Identify Homologous Words

Lydia

Bled 2011

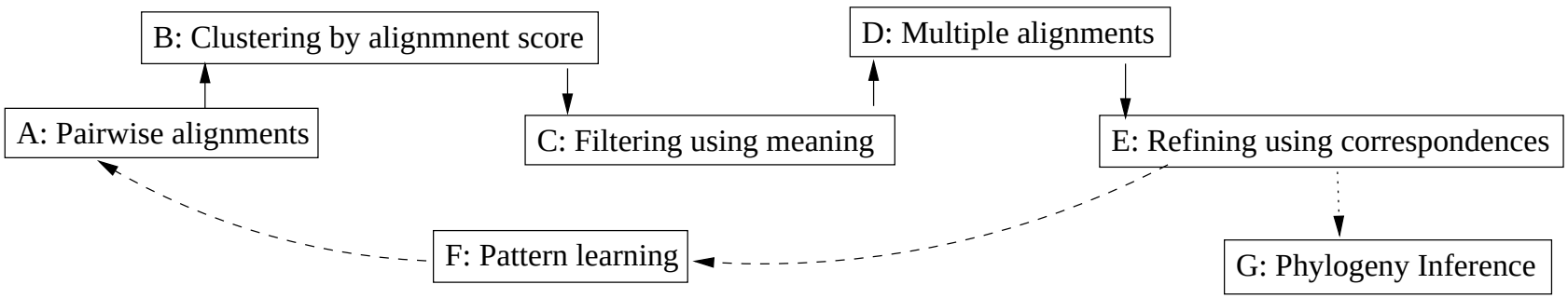
You may remind of ...

... my thesis project.

We show that

- bioinformatics methods works well on linguistics data
- finding homologous words is very similar to finding homologous proteins

Pipeline


B: Clustering by alignmnent score
D: Multiple alignments
A: Pairwise alignments
C: Filtering using meaning
E: Refining using correspondences
F: Pattern learning
G: Phylogeny Inference

Pipeline Input

- list of triples consisting of language, meaning and word
- encoded in utf-8
- words represent pronunciation not spelling
- words consists of at least one character
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The results are convincing but there are some groups of homologous words which seems to be wrong.

That's not right!

Mocovi	blood	l	e	w	o	ʔ
Wichi	blood	w	u	y	i	s
Wichi	vein,artery	w	u	y	i	s
Chorote	blood	w	o	y	i	s
Chorote	blood	y	o	y	i	s
Nivacle	blood	w	o	y	e	y
Wichi	vein,artery	n	o	y	i	h

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Making the threshold for being homologs (cognates) more restrictive destroy the complete set. :(

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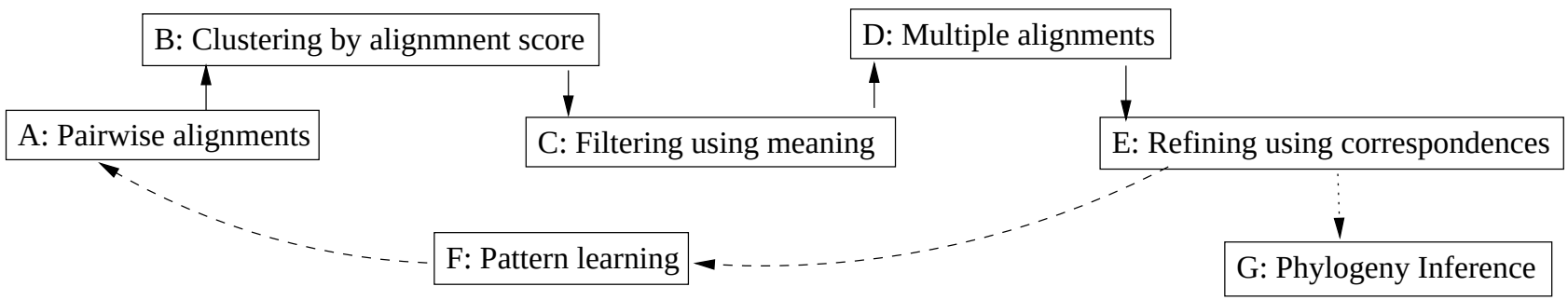
- there must be path between lewo? and wuyis in the graph representing the cognate/homolog relation
- either in step C or in step E the linking words of the path are removed from the cognate set



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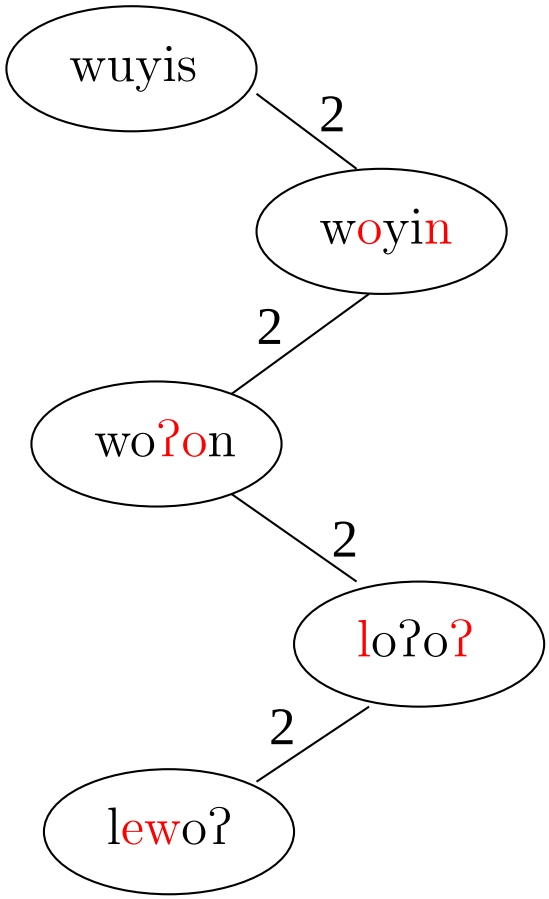

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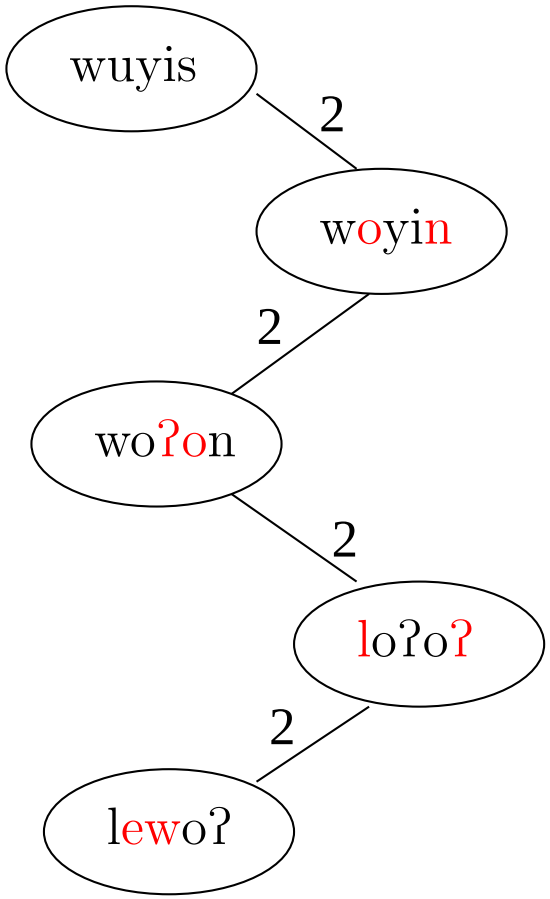

wuyis	blood
woyin	seek, look for
woʔon	marry
loʔoʔ	prostitute
lewoʔ	blood

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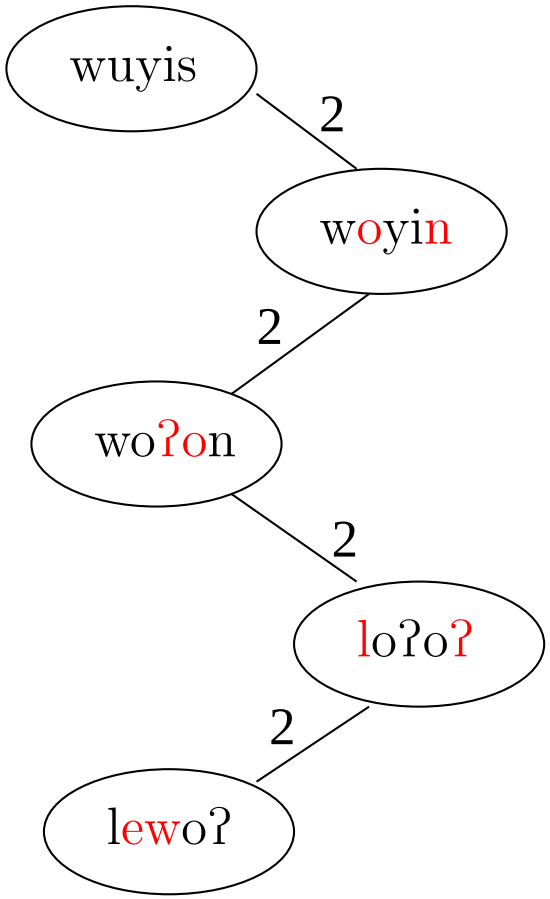

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Solution

We need

a better clustering algorithm. It should ensure that

1. resulting groups are highly connected
2. the cut should removes as few as possible edges

Solution - Spectral Clustering

Steps

1. remove tree-like structures

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4. normalize the algebraic connectivity by the number of nodes ($\bar{a}$)
5. if $\bar{a} < T$ (T - predefined threshold), split graph using $\vec{v}$ and return to Step 1

What about "lewo?"

It works!

1. "lewo?" is removed from the cognate set
2. it is now grouped together with "lawo?" (occurred in several languages, means family)
3. we could make the threshold for being cognate less restrictive such that we could better resolve the relation in the short words

Thanks to

Peter, Michael and you