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Marriage Network Analysis of Political Power in Pre-modern Goryeo Korea

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Political marriages

Political marriages have historically played a very important role in the ruling elite group to maintain or extend their power (e.g., Rollins Bahr, 1976).



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Political marriages in Goryeo dynasty

Likewise, in Korean history, political marriage has been a means for the ruling elite group including the royal families of the Goryeo dynasty to form, maintain, and expand their power (e.g., Lee, 1984).



출처: 교육형

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Previous studies on political marriages

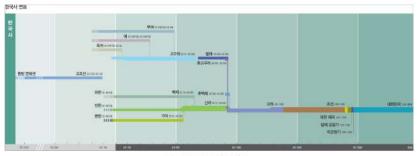
Studies on political marriages in Goryeo dynasty

- Ha, 1968
- ▶ Jeong, 1984
- Kim, 2009

Problem of political history

Due to the nature of political history, **it is difficult to cover long periods in a single paper**, which shortens the time frame that researchers can focus on with interest (Hong, 1995).

Time series data from early Korean history to modern times



Source: National Atlas of South Korea.

Designing visualization system

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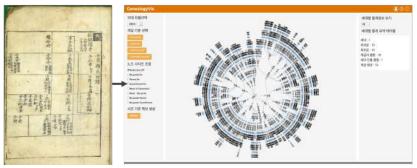
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Visualization system for 朝鮮王朝實錄

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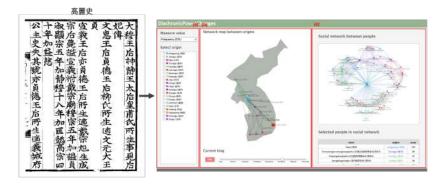
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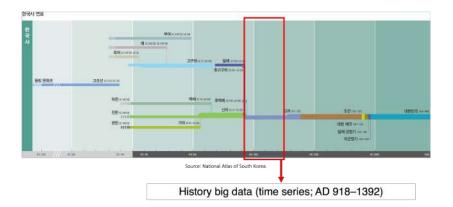
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Visualization system for 高麗史



https://github.com/seongminmun/VisualSystem/tree/master/Major/DiachronicPowerChanges/ Designing visualization system

Time series data (Goryeo dynasty)



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Question: How did royal families of the Goryeo dynasty use marriage as a political strategy to maintain or extend their power?

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Data and research tasks

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What is Goryeosa [高麗史]?

Goryeosa [高麗史] is a government-published book of Goryeo dynasty's history (Kyujanggak, 2023).



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including 137 people and 752 relationships.

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Research tasks

- RT.1: Identify the relationships between individuals and explore the influences of individuals within marriage networks.
- RT.2: Explore the local influences within marriage networks based on their origin (region).
- RT.3: Simulate changes in relationships and local influences over time based on the Kings.
- RT.4: Analyze the detailed individual information included in the marriage network by origin.

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Designing visualization system

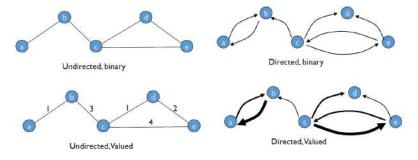
Research tasks

 RT.1: Identify the relationships between individuals and explore the influences of individuals within marriage networks.

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Network visualization

The network visualization expresses the relationship between pieces of information using nodes and links.

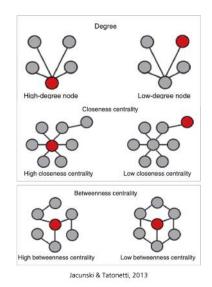


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Network analysis

For exploring the influences of individuals, we used three different centrality measures (i.e., degree, closeness, and betweenness).



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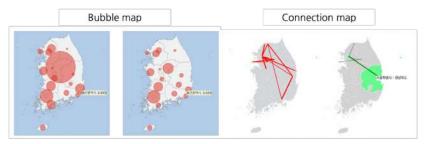
Research tasks

 RT.2: Explore the local influences within marriage networks based on their origin (region).

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Bubble & connection map

Bubble & connection map represents location data based on coordinates and visualizes regional/place differences by using the size of bubbles and links (Ryu Lee, 2021).



Ryu & Lee, 2021

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Research tasks

 RT.3: Simulate changes in relationships and local influences over time based on the Kings.

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Slider

The slider technique allows for visualizing data that changes over time.

Current king



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Research tasks

► **RT.4**: Analyze the detailed individual information included in the marriage network by origin.

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Table

To provide the details of the people on the marriage network, we used the table.

Selected people in social network

name	origins	score
Taejo (태조)	Gaegyeong (개경)	94
Janghwawanghu (장화왕후오씨_태조2)	Naju (나주)	25
Yugeungdal (유긍달)	Chungju (충주)	25
Sinmyeongsunseongwangtaehu (신명순성왕태후유씨_태조3)	Chungju (충주)	24
Hveiong (혜조)	Gaegyeong (7823)	24

Designing visualization system

Results & evaluation

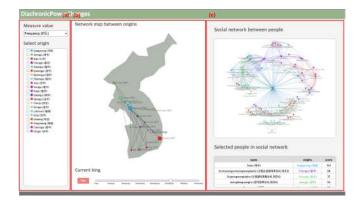
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Visualization system: GoryeoDPC



Interface of the visualization system (available at http://202.30.16.152/GoryeoDPC/)

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Results & evaluation

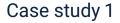
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In order to report the results through our visualization system, we conducted **two case studies**.

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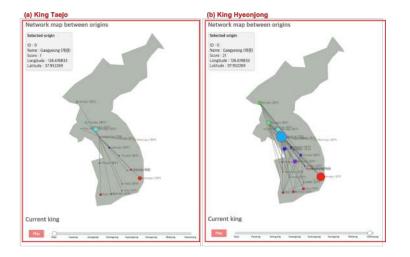


Question: How did the royal families of the Goryeo dynasty use marriage as a political strategy to maintain or extend their power?

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Designing visualization system

Case study 1



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Case study 2

Question: Which origin generated the greatest power through the marriage network?

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	Frequencies	Degree	Closeness	Betweenness
1st	Gaegyeong(21)	Gaegyeong(3.44)	Gaegyeong(11.34)	Gaegyeong(0.85)
2nd	Gyeongju(16)	Hwangju(0.96)	Gyeongju(7.95)	Jeongju(0.04)
3rd	Pyeongju(9)	Jeongju(0.75)	Pyeongju(4.46)	Hwangju(0.03)
4th	Hwangju(8)	Chungju(0.66)	Hwangju(4.21)	Chungju(0.03)

Table 1 Ranking of important origins according to frequencies and network analysis algorithms (including all marriage network data from King Taejo to King Hyeonjong).

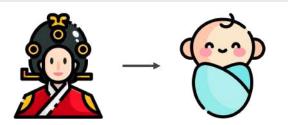
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In addition to the case studies, we conducted **a user study** to evaluate the effectiveness of our visualization system (e.g., Hou et al, 2023; Chen et al, 2023).

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User study

- The study involved a sample of 40 individuals who were humanities students with background knowledge of history.
- Data were collected for 7 d, from March 20 to March 26, 2023.
- The study used a questionnaire with Likert 5-point scale questions.

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User study

Nur	nber Question
	Patterns of data that change over time (dynasty) can be identified.
Data analysis $-\begin{bmatrix} Q_1 \\ Q_2 \end{bmatrix}$	Data Patterns that change depending on the network centrality calcula- tion method can be identified.
listorical information	The political marriage strategies of the Goryeo royal family can be understood.
L Q4	Important figures in the marriage network of the Goryeo royal family can be identified.
Data aslastian	Only desired specific data can be selected.
Data selection $-\begin{bmatrix} Q_5 \\ Q_6 \end{bmatrix}$	Desired network centrality calculation method can be selected.
C 07	The information presented in the visualization can be understood
Visualization design	without separate explanations of the visualization system.
Visualization design $ Q^7_{Q8}$	Desired regional information can be distinguished without separate explanations of the visualization system.
C O9	The operation of the system can be understood without separate
System overall -	explanations.
L 010	The system operates smoothly.

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User study

Data a	nalysis	Historical i	nformation	Data selection
Question 1	Question 2	Question 3	Question 4	Question 5
205	42.5% 15% 27.5%	45% 1775	47.5% 17.5%	25%
Data selection	Visualizati	ion design	System	overall
Question 6	Question 7	Question 8	Question 9	Question 10
25%	27.5% 10%	45% 17.5% 92.5%	30% 15% 12.0%	42,5%
N	ot at all 💿 Not really	y 🖲 Somewhat	Yes	nuch so

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Conclusion

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Conclusion

 Political marriage was an important strategy for maintaining or extending power during the Goryeo dynasty.

- The power of an origin was higher when the king was produced through marriage (i.e., Jeongju).
- The proposed visualization system can be useful for historians to analyze political history records.

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Thank you.