Flexible Queuing for Data Sonification

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Data sonification

transforms data sets into audio experiences by mapping data variables to auditory variables like pitch, volume, duration, and timing to enhance understanding and data accessibility

Goal

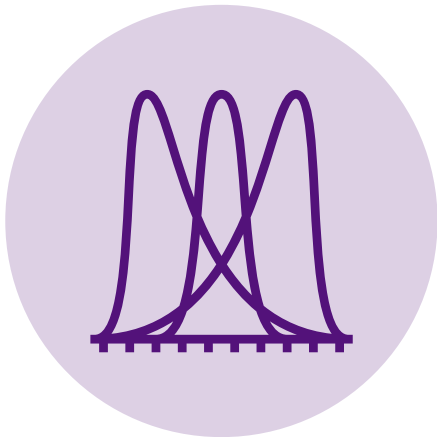**Enabling flexible queue manipulation of sonification to better support data storytelling**

Motivation

Enable flexible ordering for reusable sonifcation designs

Demonstrate practical impact through real world applications

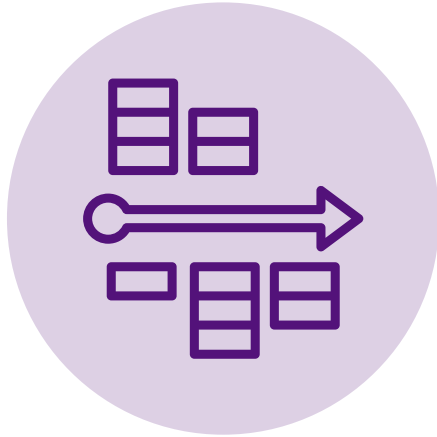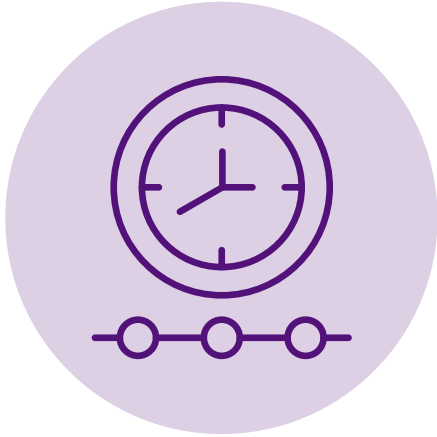Support sonification authoring with an intuitive visual editor
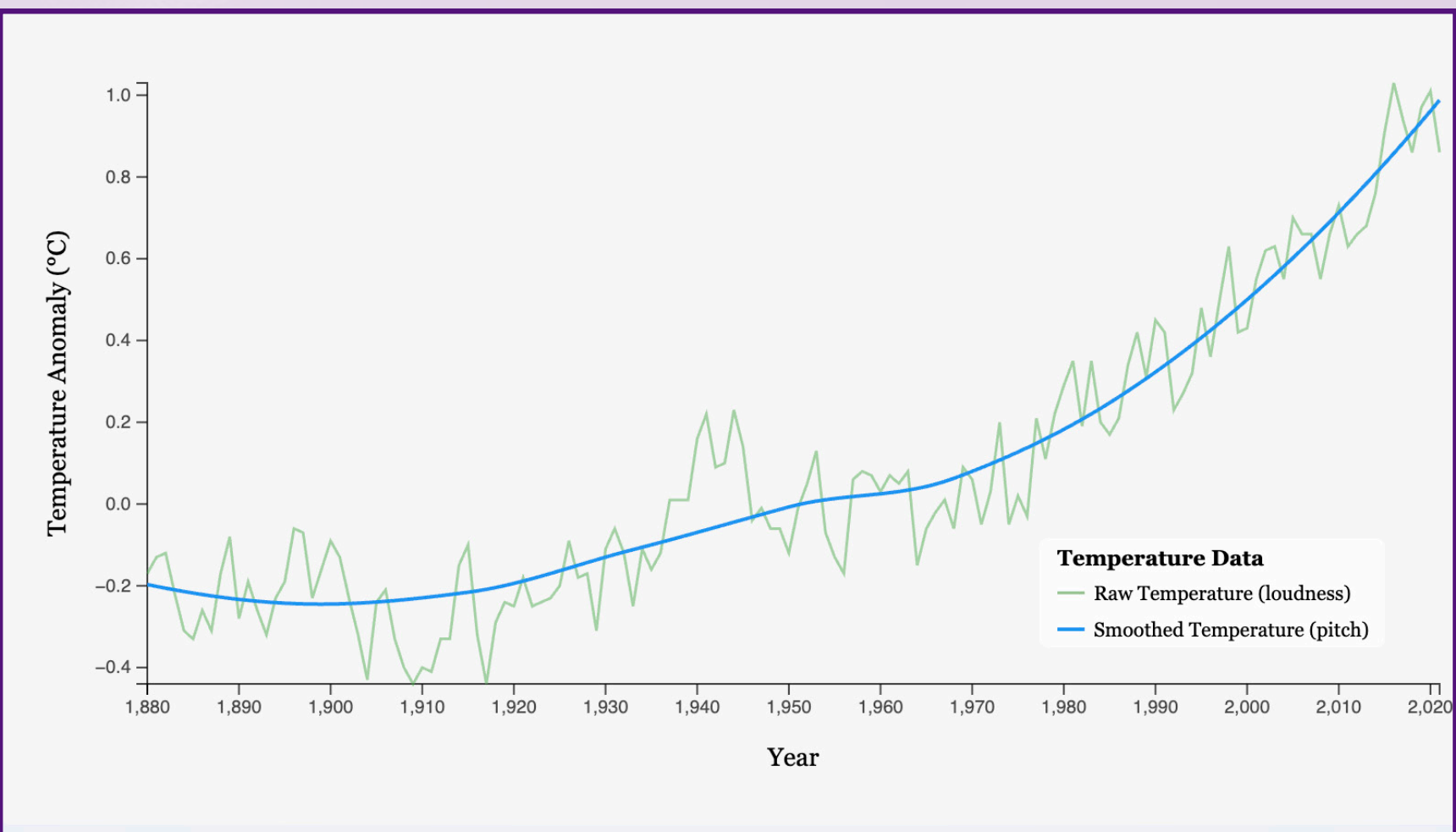
Applications

Accessibility

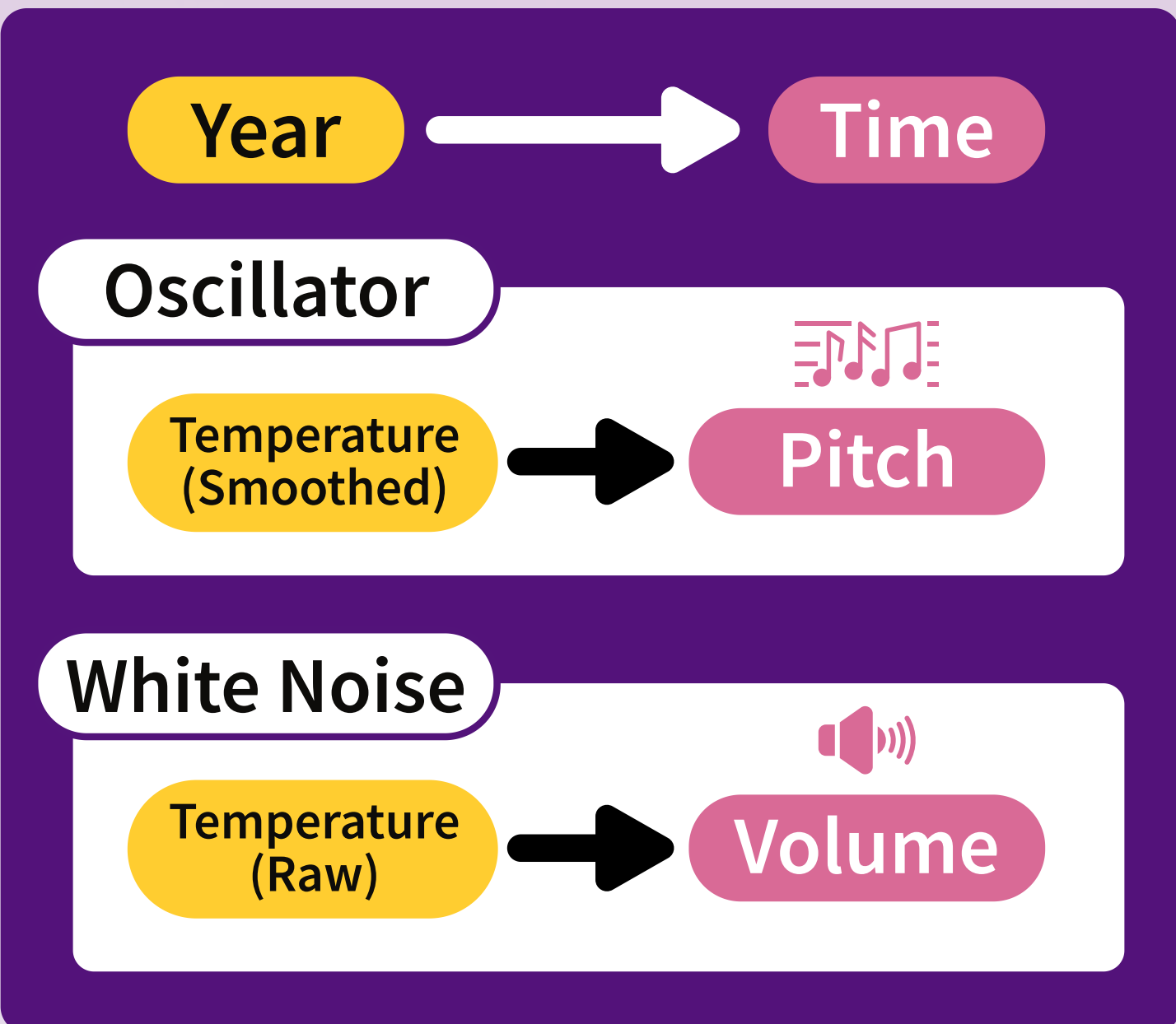Pattern recognition

Immersive data stories

Real-time data monitor

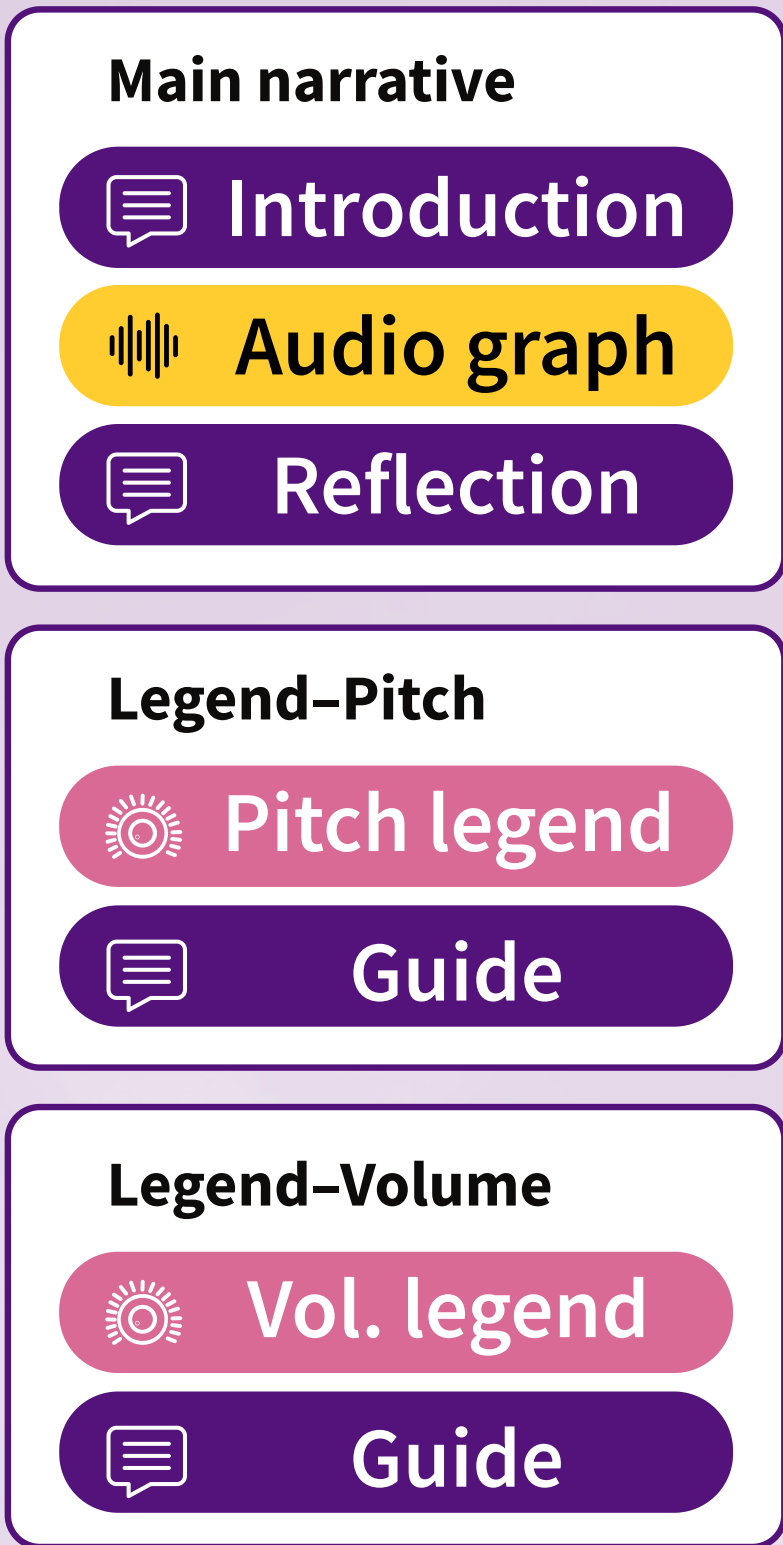## How it works — Climate Change Sonification

Global Warming Data

Sonification Design

Year → **Time**

Oscillator
Temperature (Smoothed) → **Pitch**

White Noise
Temperature (Raw) → **Volume**

The oscillator and white noise are overlaid.

Queues

Main narrative
- Introduction
- Audio graph
- Reflection

"Climate change sonification. Temperature changes from 1880 to 2021 ..."

"What you just heard was ..."

Legend–Pitch
- Pitch legend
- Guide

220 Hz to 1,760 Hz

"The higher the pitch is, the higher the temperature is "

Legend–Volume
- Vol. legend
- Guide

Gain 0 to 0.5

"The louder the noise sounds the higher the temperature is "

Output

Main sound

Interpretation guide for pitch

Interpretation guide for volume

Application — GUI authoring interface for sonification

Try out! Ask demo

Block-based authoring

Data preview

Data Block — Edit

Description: The sparsity of data tables.

name	sparsity	length
A	0.5	5
B	0.1	4
C	0.9	3
D	0	6
E	0.75	7

Instrument

Tone Block

Instrument Type:
Default (sine wave)

☐ Continued Tone

When enabled, tones will be connected smoothly with no breaks when audio properties change.

Audio Filters:
☐ lowpass ☐ highpass
☐ bandpass

Current Configuration:
```
{
  "type": "default",
  "continued": false
}
```

Audio mappings

Encoding Block — Advanced Mode

Active Channels:
time tapCount ✕ tapSpeed ✕
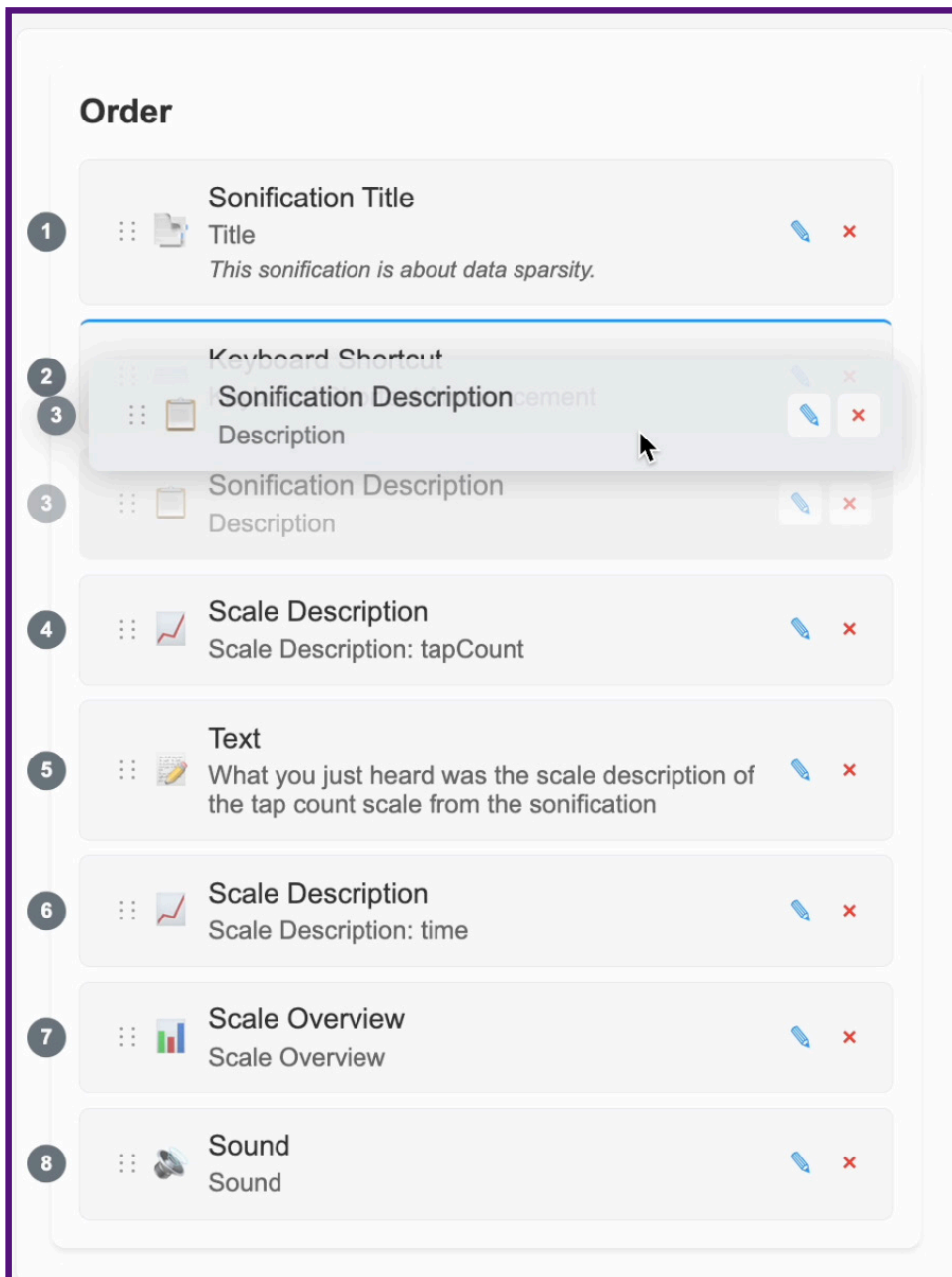speechBefore ✕   + Add Channel

Editing: time
Field:
name
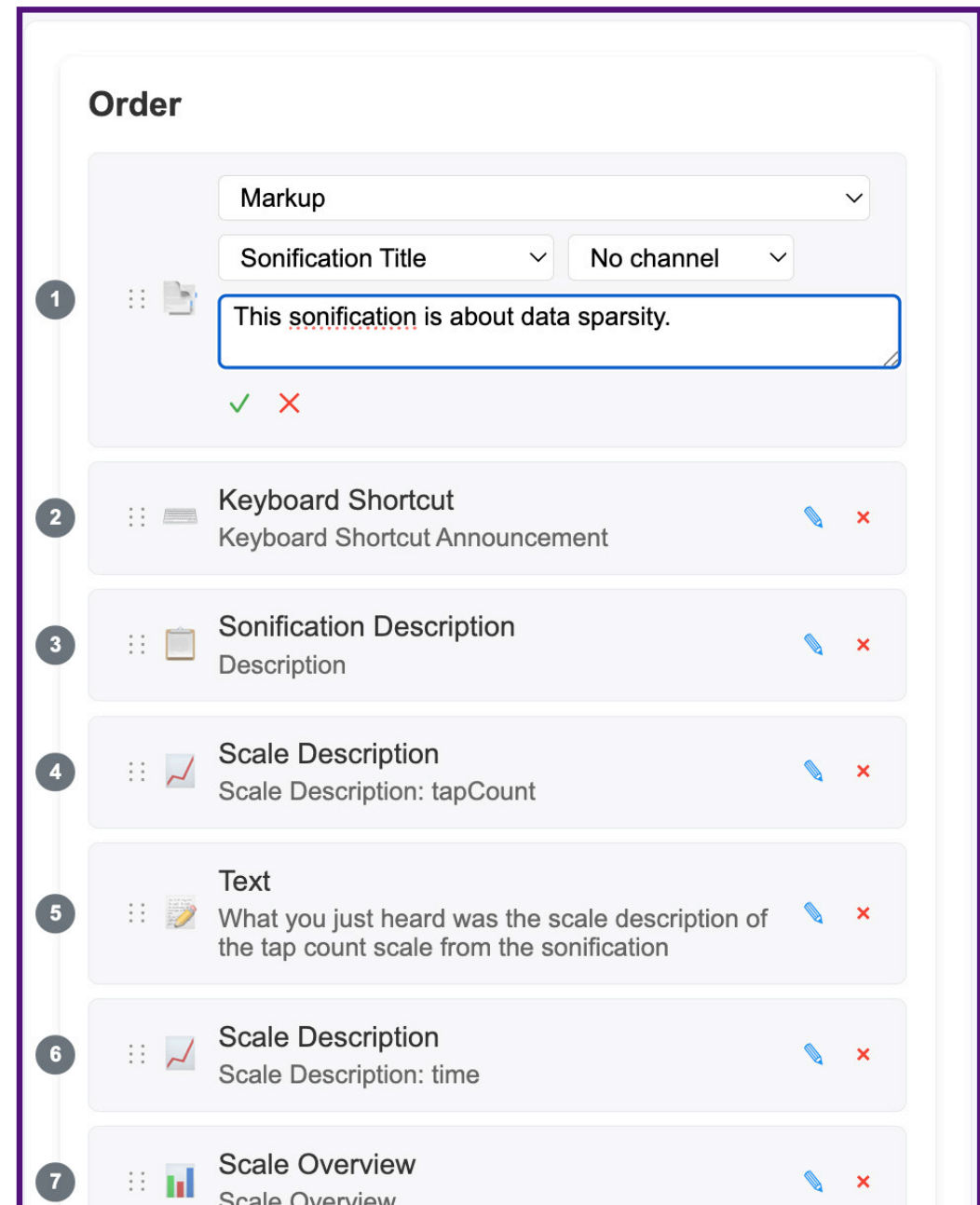Name of the data field to map to this channel

Data Type:
nominal

Scale:
Timing:
Relative

Drag-and-drop ordering

Ordering

Order

1. Sonification Title — Title
   This sonification is about data sparsity.
2. Keyboard Shortcut
   Sonification Description — Description
3. Sonification Description — Description
4. Scale Description — Scale Description: tapCount
5. Text — What you just heard was the scale description of the tap count scale from the sonification
6. Scale Description — Scale Description: time
7. Scale Overview — Scale Overview
8. Sound — Sound

In-place editing

Order

1. Markup
   Sonification Title — No channel
   This sonification is about data sparsity.
2. Keyboard Shortcut — Keyboard Shortcut Announcement
3. Sonification Description — Description
4. Scale Description — Scale Description: tapCount
5. Text — What you just heard was the scale description of the tap count scale from the sonification
6. Scale Description — Scale Description: time
7. Scale Overview — Scale Overview