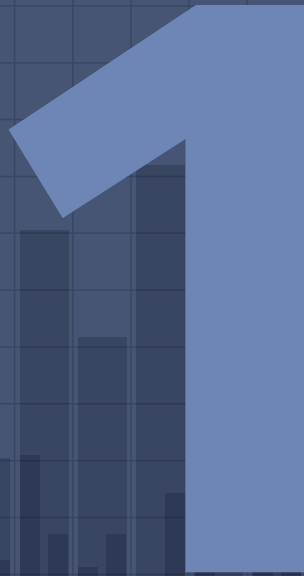# Reimagined-Vis

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USER GROUP AND PROBLEM

Who are we trying to help and with what?

1

User Group

Main group: Legally blind or blind people
- We hope to help those who are blind, or near-blind
- Particularly blind adults, but we hope to help any age

Potential group: Those who are visually impaired in other manners
- This includes people who are color-blind, or have higher level of sight.
- Only if we cannot get enough responses from main group

The Problem

How do those who are visually impaired intake **data**?

- Those who are blind don't have a way to understand visual data
- Most of the creators of data don't take into account those who are blind
- Use other senses: touch, smell, hearing, taste

Research Questions

- What is the best way to help represent visual data for those who are blind?
- What type of data is the most important/common in daily life to translate?

DIAGNOSIS AND SOLUTIONS

Interviews and some potential solutions for the problem

2

How we're talking to stakeholders

Semi-structured interviews:

- 30-45 minutes long
  - What challenges they encounter today
  - What tools (if any) are they using now.
  - What participants think may be the best solution

Participants:

- Ideally 5 but our plan b is get 3 low vision and 3 color-blind.

Coding & Affinity Diagramming:

- Code common challenges faced and existing systems used.
- Rank desires solutions

Potential Solutions

TOUCH:

- Temperature
- Vibration
- Braille-like structures
  - Aka data physicalization (will be discussed later)

SOUND:

- Musical pitches
- Different timbres

Prototyping

- Focus first on getting the right design
- Then move on to getting the design right
- So many options, want to ask users for their recommendations
- Low-fidelity, throwaway
- Wizard of Oz user testing, for rapid testing of different methods

PREVIOUS LITERATURE

Previous attempts at the problem

3

Previous Literature: Data Physicalization

- Direct Translation
  - One-to-one representation of data visualization onto embossed paper or 3D representations

- Novel Encodings
  - Translation of properties of data in temperature, haptic feedback, friction, weight, taste, etc. attributes

Previous Literature: Data Physicalization

Drawbacks
- Expensive & time-consuming
- Information intake issues
    - Sighted learners: whole-to-part
    - Tactile learners: part-to-whole

Previous Literature: Data Sonification

- Motivated by conveying basic statistics through sound

- Success in conveying the following through sound:
  - Distributional properties, first four moments of stats (mean, variance, skew & kurtosis)
    - Ex: box-and-whiskers understood as an arpeggio
  - Slope & linearity

Previous Literature: Data Sonification

Drawbacks
- Slight learning curve
- Lack of guidelines
- Need to incorporate more data-to-sound mapping and flexible editing to democratize sonification process

Most research lacks direct input for people with visual impairments.

Existing Systems

Current attempts to address this issue

4

Existing Systems

Text Descriptions
- Data visualization designers can add text to make vis more accessible
- Text-to-speech technologies & screen readers to translate to voice

Drawbacks
- Not the status quo
- Introduction of bias & lack of information

Existing Systems

Machine Learning
- Prototype Chrome extension
- DNN detect data visualization and converts into dataframe

SAS Graphics Accelerator
- Free Chrome extension
- Takes dataframe and visualization specification and gives text description and sonification (if available)

Existing Systems

Drawbacks
- Both require person with visual impairments to become data sonification designers
- Do not follow best practices as discovered in previous literature

Existing Systems

MPG City by Type

MPG (City)
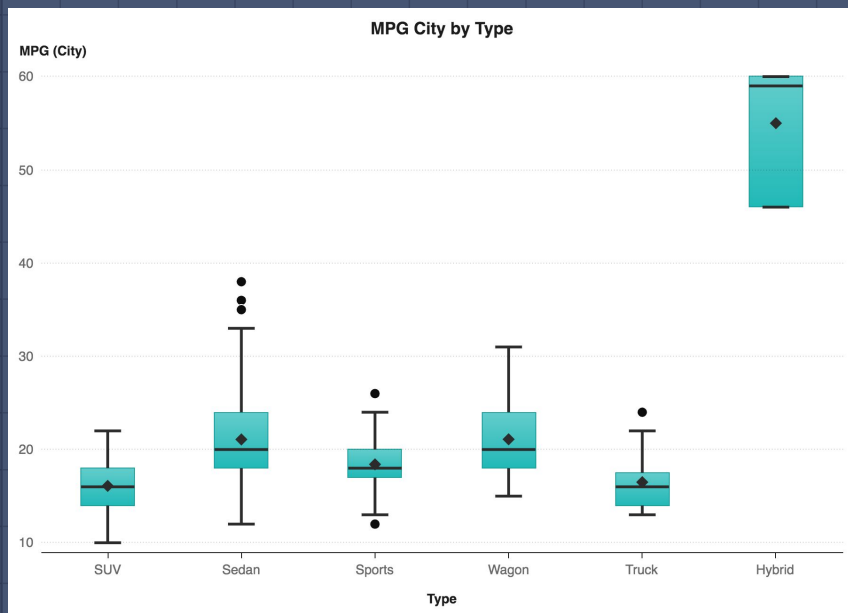
EVALUATION

Evaluation Criteria

5

Evaluation Criteria: Follow-up Interviews

Statistical Understanding
- Does our consumable convey the same info as the visualization?
- Do users have a better understanding of the data?

User Experience
- Is the output easy to use?
- Is there are large learning curve?
- Do users feel empowered and confident in insights gleaned from our product?

Thank you! Any questions?