in this stage.

3.3 Design Phase
In the stage of system design, the developed tool’s complete architecture is designed. This including represented into use case diagram and Unified Modelling Language (UML). On the other hand, the process of object design is design in the design of user based on the requirements collected in the earlier stage. This phase also includes modules design needed for the developed system and the interaction occurs between modules.

3.4 Coding Phase
Coding phase is also known as the implementation phase. Within this phase, the designed model is translated into coding using the most suited language which are C#. The database interaction is the first to be developed in this process. For the project, the database used is SQL Server Database.

3.5 Testing
Testing basically testing the functionality of this developed tool based system testing. System testing is the whole functionality of the system is tested in the system testing. The purpose of system testing is to ensure that the interaction between pages and module can work properly.

4. Result and Discussion
Before tool has been implemented, the tool requirement should be analyzed such as the software requirement by the project tool. The tool is converted into setup.exe extension for tool deployments using C# language.

4.1 Detection Module Implementation
Figure 2 shows the interface for detection module. When a spam message is detected, a list of keyword will display the spam’s keyword for user information about spam’s keyword and status message box popup. However, if there are no keywords that indicate to SMS spam, a status message box will be shown.

![Figure 2: Detection Module Interface](image-url)
4.2 SMS Spam Features
This detection testing to test the tool and to differentiate between blacklisting keyword and whitelisting keyword. Table below shows top 50 samples of SMS Spam features in Malay word and tested by using the Malay SMS Spam Detection Tool. All the keywords are set in the coding. The spam’s keyword is shown in Table 3.

Table 3: The spam’s keyword in Malay language.

| 1. keuntungan  | 29. BERJAYA + MEMENANGI |
| 2. KEUNTUNGAN  | 30. BERJAYA + MENANGI  |
| 3. Keuntungan  | 31. bpeluang + mng      |
| 4. promo       | 32. BERPELUANG          |
| 5. Promo       | 33. Berpeluang          |
| 6. PROMO       | 34. berpeluang          |
| 7. promosi     | 35. MERAIH + HADIAH     |
| 8. Promosi     | 36. meraih + hadiah     |
| 9. PROMOSI     | 37. Meraiah + Hadiah    |
| 10. MENANGI    | 38. meraih + HADIAH     |
| 11. MEME-NANGI | 39. MERAIH + WANG TUNAI |
| 12. menangi    | 40. meraih + tung tunai |
| 13. Menangi    | 41. Meraiah + tung tunai|
| 14. meme-nangi | 42. Meraiah + Wang Tunai|
| 15. Meme-nangi | 43. meraih + WANG TUNAI |
| 16. menangi hadiah | 44. BERTUAH         |
| 17. menang hamper| 45. Brtuaah           |
| 18. menangi + HADIAH | 46. btuah             |
| 19. memenangi + Hadiah | 47. bertuaah         |
| 20. Memenangi + Hadiah | 48. BRTUAH           |
| 21. memenangi + HADIAH | 49. PERCUMA          |
| 22. berjaya + menangi | 50. Percuma          |
| 23. Berjaya + Menangi |
| 24. berjaya + memenangi |
| 25. berjaya + Memenangi |
| 26. Berjaya + Memenangi |
| 27. Berjaya + memenangi |
| 28. berjaya + Menangi |

4.3 SMS Spam Result
This detection testing to test the tool and to differentiate between blacklisting keyword and whitelisting keyword. Table 5.9 shows the result of detection testing for Malay SMS Spam Detection Tool. All the keywords are set in the coding. The spam’s keyword is shown in Table 4.
Table 4: Detection Testing for Malay SMS Spam Detection Tool

| No | SMS                                                                 | Keyword                                      | Status |
|----|----------------------------------------------------------------------|----------------------------------------------|--------|
| 1  | Anda th meraih HADIAH PERCUMA "RM 19,000" dr SHELL HELIX No pin 552299 Sila Call di Talian SHELL SDN BHD 0128101094 Tq | 1. Meraih Hadiah  
2. PERCUMA  
3. Sila Call  
4. SHELL | Spam   |
| 2  | TAHNIAH! No talian anda meme-nangi undian bertuah RM.11000 sila hubungi 0062858853982xx esok pagi 08.00 Terima kasih. | 1. meme-nangi  
2. bertuah  
3. sila hubungi  
4. TAHNIAH | Spam   |
| 3  | Sbg tanda penghargaan atas kesetiaan anda. Kini muat turun nada dering/mp3/3gp percuma! Aktifkan. Hantar sms ON FREE ke39665skrg. | 1. percuma  
2. sms ON | Spam   |
| 4  | Hi Susan! U nak download sexy girl movie clip & MP3 kan? taip ON MOV dan SMS ke 32312 utk Movie. Htr ON HIT ke 36989 untuk MP3 Truetone. Free Reg! From: ANN | 1. Taip On  
2. Htr ON | Spam   |
| 5  | pinjaman 1%5k=12x46830k=36x1133 200k=60x4937 pla call 019777244 | 1. pinjaman | Spam   |
| 6  | RM0 Promotions Tahniah sim kad Anda th meraih HADIAH PERCUMA "RM 19,000" dr SHELL HELIX No pin 552299 Sila Call di Talian SHELL SDN BHD 0128101094 Tq | 1. Meraih HADIAH  
2. PERCUMA  
3. Sila Call  
4. SHELL  
5. Tahniah | Spam   |
| 7  | RM0.00: Khas utk anda! Can ps gn impian dgn MyCupid & bpe luang dpt SasungNote10.1/Sony Xperia/RM100 krdt! Htr ON MYCUPID ke27773 sblm 23/12. caj :15sen/sms.T&S | 1. Htr On | Spam   |
| 8  | RM. Your Card telah berjaya & menangi hadiah GRAND PRIZES.dr Shell(M) Berhad RM20,000 RIBU No.siri 9R247YK Sila dail talian : 0112-533-2254 www.mys-shell.tk | 1. Menangi  
2. Menangi hadiah  
3. shell | Spam   |
| 9  | RM0.Maxis DailTV: Tonton model paling hangat dan pertunjukan fesyen mingguan di saluran Supermodel. Jangan ketinggalan! Info lanjut, http://goo.gl/rcbQQ | 1. http:// | Spam   |
| 10 | RM0.00 Notis 019374****. Anda belum daftar Servis SMS content. Sila taip ON SC ke 32233 utk dapatan content skrg! Tanpa Caj daftar! EMS880625114 | 1. taip  
2. taip ON | Spam   |

4.4 System Testing

System testing where the whole functionality of the system is tested in the system testing. The purpose of system testing is to ensure that the interaction between pages and module can work properly. Functional testing is the testing on the software to check and to ensure that the system has all the required features and functionality required that has been specified in the functional requirements. This functional testing is done to ensure the functions work properly from the input to the output section of the system. Non-functional testing is basically the testing done for a system or software for its nonfunctional requirements. This testing concerns about the non-functional requirements that the system has claimed.

5. Conclusion

The advantages of this tool is enable a user to check SMS whether it is a spam or ham and display the spam’s keyword for user information about spam’s keyword and this tool uses security question and email as an authentication factor to ensure the authorized user during reset password. For the limitations of this tool is this tool does not contain statistical report features and only available for Windows desktops and laptops only. Hand held devices like smartphones are not compatible. It is targeted that this tool will be online in future and have an update keyword features. Other than that, it is also recommended that the tool will use more dual authentication method in the future such as using
other token like One-time Password (OTP). OTP SMS can be used to provide an additional layer of security for user.

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