EXPLORE MINDFULNESS WITHOUT DEFLECTION: A DATA ART BASED ON THE BOOK OF SONGS

Yifang Wang
Department of Computer Science and Engineering
The Hong Kong University of Science and Technology
yifang.wang@connect.ust.hk

Yang Wang
Department of Mathematics
The Hong Kong University of Science and Technology
yangwang@ust.hk

Yifan Cao
Computational Media and Arts
The Hong Kong University of Science and Technology
ycaoaw@connect.ust.hk

Huamin Qu
Department of Computer Science and Engineering
The Hong Kong University of Science and Technology
huamin@ust.hk

Junxiu Tang
State Key Lab of CAD&CG
Zhejiang University
tangjunxiu@zju.edu.cn

Yingcai Wu
State Key Lab of CAD&CG
Zhejiang University
ycwu@zju.edu.cn

Abstract

The Book of Songs is regarded as the origin of Chinese literature and has a prolonged impact on Chinese culture, aesthetics, and morality. In this work, we have analyzed the 305 poems in *The Book of Songs* from different dimensions. We aim to learn how various poetic imageries connect abstract themes and subjective emotions at the micro level, and how the poems connect people today and ancestors to understand the universal, everlasting, and poetical human lives at the macro level.

Authors Keywords

Digital Humanities; Cultural Heritage; Data Visualization; Data Art;

Introduction

The Book of Songs is widely acknowledged as the origin of traditional Chinese culture and highly impacted the whole East Asian culture. It is officially assembled by the famous founder of Confucianist, Confucius, who lived in the Late Zhou Dynasty around 3000 years ago. This epoch is considered paralleled with the Axial Period of world history, and Confucianist is regarded as one of the fundamental East Asian philosophies. *The Book of Songs* represents secular and religious values Confucius approved in accord with his own philosophical system, which brings a profound impact on traditional Chinese culture, aesthetics, and morality.

Recorded from 1100 BC to 500 BC, *The Book of Songs* consists of 305 poems with three genres, namely, *Songs*, *Odes and Epics*, and *Hymns* [14]. Across different genres, the poems cover various themes to portray the whole society in the Late Zhou Dynasty, including not only ballads, folk-customs of ordinary people, but also sacrifice, banquet, and the musical dance of nobility [1].

Confucius highly admired *The Book of Songs* [2], "*The Odes are 300; one expression sums up all: 'mindfulness without deflection.'*".

Although many phenomena mentioned in the book (e.g., feudalism) are antiquated to Chinese people nowadays, many language styles and underlying thoughts are substantially the same as those we are experiencing today [1], especially the unique euphemistic style lying in the Chinese culture. *Such euphemistic style usually* takes advantage of natural creatures or phenomena to make comparisons or uses them as metaphors to express the feelings of the authors. To express the euphemism, people use tons of poetic *imageries* in *The Book of Songs*. *Herbage*, *Trees*, *Birds*, *Livestock*, *Insects*, and *Fish* have constituted a huge *imagery* database [15] shared by not only Chinese but the whole East Asian cultural circle. They act as essential bridges connecting the abstract themes and the subjective emotions and feelings expressed by the authors.

Savored today, the charm of *The Book of Songs* is still vivid. It represents the circumstances, the thoughts, the habits, the joys and sorrows of individuals from all classes of society in Ancient China. *The Book of Songs* has established a time tunnel to connect people today and their ancestors, which helps us understand the distant and precious cultural heritage and the universal, everlasting, and poetical human lives.

Workflow

To systematically understand *The Book of Songs*, we used the original 305 poems to conduct the analysis and the visual designs. First, we worked with experts in Chinese Language and Literature and labeled these poems in four dimensions: *Functions*, *Themes*, *Emotions*, and *Rhetorical Devices*. In each dimension, the poems were classified into different categories (please refer to the supplementary material for more details). We cross-validated the labels with several authoritative studies related to *The Book of Songs*, including the *Anthology of Poems* [8], *Animism* [15], *Hand-drawn Book of Songs* [9], *Illustrated Handbook of Plants The Book of Songs* [10], and *Descriptive Text of Creatures from The Book of Songs* [11]. In addition to the poems, we also adopted aesthetic paintings drawn by Hosoi Jun in Qing Dynasty [12]. His works also inspired the color selection and designs of our pictorial.

Next, we programmed to obtain statistics of the above dimensions and the relationships among different *imageries*. We further designed and revised the visual representations iteratively and fixed the final version of the work.

Design Process

The pictorial contains two parts, showing the idea of connections in *The Book of Songs* from the micro and macro levels.

At the micro level, we selected the most frequently used poetic *imageries* from six categories (i.e., *Herbage*, *Trees*, *Birds*, *Livestock*, *Insects*, and *Fish*) as representatives and applied an *Imagery Glyph* design to show their importance in terms of connecting the abstract themes and subjective emotions.

At the macro level, a *Poem Flow* exhibits the relationship between *Genres*, *Functions*, *Themes*, *Imageries*, *Emotions*, and *Rhetorical Devices* of all the poems, which takes the form of a traditional Chinese arch bridge (with its inverted reflection in the water) in shape. We hope to use these traditional elements to illustrate how *The Book of Songs* connects modern people with their ancestors through universal and everlasting *imageries*, *Themes*, and *Emotions*.
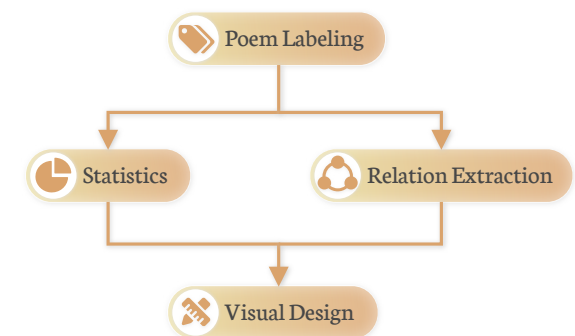
The analytical and design pipeline of the data art.

The *Poem Flow* of all 305 poems in *The Book of Songs*. Dimensions include *Genres*, *Functions*, *Themes*, *Imageries*, *Emotions*, and *Rhetorical Devices* (from left to right).
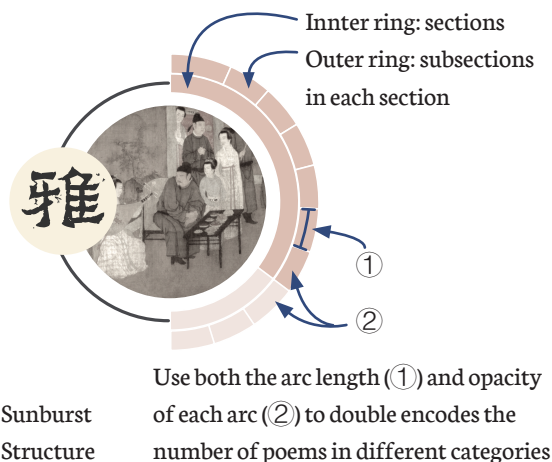
思无邪

The *Imagery Glyph* for the top frequently appeared *imageries* in *The Book of Songs*. From left to right, these glyphs represent: Proso Millet, Mulberry, Swallow, Horse, Pest, and Black Bream.

A data art based on *The Book of Songs*[1].

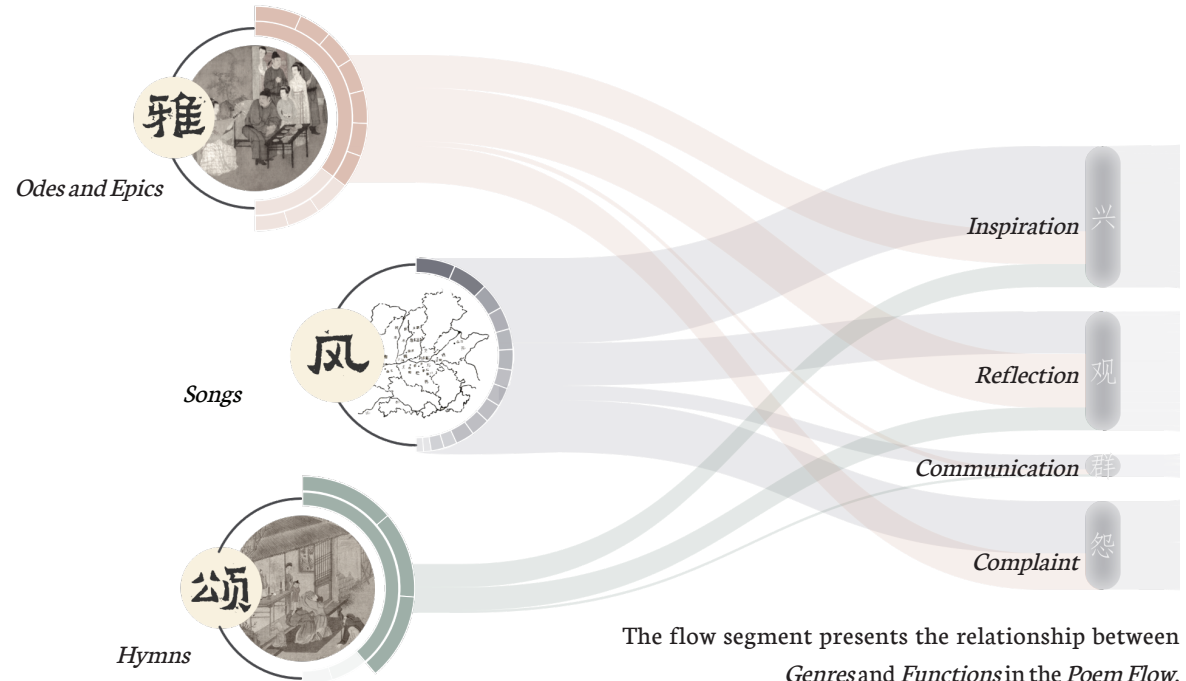[1] Project page: http://wangyifang.top/visap2021-shijing/

Poem Flow -- Visual Encoding

The *Poem Flow* provides an overview with an enhanced Sankey diagram that presents six dimensions (i.e., *Genres*, *Functions*, *Themes*, *Imageries*, *Emotions*, and *Rhetorical Devices*) of all the 305 poems. We use different node groups in the *Poem Flow* to represent the above dimensions of the poems. The height of each node (except the *Genres* dimension) encodes the number of poems in one category under a specific dimension. The width of a flow between two nodes in two different node groups represents the number of poems belonging to these two node categories. The colors of the nodes and flows follow the style of the paintings drawn by Hosoi Jun in the Qing dynasty, which makes our pictorial similar to the ancient Chinese paintings.

Three sunburst diagrams[1] on the left of the *Poem Flow* present the detailed classification of poems in the three genres (i.e., *Songs*, *Odes and Epics*, and *Hymns*), respectively. In each sunburst diagram, the length and opacity

Inner ring: sections
Outer ring: subsections in each section

①
②

Sunburst Structure | Use both the arc length (①) and opacity of each arc (②) to double encodes the number of poems in different categories
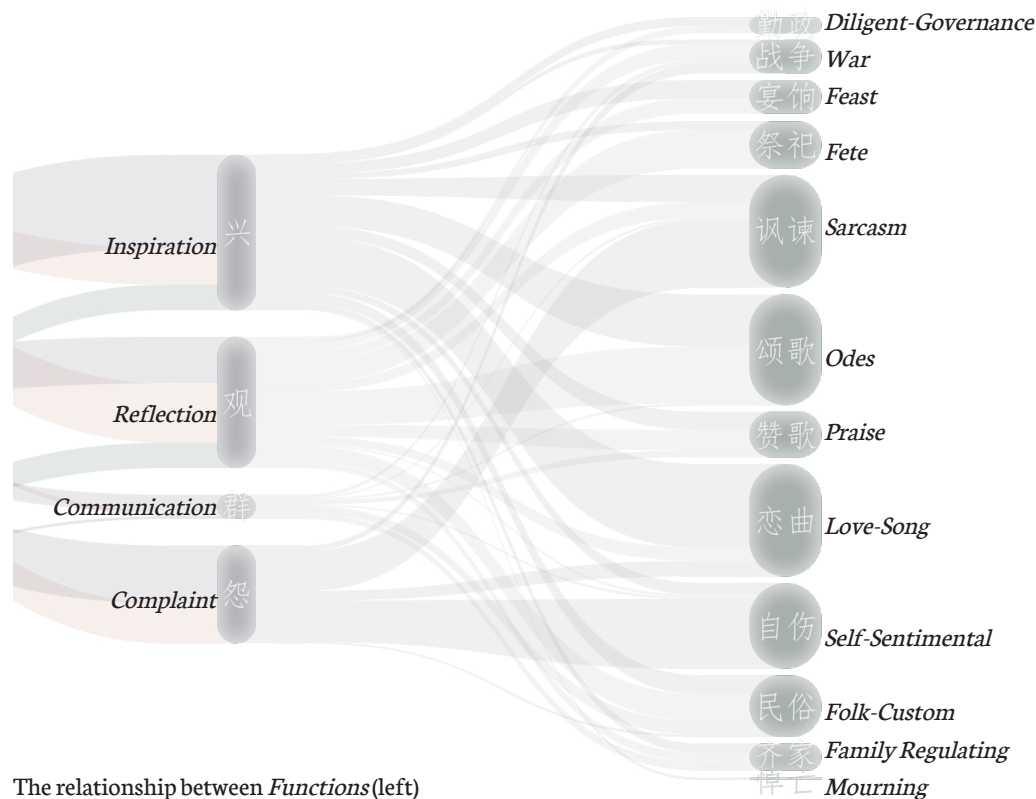
of each arc double encode the number of poems in different categories for a specific dimension. In the *Songs* node, there are fifteen categories representing poems from fifteen ducal states in the Late Zhou Dynasty. In the *Odes and Epics* node and the *Hymns* node, the inner arcs represent the section categories, and the outer arcs represent the related subsections within each section. The above *Poem Flow* segment presents the relationship between the *Genres* (i.e., *Songs*, *Odes and Epics*, and *Hymns*) and the *Functions* (i.e., *Inspiration*, *Reflection*, *Communication*, and *Complaint*) [2] of poems. Each flow represents a group of poems that belongs to a specific genre and a specific function.
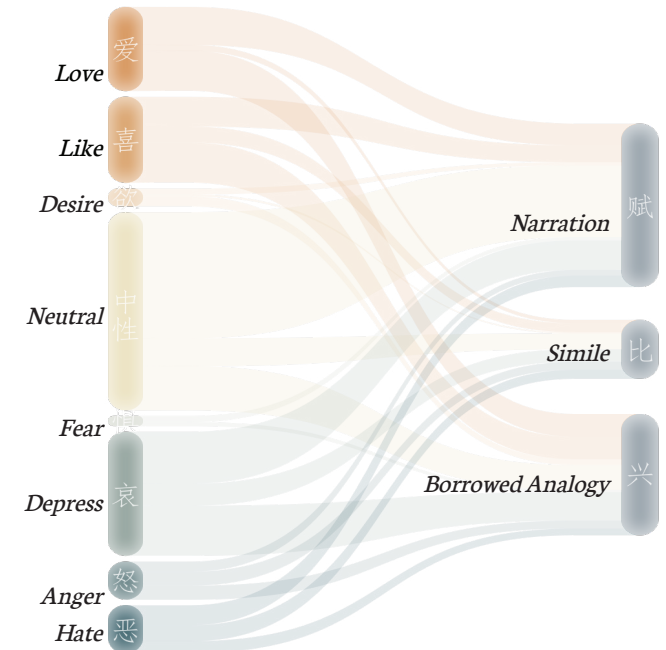
Poem Flow -- Findings

As illustrated in the diagram, the *Songs* is the

The flow segment presents the relationship between *Genres* and *Functions* in the *Poem Flow*.

genre with most poems, which records stories and lyricism among plebeians. This may be because the colorful life of the plebeians gave birth to a large number of ballads and poems. These songs and poems are usually started with natural environments or domesticated animals to express emotions since the ancient Chinese people are more euphemistic in expressing their feelings. Such a unique euphemistic style is the reason why a lot of poems in the *Songs* flow to the *Inspiration* function. Another flow from the *Songs* to the *Complaint* also accounts for a nonnegligible proportion because the plebeians may grumble to the ruler. However, most poems in the *Reflection* are from *Odes and Epics*, and *Hymns*. Poems in these two genres record the dynasty history or ritual activities, which are mostly objective.

The relationship between *Functions* (left) and *Themes* (right) in the *Poem Flow*.

Diligent-Governance
War
Feast
Fete
Sarcasm
Odes
Praise
Love-Song
Self-Sentimental
Folk-Custom
Family Regulating
Mourning

Inspiration 兴
Reflection 观
Communication 群
Complaint 怨

The relationship between *Emotions* (left) and *Rhetorical Devices* (right) in the *Poem Flow*.

Love 爱
Like 喜
Desire 欲
Neutral 中性
Fear
Depress 哀
Anger 怒
Hate 恶

Narration 赋
Simile 比
Borrowed Analogy 兴

We take the top three frequent themes, namely, *Love-Song*, *Sarcasm*, and *Odes*, as examples to introduce the relationship between the *Functions* and the *Themes*. First, *Love-Song* appears most for two reasons. On the one hand, love is an eternal theme in literature. Many poems in the *Songs* depict the stories of young people falling in love. Sometimes they are impressed by the scenery, so they expressed their feelings through these objects (*Inspiration*). On the other hand,

though several poems are ostensibly about love, the authors use love as a metaphor to convey other ideas, such as the relationship between the monarch and his subjects (i.e., *Inspiration*). Second, besides literature, *The Book of Songs* also acts as moral education materials that Confucius collected for expostulating rulers. Among the poems related to rulers, some criticize the rulers (i.e., *Sarcasm*), while others celebrate them (i.e., *Odes*).

The right flow segment shows that the emotion distribution is balanced regarding the positive and negative sides. The most are neutral emotions, which take a considerable proportion of the *Narration*. However, in the *Simile* and the *Borrowed Analogy*, the emotions are more diverse since people tend to express love or satire euphemistically to avoid offending others.

We use a word cloud to present frequently used *imageries* of plants and animals. The shape is generated from the traditional Chinese arch bridge. The size of each Chinese character encodes the number of poems the *imagery* appears in *The Book of Songs*.

One of the frequently applied plant *imagery* is the Ziziphus Jujuba. It was everywhere in the agricultural age in China: the leaves were picked for teas and the timber was used for small pieces. Select grade Jujube timber were good materials to make traditional Asian instrument components, such as fingerboard and soundposts [4].

The most frequently used animal *imagery* is the Horse. Keeping the Horse in captivity is a conventional practice of ancient Chinese since the Horse is an essential type of animals in scenarios like hunting, sacrifice, and transportation.

The traditional Chinese bridge.
Photo by Charriot ZHAI on Unsplash[1].

One of the frequently applied plant imagery is the Ziziphus Jujuba.

The word cloud presents the frequently used *imageries* of plants and animals in Chinese characters.

The most frequently used animal *imagery* is the Horse.

[1] https://unsplash.com/photos/SNtaQS1sk4k

Imagery Glyph -- Visual Encoding

The *Imagery Glyph* summarizes the poem information of the most frequently appeared *imageries* among six categories (i.e., *Herbage*, *Trees*, *Birds*, *Livestock*, *Insects*, and *Fish*). It consists of three parts: the circular icicle plot, the picture of the *imagery*, and concurrent *imagery* bubbles.

We aimed to summarize all the poems that apply a specific *imagery* to have an overall understanding of that *imagery* from different dimensions (i.e., *Emotions*, *Themes*, *Functions*, and *Genres*). We got inspiration from the icicle plot [3] to present the poem distribution of four dimensions in a hierarchical way. First, we summarized the emotion distribution. In the bottom layer, we used (1) the height, (2) the width, and (3) the fill opacity of the rectangle to triply encode the number of poems in each emotion type to magnify the differences. Following the same encoding strategy, we then classified poems of the same emotion type into different themes, as seen in the second bottom layer. We further summarized the function and genre distributions above the themes, which finally formed into an icicle plot with four hierarchies.

Second, to improve aesthetics and incorporate more information of the *imagery*, we distributed the original icicle plot along the polar coordinate. This circular design also expresses the idea of complete and perfection in the traditional Chinese culture [13]. We only made use of 2/3 of the circle to leave spaces for other information (e.g., concurrent *imageries*).

Third, we further refined the design by hollowing out a circle in the center to hold the picture of the *imagery*. We also provided a larger translucent picture to cover the whole graph.

However, as we can imagine, if we set the same radius for the inner rounded picture in each glyph, the sizes of these glyphs could vary largely due to the different distribution of poems (since the height of each outer arc also encodes the number of pomes). Thus, instead of laying away from the centre of the circle, we laid out the circular icicle plot towards the centre. This could make the sizes of glyphs uniform, easy to compare, and more aesthetic.

Finally, we filled the left 1/3 circle with pictures of the top three concurrent plant and animal *imageries*. The size of the picture encodes the number of poems where this *imagery* has appeared together with the target *imagery*.
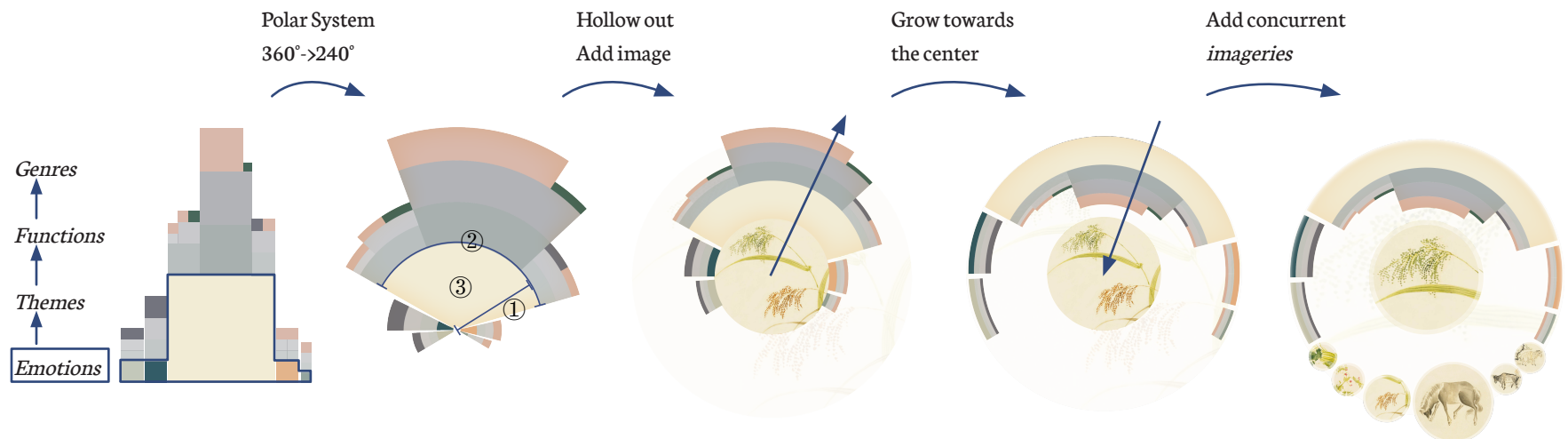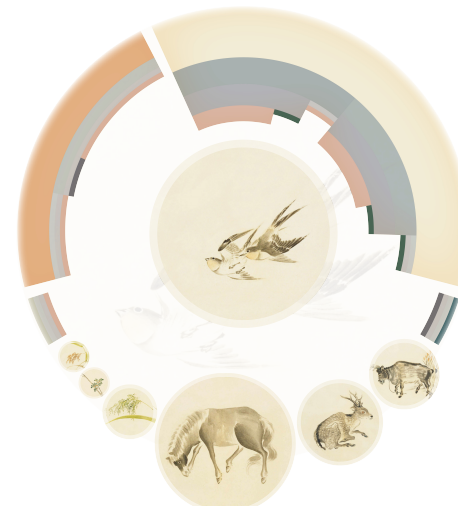
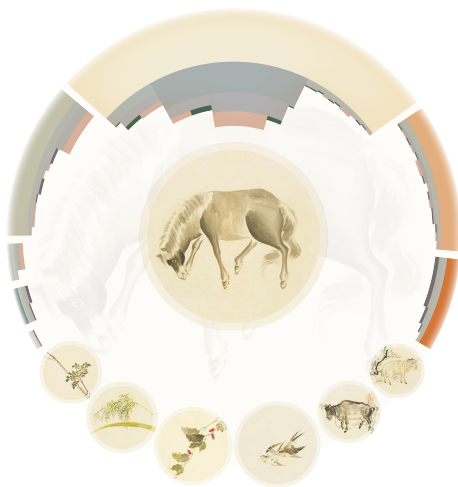The design process of the *Imagery Glyph*.

Proso Millet / *Herbage*

Mulberry / *Tree*

Swallow / *Bird*

Horse / *Livestock*

Pest / *Insects*

Black Bream / *Fish*

Many poems are with the
Like (in orange) emotion.

The Swallow appears in the
Odes and Epics (in pink) most.

燕燕于飞，
O the swallows onward flying,

差池其羽！
Wings aslant, irregular!

——《國風 · 邶風 · 燕燕》
——*Friends in Distress, the Songs of P'EI, Songs*

Imagery Glyph -- **Findings**
The Swallow is the bird that appears the most
frequently in *The Book of Songs*. Besides neutral, it tends to represent more positive emotions (in orange). For the genres, the Swallow
appears in the *Odes and Epics* (in pink) most.
The Swallow represents auspiciousness and
reunion in traditional Chinese culture, which
is always applied in the scenes of feast and
sacrifice, particularly for nobiliary class. The
Broomcorn and Proso Millet always appear
together with the Swallow, with the potential
to express the joy of harvest and the happiness
of being together:

O the swallows onward flying,
Wings aslant, irregular [1]*!*

The Broomcorn and the Proso Millet always appear
together with the Swallow, with the potential to express
the joy of harvest and the happiness of being together.
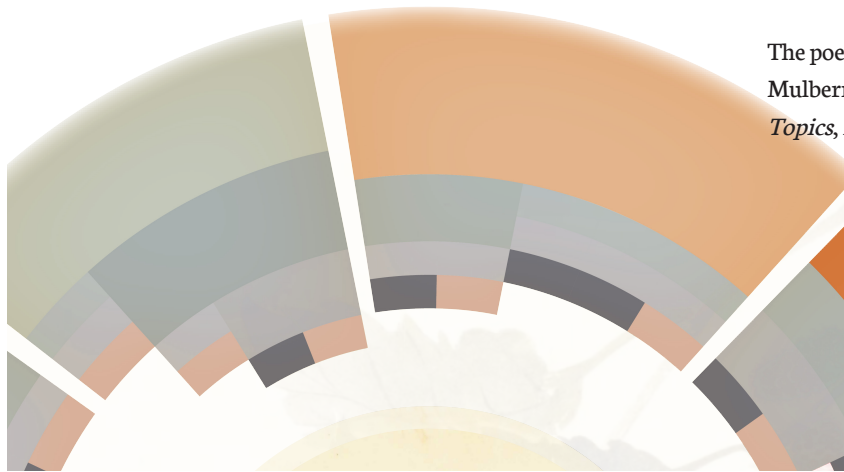
The poems that involve the Mulberry are with diverse *Emotions*, *Topics*, *Functions*, and *Genres*.

尸鳩在桑，

There in the mulberry-tree the dove,

其子七兮。

Sits on, seven young ones at her side.

——《國風·曹風·鳲鳩》
——*Praise of An Excellent Ruler, the Songs of TS'ÂU, Songs*

The Mulberry is one of the most important types of trees in Central and North China. The trunks, branches, bark, fruits, leaves, and velamen can all be used for different purposes.

The Mulberry is the most-mentioned tree. The emotions of poems involving the Mulberry are diverse compared with other *imageries*. It may be related to the cultivation culture in the Late Zhou Dynasty when the Mulberry seems to be everywhere: the gain of the Mulberry is a type of tasty fruit, the leaf of the Mulberry is a type of delicious food for the silkworm, the Mulberry trees are great raw materials for houses. Thus, people would always use this common type of tree as a metaphor to express their feelings. Among the animals mentioned together with the Mulberry, the Strigidae appears frequently. This may be due to that the Strigidae nesting on the Mulberry:

There in the mulberry-tree the dove,
Sits on, seven young ones at her side [1].
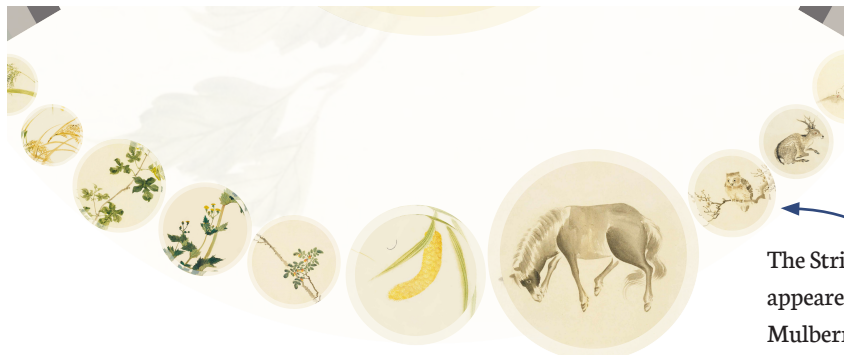
The Strigidae is the frequently appeared animal together with the Mulberry, besides the Horse.

User Feedback

We introduced our work to different groups of audiences (i.e., artists and designers (A1 and A2), experts in traditional Chinese literature (C1), Chinese teachers (T1, T2, and T3), and general audiences (G1, G2, and G3)) and received valuable feedback.

Visual Designs. Most audiences regarded the pictorial as intuitive and aesthetic. A few audiences (C1 and T3) had difficulties understanding the *Imagery Glyph* at first since they were not familiar with charts. Nevertheless, after we explained our design process with examples, they finally got the point. Many of them (T1-T3, G2, G3, and C1) were impressed by the word cloud in the *Poem Flow* because of the shining color and the intuitiveness of the font-size encoding. G1 and T1 liked the idea of laying out the circular icicle plot towards the circle centre, *"it makes glyphs more uniformed and easy to compare"* (G1). *"you can even make badges as souvenirs based on this circle design"* (T1). T2 appreciated the legends that help her understand the color encoding. They all liked the color style, which was similar to ancient Chinese paintings.

Insights. The audiences appreciated the statistics, which could help them verify previous knowledge and learn new stories. For example, G1 commented that the fact that the Horse was the most frequently appeared livestock made sense since it was an important type of transportation in the past. G2 was not aware of the relationships among imageries previously. This pictorial provided a nice summary for him to learn such knowledge.

Suggestions. We received valuable suggestions regarding the current work. First, several audiences (G1, G2, G3, T3) mentioned that three colors representing *Functions*, *Themes*, and *Rhetorical Devices* were a bit difficult to distinguish. G2 suggested merging the emotion colors into three categories and making the above three dimensions more distinct in color. Second, T2 and A2 suggested adding more legends and explanations to the encoding scheme of the glyph. In addition, our audiences also provided other information they wanted to learn from this work as well as other presentation formats. Most of them (G1-G3, A1, A2, C1, T2) suggested adding detailed information such as the raw poems and explanations for specific *imageries*. G2 wanted to list all the *imageries* using the glyph design. T1 wished to see how these *imageries* influenced poems created in the later dynasties. To incorporate new and detailed information, they suggested improving this work into an interactive web application (G1, G3, A1). Other formats such as videos (A2, G1, G2, T2, T3) and interactive books (C1) were also suggested.

Additional Comments from Different Stakeholders. For the artists (A1 and A2), though they regarded this pictorial as aesthetically pleasing, they would expect more innovative or abstract designs to show the artistic expression and feelings of the authors. For the expert in traditional Chinese literature (C1), she mentioned tha they usually study poems case by case. This work provided a new approach to obtain an overview of the poems, which was quite impressive. Also, she thought that this work might not be enough for re-

search purposes, while it could be a great tool for educational purposes. Similarly, all the Chinese teachers (T1-T3) appreciated such kind of data overview as a new approach to teaching *The Book of Songs*. *"The combination of these new approaches and traditional close reading approaches would be a great future for the education"* (T2).

Discussion

As the pioneer of the poetry anthology, *The Book of Songs* doubtless sets the foundation of Chinese culture. It has a prolonged influence on Chinese literature, serving like a cultural tunnel connecting current Chinese people with their ancestors. The heavy use of poetic *imageries* of *Herbage*, *Trees*, *Birds*, and *Livestock, Insects, Fish* successfully connects the intangible themes with subjective emotions.

In this project, we use data visualization to portray the inherent connection nature of *The Book of Songs*. A Sankey diagram deforming into a traditional Chinese arch bridge provides an overview of 305 poems. We also distill the most frequently appeared *imageries* in each category of *Herbage*, *Trees*, *Birds*, and *Livestock, Insects, Fish* to show how they assist in conveying the emotions and themes.

The impact of *The Book of Songs* is noticeable. *"I may assure the reader,"* Professor von der Gabelentz of Leipsic in a discussion on these poems remarked, *"in the whole collection of Hymns, and indeed in the whole canonic and classical literature of the Chinese, there is not a line to be found which might not be read aloud without any hesitation in the most prud-*

ish society. I know no other literature, of the East or West, on which similar praise could be bestowed"[1].

Moreover, the cultural heritage of *The Book of Songs* is inherited by poetry, prose, and lyrics from Tang Dynasty to Qing Dynasty. Confucius also highly admired the spirits and rhetoric within *The Book of Songs*. In the Analects [2], he once commented that *"The Odes are 300; one expression sums up all: 'mindfulness without deflection.'"*. The voluminous collections of historical materials such as ancient books are precious resources to connect people today to the past to learn from history. Confronted with data of enormous amount, we can utilize both big data analysis and the aesthetics of arts to facilitate education. We hope that our initial experiment on the visualization of *The Book of Songs* can encourage more trials in digital humanities.

References

1. Confucius. 1891. The Shi King, the Old "Poetry Classic" of the Chinese. (A Close Metrical Translation, with Annotations by William Jennings). London: George Routledge and Sons.
2. Yang Xu, Yuanchong Xu, Bojun Yang. 2012. Thus spoke the master (Di 1 ban.. ed., Classical Chinese poetry and prose). Beijing Shi: China Intercontinental Press : Zhonghua Book Company.
3. Kruskal, Joseph B., and James M. Landwehr. 1983. Icicle plots: Better displays for hierarchical clustering. The American Statistician 37.2 : 162-168.
4. Wikipedia. Jujube. Retrieved August 8, 2021 from https://en.wikipedia.org/wiki/Jujube#Cultivation_and_uses.
5. 周啸天. 1988. 十五国风地图:《诗经楚辞鉴赏辞典》附录. Retrieved August 8, 2021 from http://cnki55.sris.com.tw/refbook/R200608074.html.
6. 顾闳中. 五代. 韩熙载夜宴图卷. Retrieved August 8, 2021 from https://www.dpm.org.cn/collection/paint/228200.html.
7. 楼璹. 南宋. 耕织图. Retrieved August 8, 2021 from https://www.wdl.org/zh/item/289/view/1/30/.
8. 朱熹. 1961. 诗集传 (香港第1版. ed.). 香港. 中华书局.
9. 徐峙立. 2019. 诗经手绘图谱. 济南. 山东画报出版社.
10. 潘富俊&吕胜由. 2001. 诗经植物图鑑 (第1版. ed.). 台北. 猫头鹰出版社.
11. 高明乾, 王凤产, & 毛雪飞. 2020. 诗经动植物图说 (第1版. ed.). 北京. 中华书局.
12. 细井徇&细井东阳. 1848. 诗经名物图解.
13. 段玉裁&许慎. 1981. 说文解字注 (第1版. ed.). 上海. 上海古籍出版社 : 新华书店上海发行所发行.
14. 许渊冲. 2005. Selections from the book of poetry (Illustrated edition) - 精选诗经与诗意画 (英汉对照) (第1版. ed.). 北京. 五洲传播出版社.
15. 细井徇&白云出岫. 2018. 万物有灵:《诗经》裡的草木鸟兽鱼虫 (第1版. ed.). 新竹县竹北市. 品林数位文化出版 : 如是文化发行.