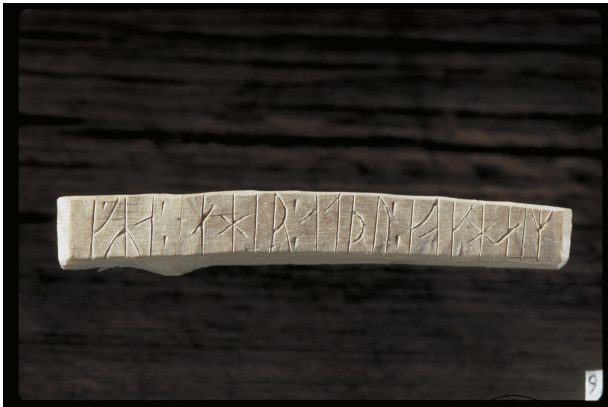
UNIVERSITETET
I OSLO

# Theoretically, It Could Be

## Representing Runic Variation in Relational Databases

Elisabeth Maria Magin
e.m.magin@khm.uio.no
Kulturhistorisk Museum

Marie Skłodowska-Curie Actions



05.03.2025

# Stages of fuþark in Scandinavia

- 1st-2nd century AD: Older Germanic fuþark

## Highly standardised and idealised fuþark examples

ᚠᚢᚦᚨᚱᚲᚷᚹ · ᚺᚾᛁᛃᛇᛈᛉᛊ · ᛏᛒᛖᛗᛚᛜᛞᛟ (24 characters)

# Stages of fuþark in Scandinavia

- 1st-2nd century AD: Older Germanic fuþark
- 7th-8th century AD: Younger fuþark

## Highly standardised and idealised fuþark examples

ᚠᚢᚦᚨᚱᚲᚷᚹ · ᚺᚾᛁᛃᛇᛈᛉᛊ · ᛏᛒᛖᛗᛚᛜᛞᛟ (24 characters)

ᚠᚢᚦᚬᚱᚠ : ᛯᚾᛁᚾᛋ : ᛏᛒᛉᛚᛦ (“long-branch” version, 16 characters)
ᚠᚢᚦᚨᚱᚠ : ᚾᛁᛁᛋ : ᛅᚾᛏᛚᛦ (“short-twig” version, 16 characters)

# Stages of fuþark in Scandinavia

- 1st-2nd century AD: Older Germanic fuþark
- 7th-8th century AD: Younger fuþark
- 9th-11th century AD: Medieval fuþork

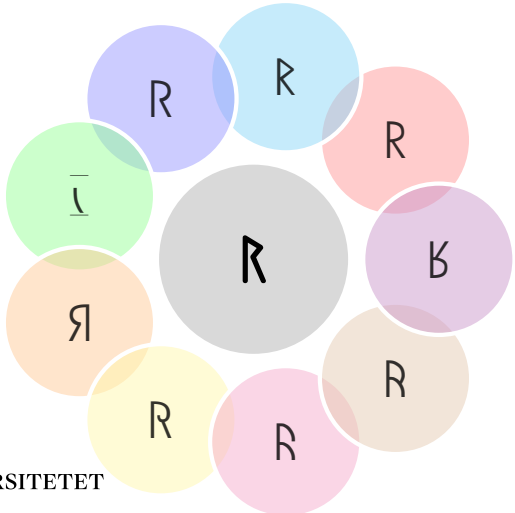
## Highly standardised and idealised fuþark examples

ᚠᚢᚦᚨᚱᚲᚷᚹ • ᚺᚾᛁᛃᛇᛈᛉᛊ • ᛏᛒᛖᛗᛚᛜᛞᛟ (24 characters)

ᚠᚢᚦᚭᚱᚠ : ᛯᚾᛁᚾᛋ : ᛏᛒᛦᛚᛯ (“long-branch” version, 16 characters)
ᚠᚢᚦᚨᚱᚠ : ᚾᛁᛁᚾ : ᛏᚾᛏᛚᛯ (“short-twig” version, 16 characters)

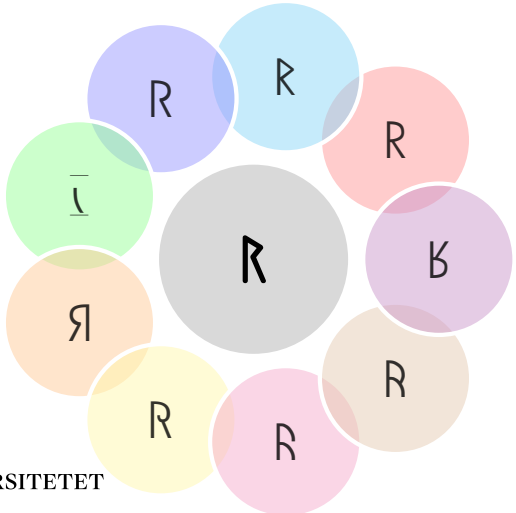
ᚠᚢᚦᚨᚱᚠ : ᚾᛁᛁᚾ : ᛏᛒᛦᛚᛯ ᚾᛯᛋ etc. (16 + x characters)

# Time- and geography-specific variants?



- ᚱ = “ideal”
- ᚱ = “older”
- ᚱ, ᚱ = “Greenlandic”
- ᛦ = staveless
- ᚱ, ᚱ = flipped
- ᚱ = ???

# Time- and geography-specific variants?

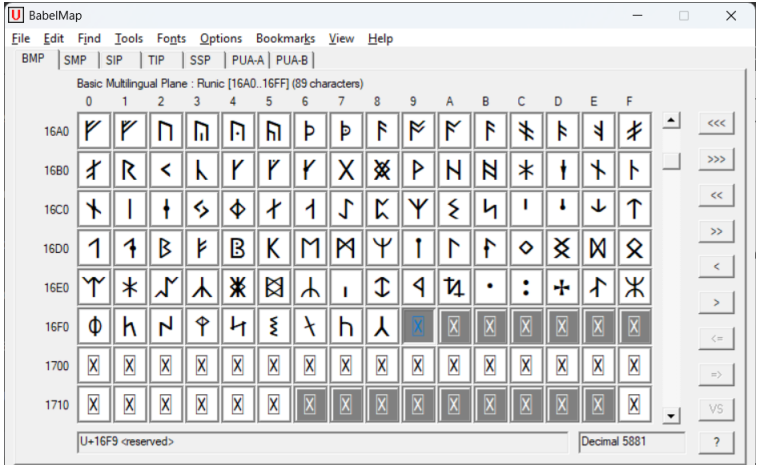


- ᛦ = “ideal”
- ᚱ = “older”
- ᚿ, ᚱ = “Greenlandic”
- ᛦ̄ = staveless
- ᚏ, ᚒ = flipped
- ᚱ = ???

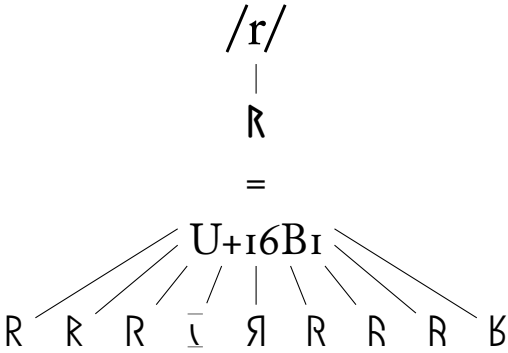
**Unicode block Runic**

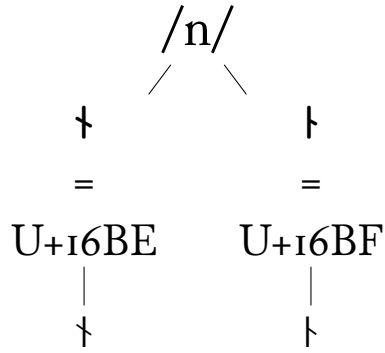
U+16B1 RUNIC LETTER RAIDO RAD REID R

# Unicode block Runic

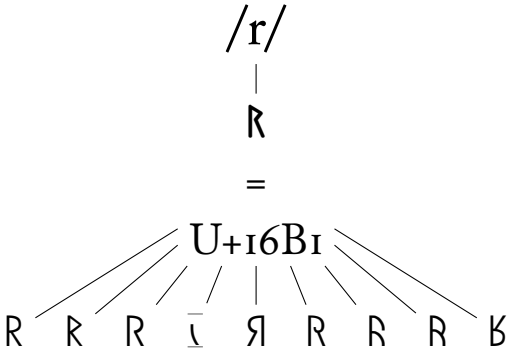


# Unicode Runic: Allograph Inconsistencies

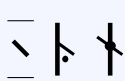


# Unicode Runic: Allograph Inconsistencies



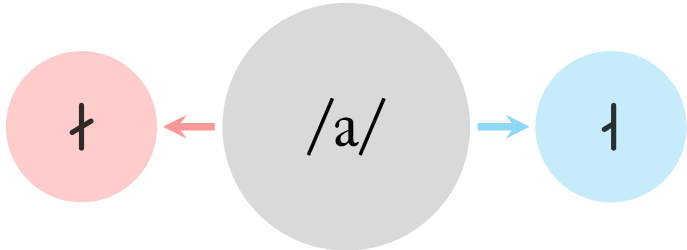

**Problem 1: Leftovers**



**Problem 2: Logic**

ɑ ≠ a ?

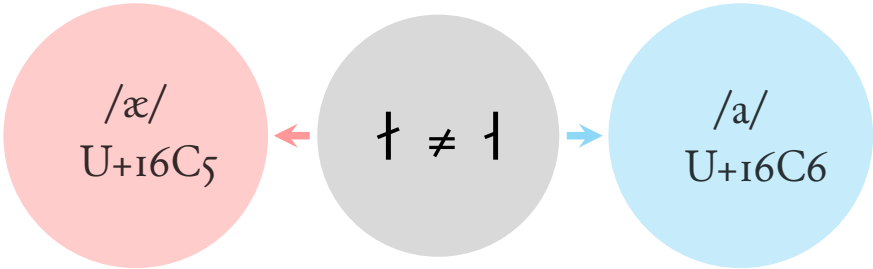
# Unicode Runic: “Homoglyphs”




**Homoglyph**

Homographs, except they used to be allographs once. But at some point someone decided that they could just as well be used for different sounds.

# Unicode Runic: “Homoglyphs”




**Homoglyph**

Homographs, except they used to be allographs once. But at some point someone decided that they could just as well be used for different sounds.

# Levels of Enquiry – Depth of Detail

**Just an r**

ᚱ

- runic orthography is not standardised
- some runes can represent up to six different sound values
- transcription (rune = Roman letter) traditions vary between runologists

**A very special r**

- searching for specific variants relevant to study (temporal/spatial)
- establish distinction between allographs and independent graphemes
- more accurate visual representation

# Unicode-based Medieval Minimal Character Set


- reduce Unicode Runic to minimal character set applying consistent criteria
- code actual runic character/codepoint into separate entity type in relational database

# Relational Database Entity Types: Runic Characters


- can include more than one runic character (bindrune)

- splits visually distinct units up into component parts
- ı bindrune = ı+ı(+ı) digital representations

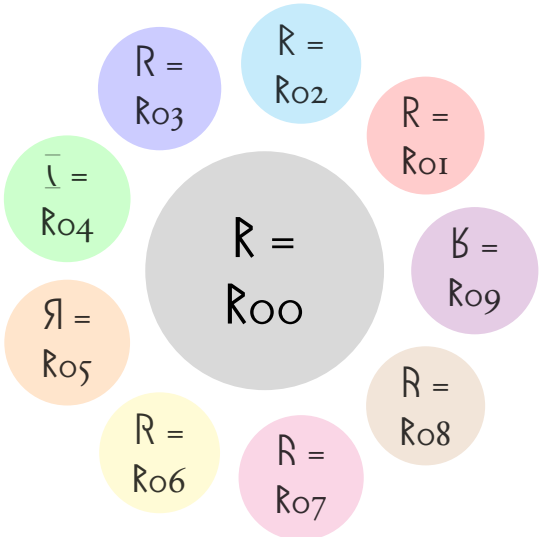
- digital representation linked to codepoint from minimal character set

# Character Data Entry

| counted-CharID | counted-CharRepID | charVar-CharID | counted-CharRepAlt | countedCharRepComment | countedChar-RepSourceID |
|---|---|---|---|---|---|
| FK #1 | PK #7 | ᚢ | 1 | It could be a **u** | C 2024 |
| FK #1 | PK #8 | ᚱ | 2 | It could be a **r** | C 2024 |
| FK #2 | PK #9 | ᚠ | 0 | | C 2024 |
| FK #3 | PK #10 | ᚦ | 0 | | C 2024 |

*FK = foreign key
*PK = primary key

# Storing Visual Traits: Extendable Minimal Character Set



# Character Variant Data Entry

| Visual representations entity type | | | | Rune/codepoint entity type | | |
|---|---|---|---|---|---|---|
| counted-CharRepID | counted-CharRepAlt | count-edChar-RepUncer-tain | charVarCharID | charVarVisualRep | charVarVersionNo | charClassCharID |
| PK #7 | 0 | 0 | FK #50 | ᛘ | 00 | FK #15 |
| PK #8 | 1 | 1 | FK #60 | ᛁ | 00 | FK #9 |
| PK #9 | 2 | 1 | FK #61 | ᛁ | 01 | FK #9 |
| PK #10 | 0 | 0 | FK #70 | ᚴ | 00 | FK #6 |

*PK = primary key
*FK = foreign key

# Recombining Runes

| objectsideid | complete_side |
|---|---|
| 1 | ᛏ/ᚴᚢᛏᚱ |
| 2 | ᚾᚢ/ᚱᚾᛒᚢᚴ/ᚱᛦ |
| 3 | ᛏᚢᚾ-ᚾ/ᛝᚾ |
| 4 | ᚾ-ᚱᚾᛁ |
| 5 | ᛒᚢᚦᚱ |
| 6 | ᛘᛁᛦ |

```
SELECT objectsideid, GROUP_CONCAT(charclassrunes
ORDER BY graphcounter SEPARATOR "") AS complete_side
FROM ( WITH RECURSIVE graphsordered AS (
SELECT objectsideid, countedcharid, followscountedcharid, 1 AS
graphcounter, charclassrunes FROM charclassrunes WHERE
followsCountedCharID IS NULL
UNION ALL
SELECT interim.objectsideid, interim.countedcharid,
interim.followscountedcharid, graphcounter + 1,
interim.charclassrunes
FROM charclassrunes AS interim JOIN graphsordered ON
graphsordered.countedcharid = interim.followsCountedCharID )
SELECT * FROM graphsordered ORDER BY objectsideid,
graphcounter ) AS interim
GROUP BY objectsideid ;
```

# Using Python for Analysing

Kraus, Sven: N-Runes – n-grams for futhork v1.0, https://doi.org/10.5281/zenodo.13880637

**Online experimental dataset**

https://n-runes.streamlit.app/