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Innovative Computing Vol 1 - Emerging Topics in Artificial Intelligence

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Editors

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**The International Workshop
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A Study on Data Mining for Type of Korean Painting Poetry

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Abstract. This study introduced the work of analyzing the meaning by using the computer information processing method. We extracted the painting poetry of Mukjukdo (Bamboo Paintings) in the early Joseon Dynasty from the *Hanguk Munjip Chonggan* (Korean Literary Collections in Classical Chinese) of *Hanguk Gojeon Jonghap DB* (Korea Classics DB). Through the data mining method, we divided the types by extracting and cataloging the painting poetry from the Korean classical literature. Then, the scope was narrowed down to painting poetry of Mukjukdo in the early Joseon Dynasty, and the text was analyzed in units of syllable corpus.

Keywords: Data mining · Painting poetry · Bamboo paintings · Extracting · Cataloguing · Type Classification

1 Introduction

This study introduced the work of analyzing the meaning by using the computer information processing method. We extracted the painting poetry of Mukjukdo (Bamboo Paintings) in the early Joseon Dynasty from the *Hanguk Munjip Chonggan* (Korean Literary Collections in Classical Chinese) of *Hanguk Gojeon Jonghap DB* (Korea Classics DB). This is one of the basic tasks of research on Hansi (poems in the Chinese style), which has subdivided types of Hansi according to their material. This study presents expression techniques and meanings objectively by converting them into numerical values by using a computer information processing method. Traditional research on Hansi has mainly relied on researchers' intuition, however, this digital data analysis, which is a quantitative method, can complement the traditional method.

2 Research Methods

2.1 Data

The basic data for this study is *Hanguk Munjip Chonggan*; the Database of Hanguk Gojeon Beonyeokwon (Institute for the Translation of Korean Classics). It is called

“Hanguk Gojeon Jonghap DB”. Hanguk Gojeon Beonyeokwon organizes and translates Korean classics into this database and then digitally converts them and discloses them to the public. This data is provided in XML format in the form of openAPI [1]. This data is categorized by author, book name, style, title, original text, year of publication, etc. Based on this, the painting data from the early Joseon Dynasty were extracted and analyzed.

2.2 Data Mining Techniques

Data mining is a technique of extracting useful information by analyzing statistical patterns, rules, and relationships in large amounts of data [2]. Today, it is used in various fields such as computerization, statistics, and management. We also intend to apply this technology to the study of Korean classical literature. Currently, 142 anthologies from the early Joseon Dynasty are included in the *Hanguk Munjip Chonggan*. The primary data mining is to select the painting poetry based on this database and to classify them by their type. The secondary mining is to analyze the text by narrowing the scope [3] to painting poetry of Mukjukdo in the early Joseon Dynasty.

3 Result

3.1 Extracting and Cataloguing

We chose the poetry from the style category at Hanguk Gojeon Jonghap DB, and selected poems with characters in the title, such as ‘do (picture)’, ‘hwa (painting)’, ‘je (mention)’, ‘muk (ink)’, ‘hoe (drawing)’, ‘sa (drawing)’, ‘byeong (folding screen)’, ‘jok (hanging scroll)’, ‘cheop (album)’, and ‘chuk (scroll)’. After that, we compare the title and the content of each poem to determine whether the poem was painting poetry or not. Through this, it was found that there are a total of 842 poetry poems currently included in *Hanguk Munjip Chonggan*.

3.2 Type Classification

Based on the previously extracted lists, the painting poetry of the early Joseon Dynasty was classified by type based on the subject matter of the painting [4]. This classification is possible because the subject matter of the picture is presented as the name of each object before and after ‘do’ or ‘hwa’, which usually means a picture. For example, the titles of most painting poems of Mukjukdo appear in expressions such as “Mukjukdo” or “Jejuk (reciting a bamboo)”. The figure below is the result of categorizing Mukjukdo painting poems using the TOPIC MAP based on the list of painting poems in the early Joseon Dynasty and the types of paintings (Fig. 1).

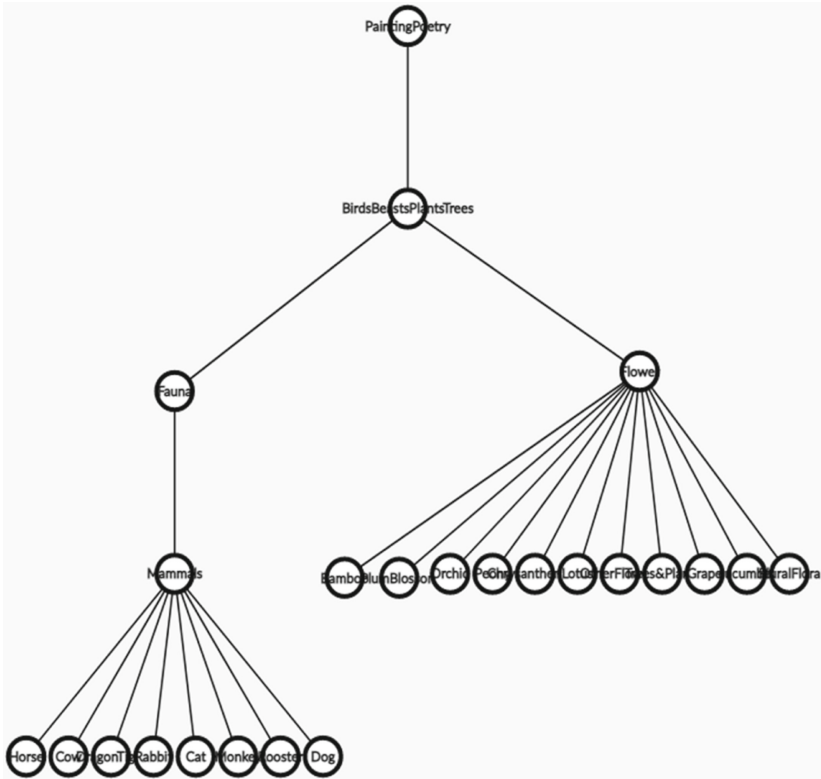


Fig. 1. A Type classification of Mukjukdo painting poetry using TOPIC MAP

3.3 Syllable Unit Segments and Statistics

Next, we analyzed the text data of the painting poetry of Mukjukdo in the early Joseon Dynasty. In order to interpret the poem [5], it is convenient to divide it into morphemes, the smallest unit of meaning. Since Hansi is composed of Chinese characters, it can be divided into morphemes up to one syllable unit. In addition, the units of these syllables are basically combined into five and seven words to form a row. Therefore, we set one row as the basic unit. Among the original text of painting poetry, o'eon (five-character) was divided from 1 to 5, and chil'eon (seven-character) was divided from 1 to 7 syllables. In succession, per line, o'eon generated five corpus of one syllable, two syllables, three syllables, four syllables, and five syllables, and chil'eon generated seven corpus of one syllable, two syllables, three syllables, four syllables, five syllables, six syllables, and seven syllables (Table 1).

Table 1. The corpus unit of o'eon and chil'eon poem

If 1 line of o'eon poem is assumed to "1 2 3 4 5", the corpus unit	If 1 line of chil'eon poem is assumed to "1 2 3 4 5 6 7", the corpus unit
1 syllable corpus(5): 1/2/3/4/5	1 syllable corpus (7): 1/2/3/4/5/6/7
2 syllable corpus(4): 12/23/34/45	2 syllable corpus (6): 12/23/34/45/56/67
3 syllable corpus(3): 123/234/345	3 syllable corpus (5): 123/234/345/456/567
4 syllable corpus(2): 1234/2345	4 syllable corpus (4): 1234/2345/3456/4567
5 syllable corpus(1): 12345	5 syllable corpus (3): 12345/23456/34567

The following is the result of dividing the original data of Mukjukdo painting poetry by syllables and calculating the frequency. This is the figure measured using the JAVA program to see how many syllable corpus units are repeated in the actual painting poetry text data. The numerical value of 1–5 syllable corpus is the sum of the data for each syllable of o'eon and chil'eon, and the numerical values of 6–7 syllables is for chil'eon only. In these values, only words from 1 to 3 syllables were actually valid, and all 4–7 syllables were meaningless because the word combination was under twice (Figs. 2, 3 and 4).

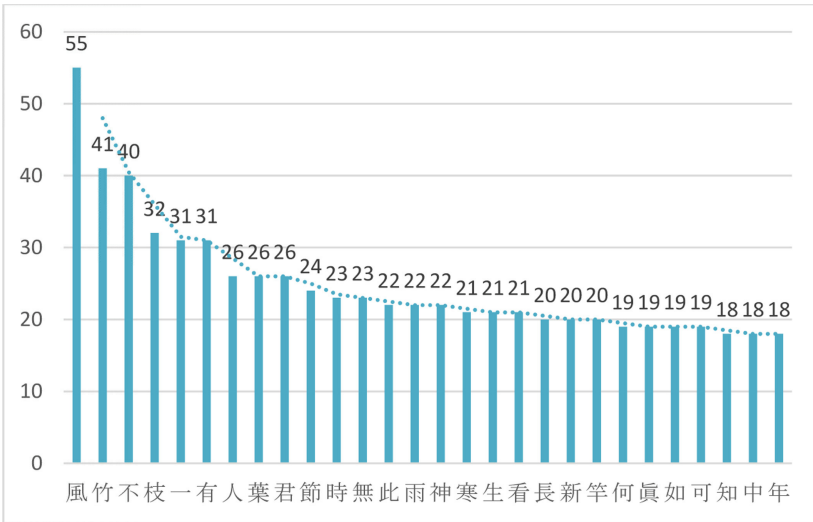


Fig. 2. The frequency of one syllable corpus in Mukjukdo painting poetry

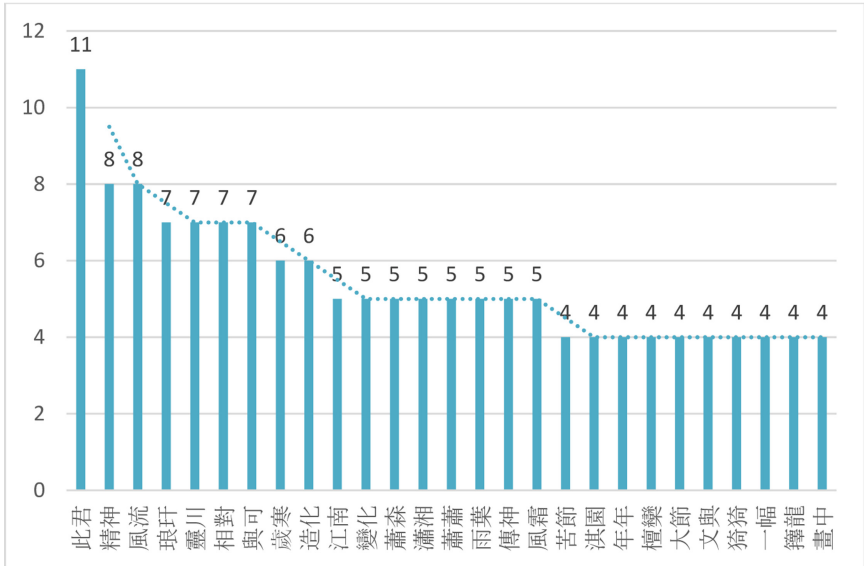


Fig. 3. The frequency of two syllable corpus in Mukjukdo painting poetry

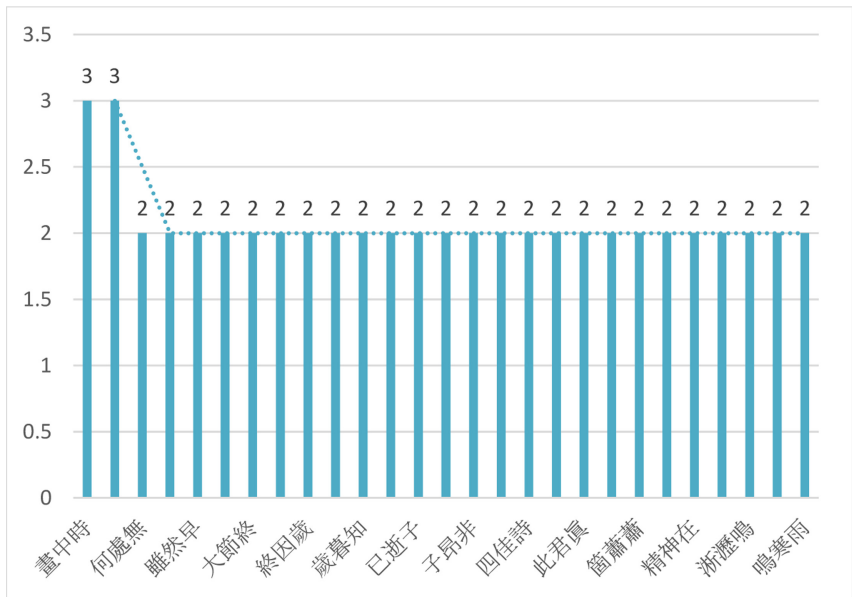


Fig. 4. The frequency of three syllable corpus in Mukjukdo painting poetry

3.4 Analysis of the Meaning of Corpus

The most commonly used one-syllable word in painting poetry of Mukjukdo is “poong (wind: 55 times)”. “poong” is a combination of words in the order of “poong ryu (a taste for the arts: 8 times)”, “poong sang (wind and frost: 5 times)”, “Chun poong(the spring breeze: 3 times)” etc. in 2 syllables. Poong ryu is presented when referring to the wonderful scenery of bamboo. Pung sang is wind and frost, which gives bamboo trials and tribulations. Chun poong appears when describing a situation in which bamboo shoots sprout.

Next is “juk (a bamboo: 41 times)”, but “juk” refers to bamboo itself, so it is not a discriminating result. And “bul (no: 40 times)”, which belongs to an adverb that represents negativity in Chinese characters, is not very meaningful in single syllables, but further emphasizes its meaning when combined with other words. And “ji (Branch: 32 times)”, which is connected in two syllables: “poong ji (a branch swaying in the wind: 2 times)”, “so ji(a slender branch: 2 times). It excludes the numerical value that does not form a special meaning, such as juk, bul, ji.

The next significant figure is “goon (a man of virtue: 26 times)”. “goon” is a combination of words in the order of “cha goon (this man of virtue: 11 times)”, “goon jin (a man of virtue is truly ~: 3 times)”, “goon dok (a man of virtue alone ~: 2 times)” etc.in 2 syllables. And “jeol” is 24 times, it means principles. “jeol” is a combination of words in the order of “go jeol(a distressed principles: 4 times)”, “no jeol (mature principles: 2 times)”, “jik jeol (a straight principles: 2 times)”, etc., in 2 syllables. The jeol represents the principles of bamboo, and the attitude of keeping faith firmly is matched with “go” and “no”, to reinforce the unchanging properties.

4 Conclusion

The data figures of corpus by syllable in Mukjukdo painting poetry are in line the symbolic meanings of bamboo in the early Joseon Dynasty. The symbolic meaning of Mukjukdo [6] is as follows. As an object, a bamboo was personified as the ideal existence of a god dragon and a Junzi. As an event, the virtual space of bamboo about the bamboo of Two queens and Qu Yuan was realized as the sorrowful and unworldly image.

Through this, the measurement of the frequency by dividing the original text of Mukjukdo painting poetry by syllables and setting it as a corpus composition unit is meaningful in revealing the symbolic meaning of bamboo in painting poetry. Conversely, the symbols of objects in various types of painting poetry can be demonstrated and shown with an objective indicator of language.

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A Big Data Based Learning Model from Student Questionnaire

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Abstract. The results of analyzing students' requirements become very important data for teachers. Because it is a very important criterion for improving learning satisfaction while increasing students' learning effects. In this paper, students' requirements are analyzed and what subjects or contents students want are investigated. The purpose of this paper is to construct a learning model that reflects the needs of students.

Keywords: Big Data · Word Cloud · Student's Needs · Learning Model

1 Introduction

Until the late 21st century, general teaching methods were mainly based on frontal teaching in classrooms. The use of digital tools has the effect of increasing learning efficiency, but the method of education insisted on traditional classroom lectures [3]. After COVID-19 pandemic, university education was changed and operated from offline to online, and many students became familiar with online education [1]. Teleconferencing platforms such as Zoom have become hugely popular with the spread of online education due to COVID-19 pandemic. This has become a catalyst for many institutions to seek traditional education methods as various educational methods that can conduct synchronous or asynchronous remote education [3]. In online education, learners' activities and learning data were analyzed and processed using a LMS (Learning Management System). The large amount of learning data extracted from the LMS platform provided basic information for both teachers and students that could help improve learning satisfaction and educational goals [1]. In addition, students' learning satisfaction is generally obtained through a post-learning survey, and most of them analyze and use it when students answer multiple-choice questions written by teachers. However, the multiple-choice questions given by the teacher are not sufficient data for the student satisfaction survey, and the results of the student's data analysis may vary depending on the teacher's intention. For this purpose, it is necessary to analyze students' learning satisfaction and their needs through big data analysis when presented as a subjective question, not a multiple-choice question, and students freely describe their opinions and submit answers to the questionnaire.

NLP (Natural Language Processing) is natural human language and communication variables such as voice, text, audio, and video, interpretations and applications [2] We call NLP as non-formal data. Text mining that is one of technique in Big data is well known a process to extract meaning words from the data and analyze them.

This paper aims to make a learning model using analysis of students' needs. For this process, students get a subjective questionnaire and they write their opinion freely without any form and select items. Their answers is used to analyze what they want to study or learn. Consequently, this research shows a frequency of their opinions that can be the students' needs from their study.

2 Related Works

2.1 Big Data

Big data is a technology that can handle unstructured data, unlike databases that only dealt with structured data. Of course, this can perform both processing of collecting and analyzing unstructured and structured data.

It also guarantees both volatility, speed, volume, diversity and integrity. In big data, data is collected in various ways, such as a web browser and a mobile web with various data formats. In the existing analysis method, different formats of unstructured and structured data could not be managed, but both big data are possible. In big data, Hadoop is cost-efficient, scalable, and enables fast and flexible parallelism. It also uses the Hadoop framework for big data analysis because it provides availability, resilient properties, security, and authentication. It is also well known for its open-source software architecture, which includes processing and storage. The part to be stored is HDFS (Hadoop Distributed File System), and the part to be processed is MapReduce. D.K. Jain et al. [4] depicted the Hadoop architecture as shown in Fig. 1.

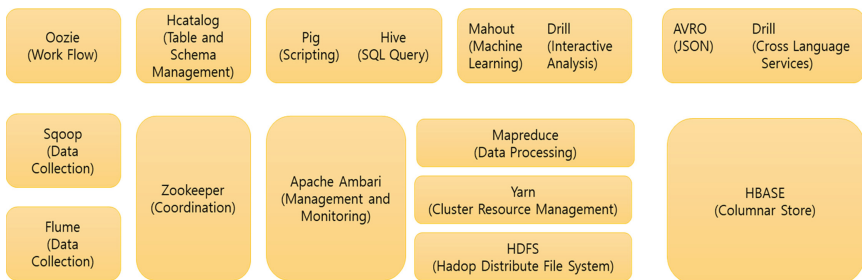


Fig. 1. Hadoop architecture by D.K. Jain et al.

Hadoop, first run by Doug Cutting and Mike Caparella in 2005, is a Java-based open-source software. Providing a distributed framework for processing and managing big data is known as Hadoop's advantage. Therefore, using Hadoop can manipulate a large amount of data. In addition, the Hadoop Distributed File System (HDFS) can store MapReduce for the purpose of the process. MapReduce is used to analyze and generate

This approach can be a good solution to accommodating an exponentially growing number of students and their curriculum, but only popular large-scale online curriculums can cause problems such as student crowding, student performance, failure and departure [6]. K. DeeJring depicted e-learning model as shown in Fig. 3 [7].

3 Data Analysis for Students' Needs

3.1 Survey of Students' Requirements for Their Class

For this study, a survey was conducted on 40 general students who did not major in IT in the liberal arts subject of K University in Seoul. The survey items are as follows.

Question: *Feel free to describe any topic or content you want to hear in the lecture. Or if there is a subject that you want to make a lecture in general culture, please write it with the reason.*

The comments as below represent one of the student's answers among the results of the survey.

Answer: *In my opinion, the topic we need in the Fourth Industrial Revolution is 'human ennui among the negative aspects of liberal utopia'. In the 4th Industrial Revolution, as each of us could access information or technology so easily, it destroyed the feudal system of the past and transformed it into a nation by the public, giving everyone a chance to politics by democracy and capitalism. As educational opportunities diversified, it began to turn into a world where everyone creates opportunities through education. But we must think about whether we will be happy. I get everything I want and come across, but I feel despondent. The reason is that in the era of the Fourth Industrial Revolution, we have it whenever we want, so we work hard to achieve something and do not feel the joy, satisfaction, and fulfillment that comes from it. Therefore, we maximize convenience and efficiency, but we may not be able to enjoy our mental satisfaction and happiness.*

3.2 Frequency from the Survey

Students' survey results are unstructured data written freely. If you analyze the frequency of words using the word cloud of big data, it is shown as shown in the Fig. 4. The results of this analysis were all processed students' opinions, and they were not able to extract actually important words from the students' answers, but only the frequency was processed from the entire content.

Figure 5 shows the results except for meaningless words. What these results show is that students want subjects related to technology and are paying a lot of attention to preparing for the future. In particular, if you look at topics such as education, development, paradigm, artificial, computer, big data, metabus, and program, it can be seen that students want lectures related to this.

