An Visualized Analysis on Affix Borrowing in Global Languages

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Overview

Affix borrowing is a normal phenomenon between languages. For example, the English affix "-able" is originally borrowed from French, meaning "being able to do" in both languages. The interactions between languages represented by affix borrowing reveal the intrinsic connections of the culture and history. We are going to propose a visualization system that analyzes the affix borrowing phenomenon. Our system will show the distribution and connections of languages.

I. Description of Data Set and Processing

We intend to use the AFBO dataset for the source of visualization. This dataset indicates the recipient-donor relationship between 2 languages as well as the details of borrowed affixes. We may also individually collect other data by researching. Our final data set will include all the information about the languages that is applied in our plan, i.e., **genus, native regions**, and **number of native speakers**, as well as the information about the recipient-donor relationship, i.e., **number of borrowed affixes, reliability of borrowed status/affixhood, and count of each kind of affixes**.

II. Usage Scenarios & Tasks

Alexander is a student of linguistic studies, and he is specifically interested in Wutun, a language spoken mainly in the East part of Qinghai province in China. With his further studies, he found that the Wutun has a lot of similarities with Mandarins and Tibetan, especially, they have shared some affixes. He is curious about the historical development of the Wutun language, and wants to know the detailed information regarding Wutun affixes borrowed from Tibetan or Chinese (Especially from the traditional Chinese).

In that case, Alexander can check into this system which has a relationship connection mark graph showing what languages affected the development of Wutun. He can also identify how strong that particular language affects Wutun through the weight and color of the line stroke in the connection mark. He will also be shown the number of the affixes borrowed from which language and number of related affixes to that language with numbers above the lines. Once he clicks onto the Wutun shown in the graph, he will be shown to the bar graph showing how many afflixes is borrowed from which language both for Wutun as a donor and a receiver in a more intuitive way. He will also be shown a pie chart with more detailed information about the borrowing and borrowed information between two specific selected languages on the type of affixes including number, norminalizer,adjectivizer, etc. He is also able to check the world-wide language map to see where else the language is used by how many people in an intuitive way.

III. Description of Visualization & Sketches

The must-have features in this project are the detailed visualization regarding the languages and the connections. That is, the information about each language depicted by features Number of Native Speakers and Native Regions, as well as the information about each relationship depicted by features like Number of Borrowed Affixes and Count of Each Kind of Affixes.

For all the language features, Number of Native Speakers will be visualized in Fg 1 and 2 by the color saturation of the point. Native Regions will be visualized in Fg 1 graphically, while it can be selected by the user in the selection box. For the relationship features, they will be mainly shown in the Fg 2, 3, 4. Number of Borrowed Affixes will be visualized in Fg 2 and Fg3, while the specific Count of Each Kind of Affixes will be shown in Fg4 via the pie chart.

Fg1 Symbol Map

In this diagram we will visualize the location and number of users of each language in the data set. We will visualize the geometry information of each language by map metaphor (locate each language on the world map).The shape of the objects will be points, and the map is used as reference. We will also visualize the number of users of each language by color saturation of points. The more users a language has, the more saturated the color of the point representing this language will be. Notice that the number of users of each language may vary greatly, therefore we need to pay attention to scale definition.

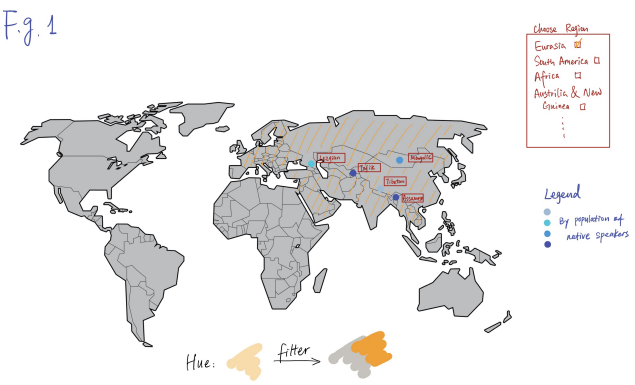

Figure 1: FG1

Fg2 Node-Link Diagram

In this diagram, we will visualize the borrowing/lending relationship between affixes and the number of users in languages. The shape of the objects will be points, and we will visualize the number of users of each language by color saturation of points. We will also visualize the number of affixes lent by each language through the size of points. The more affixes a language lends, the larger the point representing the language will be. We will also visualize the borrowing/lending relationship between affixes in languages by directional links. For each pair of relationships, the language lending the affix will be the beginning of the arrow link, and the language borrowing the affix will be the receiver of the arrow link. The thickness of the link will represent the number of borrowed affixes between the two languages.

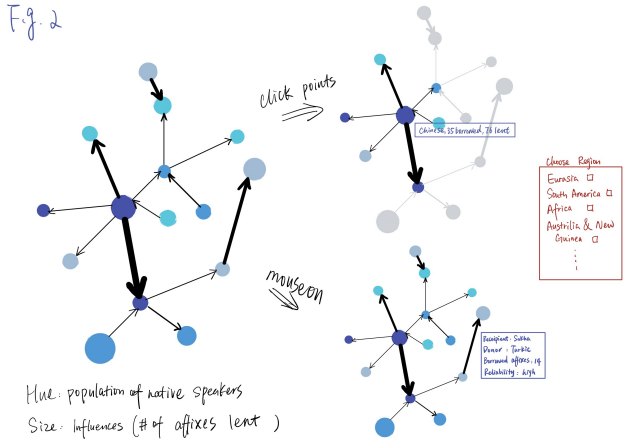

Figure 2: FG2

Fg3 Bar Charts

In this diagram, we will visualize the number of lent/borrowed affixes in each language. If a point is selected (in either the map in Fg.1 or the node-link connection in Fg.2), the information regarding the affixes lent and borrowed by the language will be displayed in a form of the barchart. As shown in the sketch, there will be a bar chart consisting of the languages borrowing affixes from the selected language, as well as the number of affixes borrowed. Also, there will be another bar chart depicting the lending relationship in the same way. The x-axis will be the language name, and the y-axis will be the number of affixes.

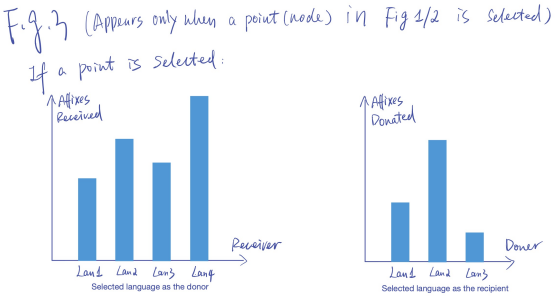

Figure 3: FG3

Fg4 Pie Chart

In this diagram, we will visualize the details of borrowing/lending affixes between two languages. If a connection (edge) is selected in Fg.2, a pie chart will be shown to specifically elaborate the selected borrowing/lending relationship between two languages. That is, zooming into the connection by the type of the affixes inlucing number, norminalizer, adjectivizer, etc.

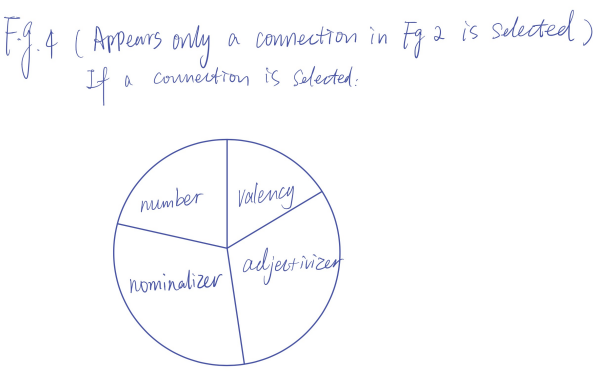

Figure 4: FG4

Visualizations & Interactions & Project Innovation

Colors: The color of the points in Fg.1 and Fg.2 will be saturated blue. Points representing the same language will have the same color saturation The color of the map in Fg.1 will be light orange. They are colorblind safe. Other colors have not been decided yet.

Selection box: When selecting one or more continents, only the languages with geographical locations in the continent(s) will be selected and displayed in each figure. Also in Fg.1, the color of the region representing the continent on the map will be more saturated, while the color of areas outside the selected continent will turn gray, in which way highlighting the selected continent.

Mouse on: When mouse is on the points/connections/bars/pies, tooltips giving the information of this object will appear.

Mouse click: When clicking on a point in Fg.1/Fg.2, only this point, the points with affixes borrowing/lending relationship with this point, and the connections representing those relationships will be displayed (in both figures). Also Fg.3 will appear. When clicking on a connection in Fg.2, Fg.4 will appear.

Innovation: Before that, few people used node-link diagram to make the visualization of language relations, and few people detailed the visualization of affix borrowing relations to specific affixes.

IV. Work Breakdown and Schedule

Preprocess the dataset - 5h, Nov 23, By Yumo
Draw the world map in Fg1 - 3h, Nov 28, By Muqing
Build the original node-link diagram in Fg 2 - 4h, Nov 28, By Siyuan
Build bar chart in Fg 3 - 2h, Nov 28, By Yumo
Design pie chart in Fg 4 - 2h, Nov 28, By Yumo
Add points in Fg1 - 3h, Dec 1, By Muqing
Add node selection and edge selection in Fg2 - 5h, Dec 1, By Siyuan
Connect each figure together by interactions like selection box and mouse click - 6h, Dec 5, Work together
Final report - 5h, Dec 7/Dec 11, Work together
Final presentation - 4h, Dec 7/Dec 11, Work together

References

[1] A world-wide survey of affix borrowing. [Online]. Available: https://afbo.info/download