HanAR : 모바일 어플리케이션 스토어의 한국어 리뷰 분석기

HanAR : Mining Informative Application Korean Reviews From Mobile Application Store

Abstract

With the spread of smartphones, mobile application development has also become the latest rage in Korea yielding higher demand for high-quality applications. Spontaneously, demand for review analyzer to pick only meaningful feedbacks also increased, but Korean developers fail as most Korean reviews are often written ill-formed or useless. This paper suggests efficient way to filter meaningful Korean reviews using consonants and vowels and visualize grouped feedbacks according to keywords.

1. Introduction

The proliferation of smartphones attracts more and more software developers to devote to building mobile applications in Korea. As the market competition is becoming more intense, in order to seize the initiative, developers tend to employ an iterative process to develop, test, and improve apps. Therefore, constructive feedback from Korean users becomes extremely crucial for developers to fix bugs, implement new features, and improve user experience agilely. But Korean reviews are often written grammatically incorrect or includes useless information which let review analysis difficult. In this paper, we propose a novel Korean review analyzer, HanAR, which (i) filters out non-informative application reviews from mobile application store[1] according to positivity and negativity using Korean consonants and vowels, (ii) groups reviews by relative importance and keyword (iii) and visualizes most informative reviews.

2. Related Works

Mining useful feedbacks from mobile application stores in English has been studied much. From efficiently extracting informative reviews from mobile application stores[1] or identifying false reviews in mobile application stores[2], to visualizing user reviews by identifying informative feedbacks[3]. However, due to language structure difference, these research outcomes don't fit exactly to Korean reviews.

Korean researchers are researching sentiment analytical processing[4], and Korean morphological analyzing skills. But there has been little work on filtering Korean non-informative reviews.

Compared to previous studies, this paper proposes a new way to efficiently filter non-informative reviews and group them to visualize.

3. Filtering

Potentially useful reviews contain constructive information(e.g., reporting bugs or demanding UI improvement) which application developers looks for to deliver their application in better quality. Usually, negative reviews are constructive feedback since they substantiate discomfort with reasons. As most reviews are useless and non-informative, filtering step is required. Filtering will deduct reviews which are positive(e.g., compliments) or meaningless by Korean consonants and vowels first, and then by morpheme.

[1] This paper used application reviews of Google Play.

3-1. Filtering by Consonants and Vowels

Korean users use consonants and vowels independently when writing reviews to express emotions or positivity and negativity. Table 1 shows consonants and vowels which are used to identify positivity and negativity of reviews. r_1, r_2 are used to express positivity whereas r_3, r_4 are to express negativity. Reviews including positive consonants r_1, r_2 in Table 1 are excluded from review list since positive consonants in reviews express satisfactions which are non-informative to mobile application developers.

Table 1 : Positivity and Negativity Filtering Consonants and Vowels

ID	Positivity/Negativity	Consonants and Vowels
r_1	Positive	ㅋ
r_2	Positive	ㅎ
r_3	Negative	ㅜ, ㅠ
r_4	Negative	ㅡ

However, this naive way would be problematic as some reviews contain positive consonants followed by negative feedback or vice versa. To exclude only positive reviews, this paper additionally applies negative vowel searching and remove only positive reviews which have r_1 or r_2 but no r_3, r_4.

3-2. Filtering by Morpheme

Filtering using only consonants and vowels will be problematic for reviews which don't have any independently used consonants and vowels. In addition, filtering using morpheme to sort out unimportant reviews is required.

This paper uses Hannanum [2], open-source Korean morphological analysis module, to find out positivity and negativity of reviews based on predefined 100 positive and 100 negative morphemes. Table 2 shows examples of predefined set of morphemes. Identically to filtering by consonants and vowels, reviews including no negative morphemes(e.g., n_1:"not good", n_2:"Not running", n_3:"ugly", n_4:"difficult") but only positive morphemes(e.g., p_1:"good", p_2:"okay", p_3:"pretty", p_4:"convenient") will be excluded from review list.

From the morpheme filtering result, we can successfully remove non-informative reviews from review list.

[2] http://kldp.net/hannanum/

Table 2 : Positive and Negative Morpheme Examples

ID	Positive Morphemes	ID	Negative Morphemes
p_1	좋다	n_1	별로다
p_2	괜찮다	n_2	안되다
p_3	이쁘다	n_3	구리다
p_4	편리하다	n_4	어렵다

4. Grouping

With informative reviews from filtering step, we can cluster reviews into groups first by keyword and then importance. Keyword grouping step will divide reviews into groups $g_k = (g_1, g_2, \cdots, g_k)$ using keywords. Then, importance grouping separates each group into 3 subgroups by detecting importance degree words in the review.

Table 3 : Groups by Keyword and Relative Importance

ID	Important	Normal	Useless
g_1	$g_{1Important}$	$g_{1Normal}$	$g_{1Useless}$
g_2	$g_{2Important}$	$g_{2Normal}$	$g_{2Useless}$
…	…	…	…
g_k	$g_{kImportant}$	$g_{kNormal}$	$g_{kUseless}$

4-1. Keyword Grouping

If an application has certain continuous problem which can be noticed by several users, some users will write negative feedback about it. For example, if server has problem and not solved for long time, user feedback including keyword 'server' will be accumulated. Then we can make groups $g_k = (g_1, g_2, \cdots, g_k)$ by keyword counts in descending order.

4-2. Importance Grouping

Even in same group, there still might be different level of issues according to importance. In this step, we divide one group(i.e., g_i) into three subsets(i.e., Important, Normal, Useless) as ($g_{iImportant}$, $g_{iNormal}$, $g_{iUseless}$) using importance degree words(e.g., "hurry", "right now" in important group, '). Each subgroup will include reviews which contains importance degree words. For instance, feedback that says "My item disappears after I log out. Fix this right now. Please hurry" will be inside important sub-group($g_{Important}$) of 'item' keyword group as importance degree words "hurry"

and “right now” are included in review.

5. Visualization

After grouping, we visualize reviews of each group in ((g_{iI}, g_{iN}, g_{iU}), ($g_{(i+1)I}$, $g_{(i+1)N}$, $g_{(i+1)U}$)) order. For testing, we used application “덱히어로즈: Deck Heroes[3]” from Google Play store. There are 76 reviews in total and finally we retrieved 26 reviews into 10 groups with minimum keyword count 2. Figure 1 shows 2 reviews from 5th group of keyword ‘확률’(i.e., probability) out of top 10 groups. Reviews in 5th group depict imbalance among probability system in game.

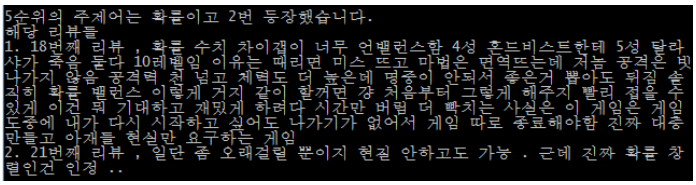

Figure 1 : 5th Group of Test Result from “덱히어로즈 : Deck Heroes”

6. Limitations and Future Works

As language structure between Korean and English is different and methodologies of Korean analysis are not much researched compared to English analysis, technological limitations(e.g., spacing words) exist. We plan to address these issues with more advanced NLP(Natural Language Processing) and Machine learning algorithms(e.g., Word2vec).

If not enough users write reviews about specific flaw of mobile application, then keyword grouping would not operate efficiently as expected.

Besides, as we only choose Google Android application store, future work will conduct other several stores(e.g., Apple Store).

7. Conclusion

In this paper, we proposed an effective and instinctive way to visualize Korean reviews according to informativity and importance for mobile application developers who develop application in Korean version but suffer from absence of analyzing Korean reviews. We plan to deal with these issues in future work.

[3] Deck Heroes From Google Store: https://play.google.com/store/apps/details?id=com.igg.android.deckheroeskr

References

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