The Star Husband Tale (Again): A Network Approach to the Historical Geographic Method

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Abstract

This project seeks to use network methods to reanalyze a classic folklore study: Stith Thompson's 1953 analysis of *The Star Husband Tale*. Thompson's work identifying specific similarities and differences between variants of the same story becomes the basis for creating a network of story variants. Centrality measures reveal variants of particular interest for further study. Community detection methods reveal regional variation and discrepancies between the original dataset and the conclusions Thompson initially drew. The intention is to refine network analysis as a tool for connecting the formal elements of story to cultural transformation and historical social connections.

Introduction

The study of folklore examines how stories and other art forms are used to reinforce and create social ties. As traditional narratives move over time and space, storytellers both preserve and alter specific aspects, adapting the story over time. The elements of change and stability can provide important cultural insight.

Network science offers a promising approach to storytelling because of its ability to map information spreading processes across connections. Its methods can address some of the questions posed by folklorists before such tools were available. The tracing of story diffusion on a large scale was a popular subject for study in the early and mid-twentieth century. Folklorists explicitly tried to bring a level of objective rigor to the study of stories, resulting in a methodology known as historic-geographic (Goldberg, 1984). Historic-geographic studies attempt to uncover the connections between communities by tracing the diffusion of specific tale types. Variation between stories of the same type is used as a proxy for the story's transmission across space and time. This method is applied to stories which move through oral transmission, passed on face to face as one storyteller teaches it to another. More similar versions of the same story are assumed to be more closely related to each other, and have fewer transmission links in between. Folklorists seek to uncover the context for the changes that happen, and tie them to concrete historical and cultural factors that affect how the story is told over time.

An example of the historic-geographic method is Stith Thompson's seminal 1946 analysis of *The Star Husband Tale*. The work is an assessment of a traditional Native American prose narrative, recorded in many cultures across North America. As the study shows, the plot varies widely, and the best way to understand the story is to hear it performed or read a full transcript. However, a brief summary will provide context. The plot often centers on two women who wish that they could be wed to two stars in the sky. Overnight, they find themselves transported to the world of the sky, where the stars are revealed to be men to whom the women are wed. They are forbidden to leave, but eventually dig a hole in the sky and find their way back to their first home (Thompson, 1946).

Thompson assembled every version of the story available to him and recognizable as sharing important plot elements and motifs, numbering and examining the relationships between them. He convincingly theorized that changes in the story spread from the center to the peripheries of North America, and identified regional variations on the basic plot.

However, many specifics of the story's history remain undetermined. This project seeks to supplement Thompson's manual approach with a computational network assessment of *The Star Husband Tale*. The goal is both to supplement and specify Thompson's results, as well as fine-tune existing network tools to better apply to story datasets. In this project, I have used Thompson's original structural comparison data to create a network of story variants. Links connect highly similar story variants. I have used centrality measures to infer properties about the nodes. The most central nodes correspond to Thompson's "archetype" story, the most common assemblage of traits, which is assumed to be the oldest form of the tale type. Properties of the nodes in the network correspond to properties of the stories and also context of the specific community from which that story originates. I also utilize community detection methods to identify distinctive local variants, and compare my findings with Thompson's manual categorization of the tales. Knowing more about the transmission of these stories and their changes helps folklorists know where to dig deeper into the historical and cultural record. The ultimate goal is to use network analysis to better connect the formal elements of story to cultural transformation and historical social connections. I propose that these methods could be applied in the future to perform similar analysis on larger corpuses which have not been the subject of previous study.

Folklore and Networks

Much of the work in the historic-geographic tradition was inspired by the wide spread of traditional folktales. The same story could be found in a recognizable form across continents in distant cultures, and this offered a way to trace how those stories travelled. By breaking down the story into plot points or unusual "motifs" scholars attempted to trace how the story was passed from one community to another. The assumption is that, like linguistic mutations, changes build up over retelling, so stories with more similar plots will be more closely related. The diffusion across space and time is encoded in the text of the story (Noyes, 2010). The method was initially developed by Julius Krohn, a Finnish scholar, who used this strategy to recreate the Finnish epic the Kalevala from fragments. His son Kaarle Krohn extended the idea from verse to folktales, which required breaking down the folktales into "motifs" or elements of change which could be traced. (Because of the Krohns, the historic-geographic is also known as the "Finnish method") (1971).

Thompson was intimately familiar with the spread of stories, having compiled and revised the Arne-Thompson Tale Type Index (later the Arne-Thompson-Uther Index), a compendium of folktales and motifs begun by Ante Aarne, another Finnish scholar of the method. Most of the stories in the ATU are of European or Indo-European origin. Many historical-geographic studies use the Index as a starting point, and so the story under examination has already been tied into a network of comparisons and motifs. As a North American tale, the motif codes developed for the Star Husband Tale are separate from motifs in the Tale Type Index. Initial work by Gladys Reichard established the basic outline and variation within the story, which Thompson refined and elaborated for his study.

George Rich has leveled criticism at Thompson's choice of motifs, but folklorist Alan Dundes and others have praised Thompson's "careful" parsing of the stories he collected (Young, 1970, Rich, 1971). In this project I take Thompson's motifs directly and uncritically, assuming his review of the texts to be accurate and his division of motifs to be useful. However, the network created from his coding can be used to more accurately evaluate Thompson's choices. As I'll discuss later, in future study I hope to use these methods to quantitatively assess some of the assumptions made in the initial coding and data collection.

The main criticism leveled towards the historical-geographic method is that its detailed histories of tale types fail to inform us on the meaning and function of the stories (Goldberg, 1948). Several scholars have revisited Thompson's study over the years, most seeking to address this concern by interpreting the symbolism of the motifs and plots in the story (Swanson, 1976, Young, 1970). These studies mainly employ psychological universals, working from the text of the story outside of its cultural context. Incorporating more recent research and ethnography would be a more productive avenue towards understanding what this story meant to those who told it. The anthropological work of moving towards meaning is beyond the scope of this paper, but renewed interest and information about the story could revitalize interest in future research.

In my initial exploration, I have applied network methods which have a history within network science as key measures of processes and structure. The centrality measures used here are well-documented as measures of node importance and influence within the network (Rodrigues, 2019). For questions of clustering and community detection, I have also opted for simple and firmly established approaches, which have proved effective in small networks with distinct structures (Fortunato, 2010). Network measures have previously been applied to folklore studies, in limited ways. In 1979 Gary Alan Fine used a small social network within a school to augment his study of folklore in that setting. In that case, he was able to use ethnographic study to map the underlying social network, and trace the movement of stories and rumors through this network. A more recent study by Julien D'Huy takes a somewhat similar approach to the one proposed here. D'Huy examined centrality measures (degree, betweenness, and eigenvector centrality) in a network of Tale Types as catalogued in the ATU (2019). Pádraig Mac Carron and Ralph Kenna examined the networks within stories in order to compare story structure (2012). Such approaches retain the rigour of the original historical-geographic *Methodology*, but add nuance by using more advanced computation. As Dundes writes in his later introduction to "The Star-Husband Tale" analysis:

> if a folklorist is trying to compare as many as a thousand versions of a tale, it is almost impossible to do so by reading the full narrative accounts and keeping them all in mind. By comparing the trait sequences, one can much more readily note similarities and differences. No doubt some enterprising folklorist will one day use an electronic computer to help him separate groups of similar tales from an unwieldy corpus of texts. (1965, p.415)

Scientists across disciplines have long since developed the tools to computationally perform such "distant reading" of folklore texts. Considering the importance of this study, the robustness of the dataset, and the number of reinterpretations, it is past time to adapt computational network tools to examine the way motifs move across the network of tales.

Materials and Method

The network in this project is constructed using the coding schemes offered by Thompson in his original analysis of the "Star Husband Tale." Pairwise similarity for each pair of stories was calculated from these codes and used to construct the links of the network. In the 1956 paper, Thompson assembled 86 variants of the Star Husband Tale, including full transcript or text and collection metadata. He manually established a set of 14 motif traits which he felt captured the significant similarities and differences between variants. From the full text of each variant, he assigned a value for each of the traits using a letter (to signify the trait) and a number (to signify the value for that trait.) Thus, he created an "archetype form," supposedly an older or more basic version of the story, by combining the most common value for each trait. That story follows the coding scheme: A2, Bl, Cl, D2, E3, F4, GO, HI, I1, JO, K3, Ll and corresponds with the plot summary provided in the introduction to this paper (notice this does not include every trait).

Certain features of Thompson's codes needed to be modified in order to calculate pairwise distances. Some of the trait values themselves had subsets (e.g. K3a descending from the sky on a skin rope and K3b on a sinew rope) which necessitated the addition of more traits in the network code. Any such "subtraits" are titled according (e.g. K3) and given half the weight of the main traits in calculating distances. Additionally, some story variants were assigned more than one feature (e.g. contained both F5 and F10, as the husbands were described as hunters as well as having different colored blankets). This necessitated the addition of more values to certain traits (full character states for each trait, along with Thompson's codes, my corresponding codes, and trait distance matrices for all story variants can be found in the appendix of this paper). Traits included in the coding for this project are recorded in Table 1.

Table 1: Traits included in distance calculation for Star Husband variants

A: Number of Women
B: Introductory Action
C: Circumstances of Introductory Action
C1: sleeping out
C2: performing task
D: Method of Ascent
E: Identity of Husband

F: Distinctive Qualities of Husband
G: Birth of Son
H: Taboo Broken in Upper World
H1: Type of digging/disturbing ground
I: discovery of skyhole
J: Assistance in Descent
J1: type of spider
J6: type of bird
K: means of descent
K3: type of rope
K7: type of descent taboo
L: results of descent
M1: Heavenly Body explanatory elements
M3: Plant and Animal explanatory elements
M: Other explanatory elements
N: Sequel
C2: performing task

From that new set of values, distance matrices were created that assigned the distance between values of each treat. For example, for trait E, the values associated with celestial husbands, such as the sun, moon, and stars, were marked as closer to each other than to other values such as man, or porcupine. Trait values that were composed of two other trait values (such as the example with F5 and F10 above) were assigned a smaller distance to each of their constituent values than to other values.

Next, pairwise distances were calculated between each combination of the 86 variants, using code developed by Elizabeth Sibert et al. for the 2018 Ichtyoliths project. This process involved reconfiguring the distance matrices to fractional values, then adding the distances between each pair and dividing by the number of traits compared for each pair. Because some variants did not include certain traits, values of 0 indicated that that trait would not be included in the distance calculation.

Similarity measures range from 0 (completely dissimilar) to 1 (identical motifs). Once a full distance matrix was produced for the 86 variants, this matrix was used to construct the network, using python's Networkx package. Trait values and metadata were assigned as node attributes, and links were created using the distance matrix, with a threshold value of 0.8. Centralities and clustering were calculated using Gephi's built-in degree, PageRank, betweenness, and modularity functions.

Results

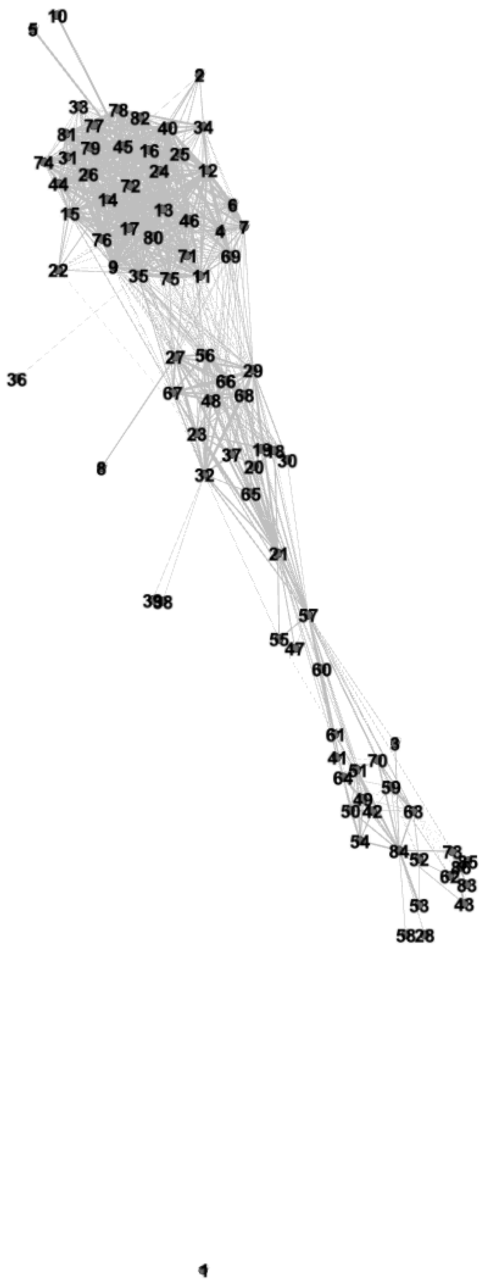

Figure 1: Network of The Star Husband Tale. Node labels correspond to variant numbering in Thompson, 1956.

In the constructed network, all nodes are connected except for story variant 1. This agrees with Thompson's conclusion that although this story shares some motifs with the others, it "probably doesn't belong to the star husband cycle (1946, p. 420).

Within the rest of the network Thompson identified the "archetype" version of the story by taking the most common form of each trait. He then identifies several variants which fully match this set of most common traits. For this network, centrality measures can be employed to identify which versions of the story are more "archetypical." Nodes with the highest degree are highly similar to many variants within the network. This provides a measure similar to Thompson's archetype, in that stories with many common traits will be more similar to more stories, thus more connected. However, using the network to calculate the typical version takes into account the combination of traits, and the relationship between whole variants.

Table 2 shows the variants with highest degree. Many of the stories with higher degree follow Thompson's archetype, but there are interesting exceptions. One of the two nodes with highest degree, variant 9 (Chilcotin 1) is not one that Thompson names as fitting with his

This is likely because he considered this variant to be fragmentary, as he wrote in its annotations, although it does fit with his archetypal trait characteristics. Variant 13 has the second highest degree ranking, and also is not included in Thompson's archetypes. The one feature which makes it different is trait N, the ending of the story. In this case, it follows the "origin myth sequel" which Thompson considers to be an "add on" to the story rather than essential to its base. Notably, this is one of the characteristics which Rich found to be incorrectly accounted for in Thompson's analysis. He felt that the origin myth was a more essential part of the story than did Thompson. Interestingly, variant 35, which Thompson includes as one that follows his archetype, has a different trait A, as it begins with 2 women but one drops out of the story. By examining the traits and their relation to this centrality measure, it seems as though Thompson is putting more emphasis on traits M and N in his analysis, rather than weighting all traits equally as they are in this preliminary network.

*Table 2: Star Husband Variants with highest degree centrality. * marks variants identified by Thompson to be "archetypal"*

ID	Title	Area	Thompson Type	Degree	PageRank	Betweenness
9	Chilcotin 1	North Pacific	0	44	0.01420607394	81.24060633
35	Kutenai*	Plateau	1	44	0.01444922146	157.6459702
13	Quileute 1	North Pacific	5	43	0.01380680751	46.08259355
17	Chehalis 2*	North Pacific	1	43	0.01380680751	46.08259355
76	Koasati	Southeast	1	43	0.01380680751	46.08259355
80	Ojibwa 4	Woodland	3	43	0.01380680751	46.08259355
46	Assiniboine	Plains	3	38	0.01245915766	358.2207526
16	Chehalis 1	North Pacific	0	37	0.01180978359	24.4312319
24	Coos 1*	North Pacific	0	37	0.01180978359	24.4312319
25	Coos 2*	North Pacific	0	37	0.01180978359	24.4312319
14	Quileute 2	North Pacific	0	36	0.01153275142	17.68186745
40	Gros Ventre 1	Plains	0	36	0.0114836835	13.43989264

45	Cree 3*	Plains	1	36	0.01198005761	169.0953818
72	Wichita 2	Plains	0	36	0.01150596322	13.66509521
11	Songish*	North Pacific	1	33	0.01104484516	64.29634891
27	Maidu	California	1	33	0.01221680322	229.4423629

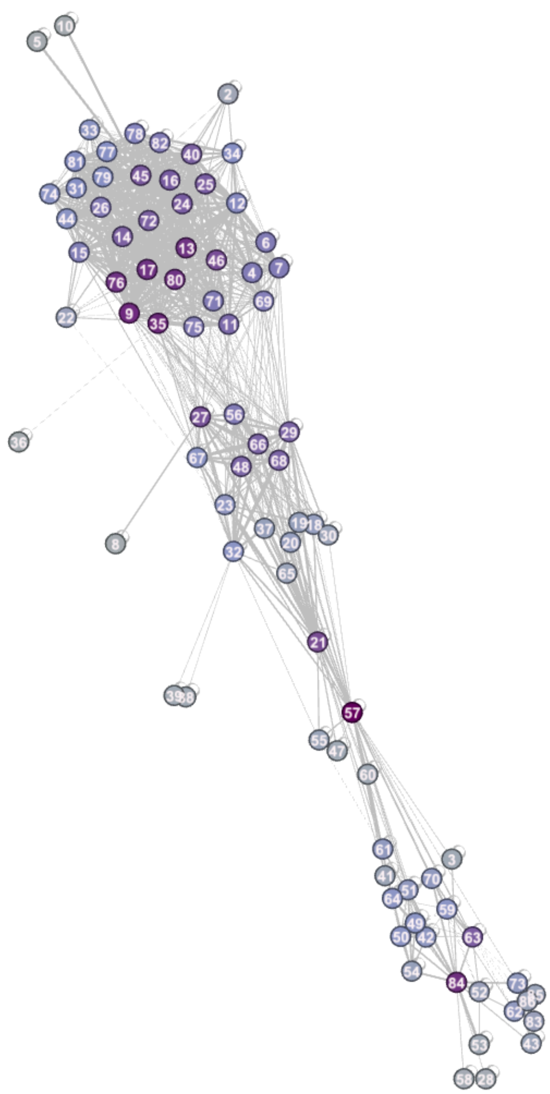

Figure 2: PageRank centrality in the Star Husband Network. Darker colors correspond to higher PageRank centrality

For comparison, I have also calculated the PageRank centrality of the nodes. These results are displayed in Table 3. PageRank is an extension of the simpler degree measure. An important aspect of this measure is that by incorporating random walker calculations, PageRank takes into account the degree values of the connections. Thus, nodes connected to more central nodes are given an increased PageRank measure themselves.

For the most part, the same set of nodes are highlighted by degree and PageRank. Notably, the PageRank measure highlights variant 84 (MicMac 3) which is in a distinctly different part of the network than the other most central nodes. This offers a potential secondary “archetype,” a basic form that represents another point in the transformation of this story, or perhaps a regional variant. Computational methods allow us to find these "typical" forms for subsets of the network, in a way that would not be possible to calculate with Thompson's original manual measures of "common traits."

*Table 3: Star Husband Variants with highest PageRank centrality. * marks variants identified by Thompson to be "archetypal"*

ID	Title	Area	Thompson Type	Degree	PageRank	Betweenness
57	Dakota 2	Plains	2	32	0.01673978942	845.1950228
35	Kutenai*	Plateau	1	44	0.01444922146	157.6459702
9	Chilcotin 1	North Pacific	0	44	0.01420607394	81.24060633
84	Micmac 3*	Woodland	1	18	0.0139908311	275.8644954
76	Koasati*	Southeast	1	43	0.01380680751	46.08259355
13	Quileute 1	North Pacific	5	43	0.01380680751	46.08259355
17	Chehalis 2*	North Pacific	1	43	0.01380680751	46.08259355
80	Ojibwa 4	Woodland	3	43	0.01380680751	46.08259355
21	Puyallup 1	North Pacific	4	26	0.01261199413	693.0389831
46	Assiniboine	Plains	3	38	0.01245915766	358.2207526
27	Maidu	California	1	33	0.01221680322	229.4423629
45	Cree 3*	Plains	1	36	0.01198005761	169.0953818
16	Chehalis 1	North Pacific	0	37	0.01180978359	24.4312319
24	Coos 1*	North Pacific	0	37	0.01180978359	24.4312319
25	Coos 2*	North Pacific	0	37	0.01180978359	24.4312319

The third centrality measure I explore is Betweenness. Betweenness measures a different kind of centrality, related not to influence of the node, but to its importance in establishing paths across the network. Nodes with high betweenness are part of more shortest paths between nodes in the network. Betweenness has been used in the past as part of community detection, because high betweenness.

In this analysis, betweenness helps identify transitional stories, the bridges between different sets of plot features that represent story subtypes. These stories potentially correspond with paths of diffusion or origination of motifs, marking important moments of change in the history of the story.

*Table 4: Star Husband Variants with highest Betweenness centrality. * marks variants identified by Thompson to be "archetypal"*

ID	Title	Area	Thompson Type	Degree	PageRank	Betweenness
57	Dakota 2	Plains	2	32	0.01673978942	845.1950228
21	Puyallup 1	North Pacific	4	26	0.01261199413	693.0389831
46	Assiniboine	Plains	3	38	0.01245915766	358.2207526
84	Micmac 3*	Woodland	1	18	0.0139908311	275.8644954
63	Arapaho 6	Plains	2	15	0.01174846378	270.256785
27	Maidu	California	1	33	0.01221680322	229.4423629
32	Shoshone 2*	Plateau	1	20	0.008843011071	216.2538313
56	Dakota 1	Plains	2	28	0.01031129521	186.4352936
45	Cree 3*	Plains	1	36	0.01198005761	169.0953818
35	Kutenai*	Plateau	1	44	0.01444922146	157.6459702
73	Seama	Plains	0	8	0.007505688467	118.5205275
48	Arikara 2	Plains	2	30	0.011276264	116.3602086
66	Pawnee 1	Plains	2	30	0.011276264	116.3602086
68	Pawnee 3	Plains	2	30	0.011276264	116.3602086
29	Washo 1	California	1	30	0.01128145152	114.6957198

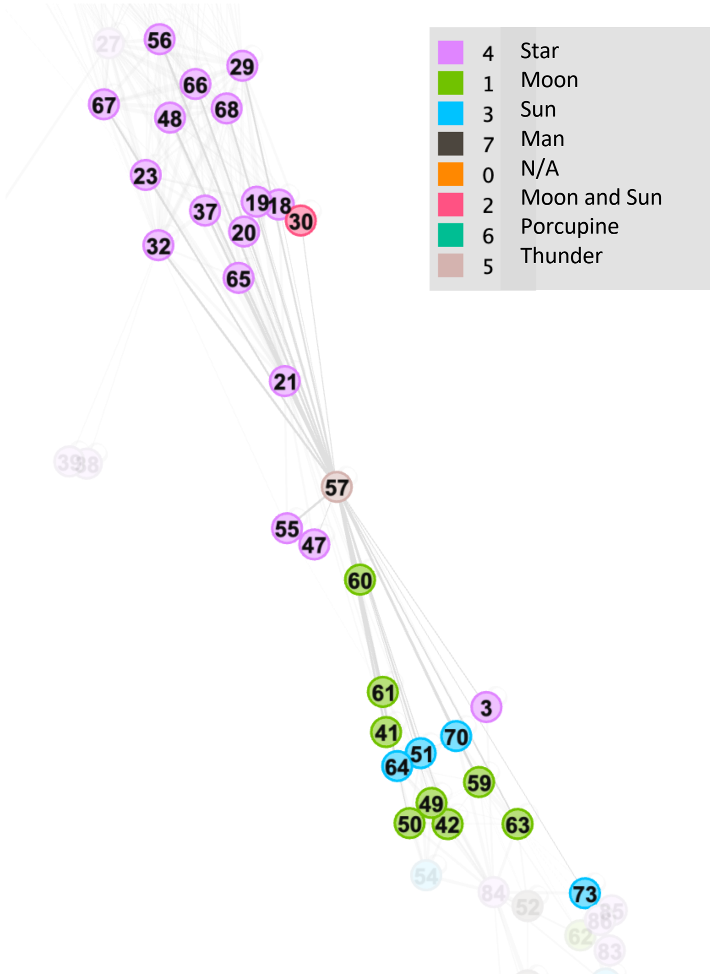

Figure 3: Story Variant 57 (Dakota 2) and its immediate neighbors in the Star Husband Network. Colors correspond to values for Trait E: Identity of Husband

Variant 57, the second Dakota story collected by Thompson, appears at the top in both Betweenness and PageRank. In the network, this story operates as a bridge between two distinct regions of similar variants (These roughly correspond with the basic story and the "porcupine redaction," discussed in more detail below). Its high centrality indicates similarity with stories on both sides, but it also has some more rare trait values, particularly for traits (such as E, in Fig. 3) which are correlated with the groups it bridges. Indeed, the points with the highest betweenness: 57, 21, 46, all have overall very typical and complete plots with a few unusual traits. They also each correspond with a different "Type" identified by Thompson. The unique traits of these nodes call for further quantitative and anthropological study. Looking at these points may help to flesh out the underlying social network for which the story network is a proxy.

This applies also to points with the lowest centrality, such as 36, 8, and 5. Perhaps there are important "missing links" in the network, or some reason these are different from most collected variants.

Through his work with the stories, Thompson identified groups with distinguishably different plots. He identified six groupings of stories, the first three of which he deemed most significant. Thompson's Type 1 is the "archetype" discussed above, and similar variants. Type 2 is the “porcupine redaction,” a series of variants in which, rather than wishing to be wed to stars, the protagonist(s) follow a porcupine up a tree into the sky world. The porcupine then transforms into the celestial husband. Type 3 is categorized based on a distinctive ending in which, after the protagonist(s) have returned from the sky, they are trapped in a tree and pursued by animal tricksters, such as the wolverine.

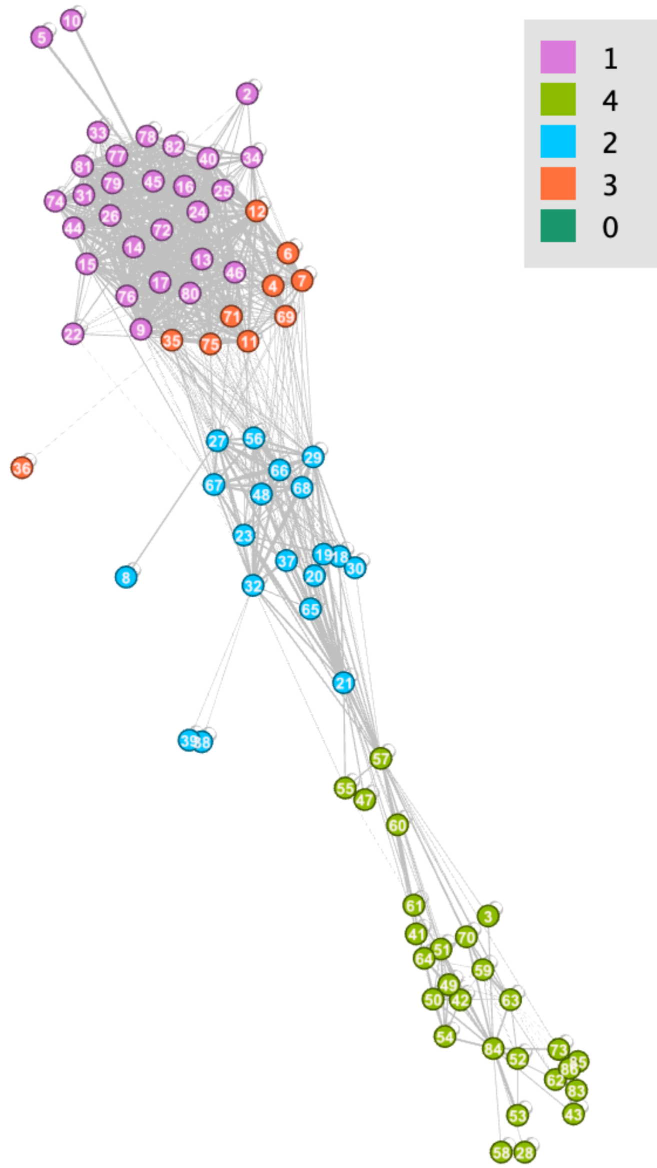

Figure 4: Community Structure in the Star Husband Network. Communities identified using Louvain method with modularity resolution .9

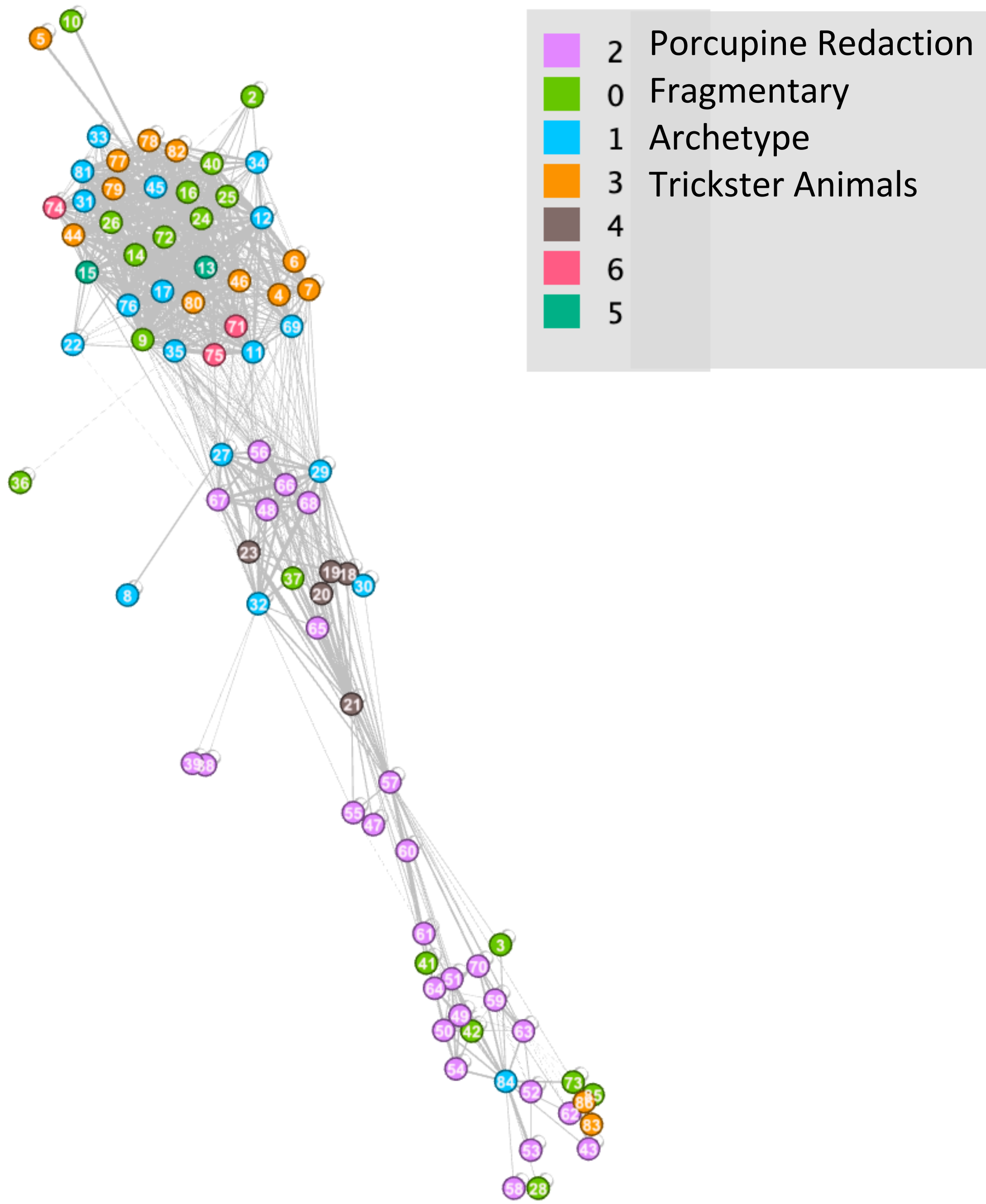

Figure 5: Thompson's Subtypes of the Star Husband Tale

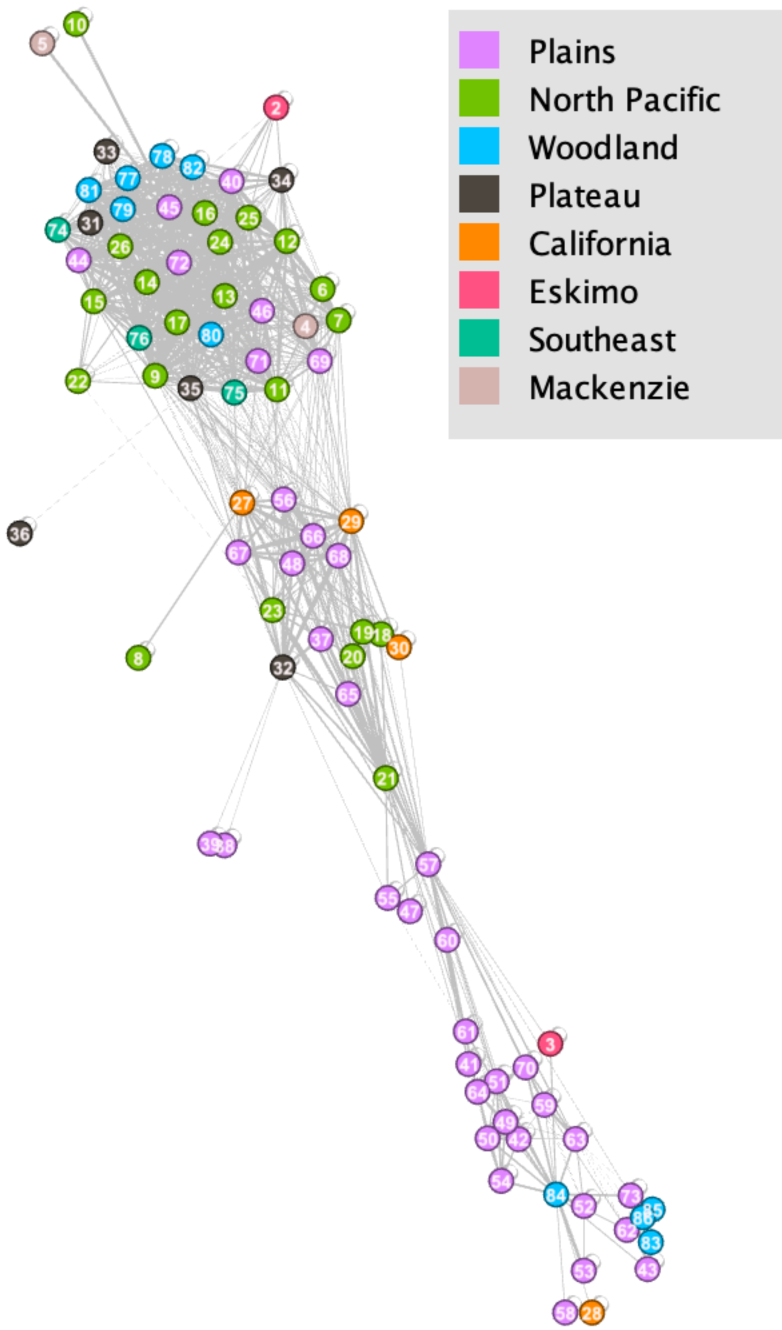

Figure 6: Geographic Areas of Star Husband Variants

The porcupine redaction does seem to substantially differentiate in the network, demonstrating that these stories represent a clear subtype based on Thompson's plot motifs. Additionally, Thompson's type 3, the trickster animals, corresponds with modularity class 3.

Modularity Class 2 offers a particularly interesting avenue for further exploration, as it does not correspond clearly to any of Thompson's subtypes. It seems to represent a different subtype local to parts of the Plains and California. Most of the trait values, for B and E in particular, which correspond with the porcupine redaction, and also modularity class 4, also apply to this group. However, Trait G, the binary value for birth of a son, is distinctly associated with modularity classes 1, 2 and 3, but not 4.

The few variants which Thompson labels "origin of the transformer," (Type 4) appear in this middle group. This type records stories in which the woman's son becomes a transformer culture hero. These results again seem to support Rich's theory that the continuing adventures of the son, which Thompson labels a "sequel," are actually a central part of the story, and perhaps should be included in the archetype. However, it may also be that Thompson was drawing on other story features that made it clear that this trait was less important. These results call for a return to the text to assess whether trait G should be down-weighted in future versions of the network.

Discussion

In addition to providing useful visualization, the network can easily process and compare both individual variants and subgroups of variants. The quantitative comparisons provide more nuance than simple categories. This kind of precision in identifying and tracing variation in stories was the original promise of the historic-geographic method. Now researchers have the tools to make good on that promise.

Mapping diffusion of the stories was always an attempt to access the underlying social network across which these stories were transmitted. The goal has always been to have greater insight into how story works in culture. Better calculations and processing of the stories will allow researchers to better evaluate how similar this network is to some “real” social network, which can be proxied through geography, trade routes, or other cultural evidence.

The next step for this network approach is to include geographic data. The distribution map is a well-established tool for wide-scale folklore studies. Often, the primary product of a historical-geographic study was a map of the variants, sorted into regional subgroups. Simply mapping the network over the distribution map would improve the map’s effectiveness, showing strength of those categories and connections, reaching towards that underlying route of motif diffusion. The geographic distances between story variants could be compared to the distances between motif codes in order to reveal where cultural factors impact the evolution of these stories beyond steady minor changes over time and space.

As another approach, the network tool could evaluate the process of motif extraction and compare different possible structural schemes. Using the same setup from the network built here, one could alter the weights assigned to each trait in calculating the distances, as well as the threshold for making connections in the network. By performing a parameter sweep, the network structure could be optimized to match Thompson’s groupings, or the geographical groupings. Once identified, the weights and threshold which produce the best results would reveal many assumptions and implicit choices made by Thompson in assigning his motifs and types.

If these measures can be effectively applied in the well-established and comprehensive case of *The Star Husband Tale*, they could be productively applied to other folklore datasets. Currently, the size of the dataset is limited by the need to manually code the stories, but hopefully future work would be able to establish a method of automated motif extraction, and then these measures would allow for the processing of much larger comparative story data.

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