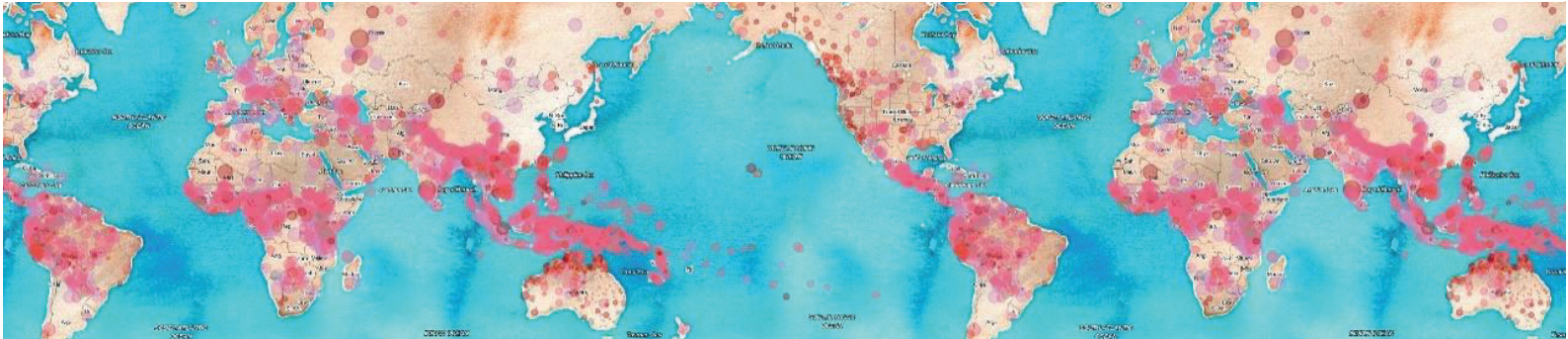


Atlas of the Inuit Language in Canada: Mapping and visualizing language beyond the land

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Atlas of the Inuit Language in Canada: Mapping and visualizing language beyond the land

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Abstract

Language maps typically highlight the relation between language and the land by displaying the geographical distribution of linguistic phenomena. This paper presents three language maps from the cybercartographic *Atlas of the Inuit Language in Canada* that portray relations between language and spatial, but not geographical, information. It is shown that these maps share three spatial properties (Couclelis' 1988 place, way and region) that define them as language maps, expanding the concept of "language map" to visualizations beyond geospatial reality. Two features, physical reality and spatial accuracy, are introduced as a method of ranking the "map-ness" of visual representations.

What is a language map?

A language map situates language in space, connecting linguistic and spatial information (Girnth 2010; Kehrein *et al.* 2010). It typically presents the distribution of languages or linguistic forms across geographical space, highlighting the direct connections between language and the land. We can distinguish two types of language maps based on the linguistic data highlighted (see Figure 1): a language distribution map, which exhibits the number and distribution of language varieties (e.g., languages, language families, and dialects) in a geographical area, and a linguistic structure map, which displays the geospatial distribution of linguistic forms such as sounds, words and phrases (Murasugi in press). Pluridimensional language maps involve additional dimensions such as social structure (e.g., speaker's age, gender or socioeconomic class), communicative settings (style or register) or time (historical change) (Girnth 2010).

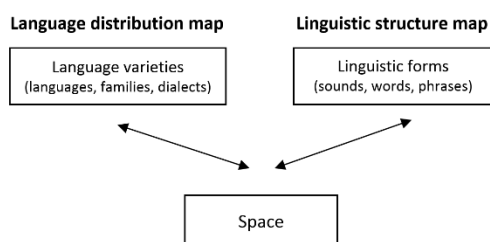


Figure 1: Mapping language and space in a typical language map (Murasugi, in press)

Shown in Figures 2 and 3 are examples of typical language maps. Figure 2 is a language distribution map of the language varieties in Hormozgan province, Iran (Anonby, Taheli-Ardali *et al.* 2015-2018). Figure 3 is a linguistic structure map displaying a sample of languages in the world that have optional (pink dots) or obligatory (red dots) numeral classifiers (Gil 2013).

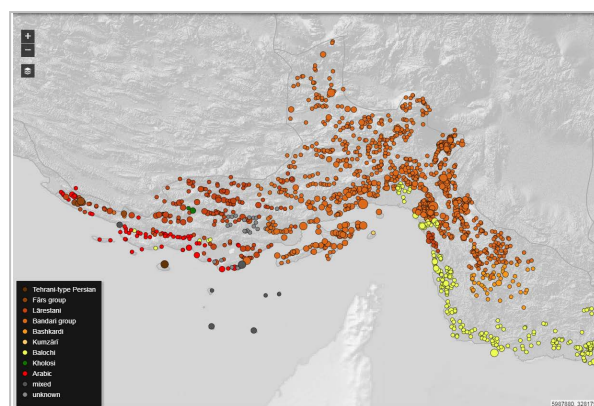


Figure 2: Distribution of language varieties in Hormozgan province, Iran (Anonby, Taheri-Adali *et al.* 2015-2018)

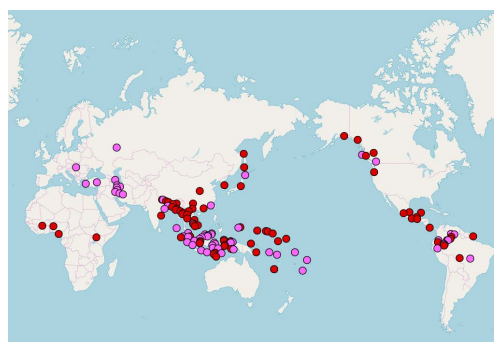


Figure 3: Map of languages in the world with optional (pink dots) or obligatory (red dots) numeral classifiers (Gil 2013)

A linguistic map typically consists of a geospatial base map that conforms to the standard definition of a map as "a graphic model of the geospatial aspects of reality" (Kraak and Ormeling 2003: 45). However, a map can model other spatial realities such as electrical circuits, the human brain, or the genes of a chromosome (Andrews 1996; Kehrein *et al.* 2010). In this paper I explore visualizations of linguistic information on non-geospatial base maps that reflect relations between language and spatial, but not geographical, information. These maps are from the *Atlas of the Inuit Language in Canada*

(Murasugi *et al.* 2016-2018), a cybercartographic atlas currently being developed at the Geomatics and Cartographic Research Centre (GCRC) at Carleton University in Ottawa, Canada.

Atlas of the Inuit Language in Canada

The goal of the *Atlas of the Inuit Language in Canada* is to help protect and strengthen the vitality of Inuit dialects through the documentation of their words (Murasugi in press; Murasugi & Ittusardjuat 2018; Anonby *et al.* this volume). Dialects provide a sense of regional identity, allow effective communication with others who share the dialect, and are a symbolic and practical link to the past (Tulloch 2006). The display of words in different dialects in the Atlas reinforces the uniqueness and importance of each dialect, and raises awareness of the similarities and differences among them by facilitating cross-dialectal comparisons (Murasugi in press).

The central component of the Atlas is a database of written and spoken words in twelve Inuit dialects. Each entry in the database contains an Inuit word, its English equivalent, grammatical category (noun, verb, etc.), semantic category (e.g. Body Parts, Kinship Terms), definition, pronunciation, source, and links to photographs and videos, where available.

The cybercartographic approach is defined by the evolutionary and integrative process of atlas creation, incorporation of qualitative and quantitative data linked by location, interactive and multimedia technology, and the importance of the user in the atlas design process (Taylor 1997, 2005, 2014, in press; Anonby *et al.* this volume). Multiple perspectives on users, data relations, data presentations and media formats are key concepts in cybercartography that are especially suited to language mapping (Murasugi in press). The innovative approach of cybercartography takes the language maps in the *Atlas of the Inuit Language in Canada* beyond language and the land to other relations that are only indirectly mediated by geographical space. The Atlas is built upon the Nunaliit Cybercartographic Atlas Framework, which is designed to connect both new and old data stored in multiple locations (Hayes *et al.* 2014; Hayes *et al.* in press), making it an ideal software platform for collecting information into the database and presenting it in various formats. The online, interactive component of Nunaliit allows the representation of multiple data sets and relations, such as the mapping of language varieties and linguistic forms.

One of the language maps in the Atlas, the Dialect Map (Figure 4), is a typical language distribution map displaying Inuit dialects spoken in different Arctic communities.

The Atlas' focus on word forms and dialects, though, has resulted in three other maps that differ from those in Figures 2-4 in the simultaneous mapping of both Inuit dialects and words on base maps representing different types of space. These language maps are found in three

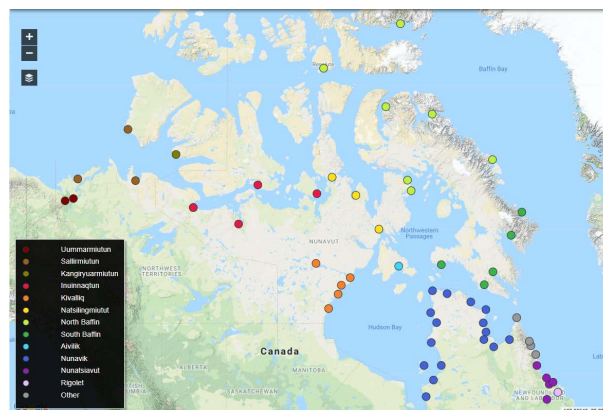


Figure 4: Dialect Map linking dialects

modules: Dialect Chart, Sculptionary, and Kinship Terms (see Murasugi in press for a detailed discussion of these modules).

The first module, the Dialect Chart, focuses on the relation between word forms and their associated dialects in the form of a table. Each row displays the Inuit word belonging to a particular semantic category (e.g., Body Parts, Birds, Animals, Kinship Terms, Weather), with a column for each dialect (see Figure 5). Words from a particular semantic category are grouped together. The dialects are arranged from left to right following the west-to-east direction of the communities with which they are associated.

English	Uummarmiutun	Sallirmiutun	Kangiryuarmiutun	Inuinaqtun	Kivalliq
anus	iliq	iliq	iliq	iliq	iliq
arm	taliq	taliq	taliq	taliq	taliq
armpit	uniq	uniq	uniq	uniq	uniq
back	tunu	quilik	tunu	quilik	
back, lower (waist)	qitiq	qitiq	qitiq	qitiq	
bladder	nakahuk	nakasuk	nakahuk	nakahuk	nakasuk
blood	auk	auk	auk	auk	auk
bone	hauniq	sauniq	hauniq	hauniq	
brain	qaritaq	qaritaq	qaritaq	qaritaq	qaritaq
breast	miluk	miluk	iwangiq	iwangiq	
buttock	iqquk	nuluq	iqquq	nuluq	
buttocks					uppatik
calf	nakahuknaq	nakasungnaq	nakahungnaq	nakahungnaq	
cheek	uluuq	uluuq	uluuq	uluuq	
chest	qatigaak	satoqak	hakiak	hatqak	
chin	taviu	tablu	tablu	tablu	tablu
collarbone	qutuk	qutuk	qutuk	qutuk	

Figure 5: Dialect Chart displaying words in different dialects

The second module, the Sculptionary, contains a visualization of the relation between word forms, word meaning and dialects (Figure 6). Words belonging to the semantic category of Body Parts are displayed on a photograph of a sculpture consisting of “hotspots” that are connected to body part words in the database. After selecting a dialect from a menu, the user can hover over a body part hotspot to hear the word pronounced, or click on it to see all the information associated with that word (including its dialect) in a side panel. Figure 6 shows the result of selecting the Inuinaqtun dialect and clicking on the sculpture’s foot. If “All dialects” is selected, then the words from all dialects will appear in the side panel, with links to the individual entries in the database.



Figure 6: Sculpture module. The sculpture of the Inuit hunter is the work of Gjoa Haven artist Nelson Takkiruk (1930-1999)

The newest module, Kinship Terms (still under development), also focuses on the relation between word forms, word meaning and dialects. Inuit terms encompassing siblings, children, grandchildren, parents, grandparents, aunts, uncles, cousins, etc. are being collected and entered into the lexical database. We are currently exploring the optimal visualization for the complex Inuit kinship system. Figure 7 illustrates one section of a potential kinship map.

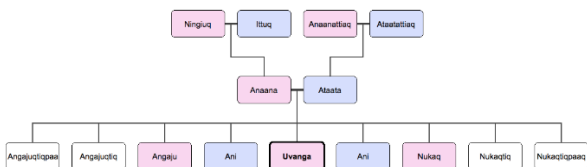


Figure 7: Kinship Terms (North Baffin dialect)

In the centre is *uvanga* (ego), from whose perspective the kinship terms are being mapped. Same-generation members appear at the same horizontal level, represented on a timeline where older members (born first) appear on the left of *uvanga*, and younger ones (born later) appear on the right. Spouses are connected by a different type of horizontal line. Ancestors appear at a higher level than *uvanga*, and descendants, at a lower level. In the pilot map shown in Figure 7, terms for male members appear in blue boxes, female terms appear in pink ones, and gender-neutral terms appear in white boxes. The use of colour to represent gender is easier to process than the circles and triangles used to represent male and female terms in more traditional representations of kinship terms (e.g., Collignon 2006; SIL International n.d.). The blue and pink colours are for illustration purposes only; the final product will likely have different colours for the male and female terms. Eventually it will be possible to display the words for one dialect, or groups of words for multiple dialects, in the kinship boxes.

Spatial organization in language maps

While the four maps in Figures 4-7 are substantially different, they do have one property in common: spatial organization, i.e., the arrangement of objects relative to their position in some form of reality. Spatial organization can be defined in terms of three concepts—

place, way and region—presented in Couclelis (1998) (see Murasugi in press for further discussion). Couclelis discusses the importance of these concepts in information visualization. Information visualization is the spatialization of abstract, non-spatial information (Card *et al.* 1999; Chen 2010), which would include dialects and kinship terms. Couclelis claims that when a map user sees a visualization as a landscape, they will cognitively interact with it as if it were a geographical space. That is, they will recognize that a “place” in a visualization is where you store, find, save, and retrieve particular information, but also where you keep similar things together; a “way” takes you from where you currently are to another place that contains relevant information, but also provides a logical transition between different types of information; and a “region” is where you may first go to find a high density of relevant information, but also where you may expect important connections among documents and their contents to be revealed. While Couclelis (1998) is referring to “information spaces represented as geographical landscapes” (p. 209), her theory applies equally to non-geographical information landscapes, such as those in Figures 5–7.

Table 1 (from Murasugi in press) shows the places, ways and regions in Figures 5-7.

Map	Place	Way	Region
Dialect Chart	Word cell	Adjacency of cells (horizontal or vertical)	Words (rows) and dialects (columns)
Sculpture	Hotspot for body parts	Link between body parts	Areas of the body
Kinship Terms	Kin member	Time lines connecting generations (horizontal and vertical)	Kinship categories

Table 1. Place, way and region in three language maps

Spatial organization is a definitive property of geospatial maps, and a necessary component of any map-like representation (Kehrein *et al.* 2010; Liben 2001). With spatial organization defined as the presence of the features place, way and region, the concept of “map” can be expanded to include symbolic representations of reality based on relations rather than geography (as suggested by Andrews 1996 and Kehrein *et al.* 2010), provided those visualizations include the three crucial features. When such maps are used as the base for language maps, the concept of “language map” can similarly be expanded to include representations of linguistic relations such as those presented in Figures 5–7. Incorporating such representations in the definition of “language map” recognizes that they belong within the

domain of linguistic cartography, subject to the same principles and applications that are relevant to geospatial language mapping. These include map design, map function, data classification and presentation, mapping methods, and user needs (Girnth 2010; Kehrein *et al.* 2010).

In the next section I examine in more detail the spatial organization of the maps in Figures 5-7, and introduce two features that can be used to rank their “map-ness,” i.e., their likelihood of being classified as a “map” (Vasiliev *et al.* 1999).

Degrees of ‘map-ness’

A map can model physical reality, such as the earth’s surface, or represent abstract relations such as kinship terms. Another feature of maps is the degree to which they accurately depict spatial relations such as surface area, distances, or angles and directions (Ormeling 2010).

The maps in Figures 5–7 vary in these features (see Table 2). Assuming that the more features a map has, the more map-like it is, we can rank the maps in Figures 5–7 from most map-like to least map-like in the following way: Sculptorary, Kinship Terms, and Dialect Chart.

Map	Physical reality	Spatial accuracy
Sculptorary	+	+
Kinship Terms	-	+
Dialect Chart	-	-

Table 2. Features for ranking the map-ness of language maps

The sculpture in Figure 6 is a spatially accurate model of a human body, preserving the proportions and form of a physically real human form. Having both features, it is the most map-like of the three. While the subject matter of the Kinship Terms map is abstract, the spatial organization of the kinship boxes accurately represents generational relations: vertical for ancestors and descendants, horizontal for spouses and siblings, and with lines depicting links between kin members. Having one feature, it is less map-like than the Sculptorary map. The Dialect Chart map, like the Kinship Terms map, is not a model of a physical entity (neither dialects nor semantic categories take up physical space). More significantly, though, it does not accurately reflect the abstract spatial relations between semantic categories or between dialects. For example, with all the cells in the chart being the same distance apart, there is no difference between words in one semantic category or words in adjacent categories. Similarly, while the left-to-right ordering of dialects reflects the west-to-east direction of the communities in which they are spoken, the columns are equally spaced, thus treating the dialects homogeneously even though they differ in geographical distances from each other, in addition to other properties such as language group and number of speakers. Thus,

lacking both physical reality and spatial accuracy, it is the least map-like of the three.

Where does the Dialect Map in Figure 4 rank in terms of map-ness? The Dialect Map has the same properties as the Sculptorary: it has places, ways and regions; it models physical reality; and it is spatially accurate. The two maps differ, though, in the subject of their base map. The base map in the Dialect Map is topographic, while in the Sculptorary it is an image of a hunter. A study by Vasiliev *et al.* (1990) investigated defining properties of maps in an experiment where participants rated the map-ness of visual objects on a scale from “definitely maps” to “definitely not maps.” Among other properties, Vasiliev *et al.* (1990: 122) found that images whose features “corresponded well with the actual geographic arrangement of the same features on the earth’s surface” received a high map-ness rating. This property, then, would rate the geographical base map of the Dialect Map as more map-like than the sculpture image, which is consistent with the identification of a prototypical map as one representing geographical space (Downs & Liben 1987; MacEachren 1995; Andrews 1996).

Conclusion

A language map is not limited to displaying the distribution of linguistic phenomena on a geographical map. As shown by the cybercartographic *Atlas of the Inuit Language of Canada*, there are many creative ways to map linguistic information: in a table (Dialect Chart), on a sculpture image (Sculptorary), or in a hierarchical chart (Kinship Terms). What these maps share are the essential spatial features of place, way, and region; what distinguishes them are their physical or abstract subject matter, and their accurate or abstract representation of spatial relations. Given the multiple dimensions of language – from cognitive to social, individual to international, the past to the present – there is great potential for language maps to present visualizations of linguistic information in exciting new directions.

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