Annotated Sources:

Authors: R. Weir, B. Sizemore, H. Henderson, S. Chakraborty & J. Lazar

Title: Development and Evaluation of Sonified Weather Maps for Blind Users

Link: https://link.springer.com/chapter/10.1007/978-1-4471-2867-0_8

Aim: This paper attempts to use sonification to present weather data to blind users. They examined an existing sonification tool named iSonic that allows blind users to hear population trends and patterns on a map of the United States. They also interviewed many blind people to determine how blind users access weather information. Based on these interviews, they developed eight specifications for their weather app. The first is to provide weather information related to current and future temperatures, precipitation, and wind speed. Next, is to let users obtain discrete weather related information and trends for a geographical location. The app needed to allow users to choose the nature of weather information and the level of detail. It also needed to provide multimodal interaction to enable perception of information through multiple senses. Finally, it needed to be easy to use for users without access to sophisticated assistive technology or minimal experience with assistive technology.

Conclusion: The paper displayed temperature, wind speed, and percentage chance of precipitation on three separate maps that the user to toggle between. It allowed for keyboard-based interfaces and a touch screen with a tactile map overlay. It had two different data views, one with the map and one with a tabular view of the data that the user could once again switch between. Users could traverse the map either absolutely or relatively, with a sound played for when a sweep of a row ends or when navigation takes them outside the boundaries of the map. With different levels of detail, the lowest level of information is provided through the pitch of a tonal sound. Any higher levels of information were given through spoken feedback. In the user testing, it was clear the users preferred the spoken feedback rather than the tones. Additionally, not all users wore headsets and that would be useful for a spatial sense of where sounds are coming from.

How does what they're saying inform how we design interventions/feedback for people? We can design our map similarly to have toggled maps for different weather information. Additionally, it gives us an idea of how we can implement multimodal interactions. I also think it's a good idea for there to be multiple data views such as having the map and the tabular data.

Authors: N.W. Kim, S. C. Joyner, A. Riegelhuth, Y. Kim

Title: Accessible Visualization: Design Space, Opportunities, and Challenges

Link: https://onlinelibrary.wiley.com/doi/full/10.1111/cgf.14298

Aim: The aim of this paper is to investigate and address the lack of accessibility in visualizations for individuals with visual impairments. It examines existing literature over the past two decades to analyze approaches for making visualizations accessible. The paper aims to map a design space for accessible visualization across seven dimensions, including user group, literacy task, chart type, interaction, information granularity, sensory modality, and assistive technology.

Conclusion: The paper proposed a model to support accessibility by synthesizing the different models and strategies they observed in visualizations. It identifies some opportunities and challenges in accessibility to guide research efforts in the future. Overall, the paper aims to stimulate further work in supporting a wider audience in visualization research.

How does what they're saying inform how we design interventions / feedback for people? The paper allows us to analyze our visualization tools from the accessibility perspective. It highlights the various forms of disability that can occur and steps visualization designers can take to ensure their visualizations are accessible to all. This paper would be very useful given the goal of our project and would help us identify steps we should take with our own work.

Authors: Dustin Carroll, Suranjan Chakraborty & Jonathan Lazar

Title: Designing Accessible Visualizations: The Case of Designing a Weather Map for Blind Users

Link: https://link.springer.com/chapter/10.1007/978-3-642-39188-0_47

Aim: Proposes updates to the AISP framework (a framework that aligns using auditory feedback to assist blind users) to use a sense of touch, creating their own framework MISD. They tried to apply their research to make an accessible weather map.

Conclusion: The updated MISD mentions touch based interaction to give spatial understanding of the application, as well as the use of filtering mechanisms through different audio methods. They mention the importance of syncing up audio and touch. They created an interactive map that the user can use touch to move through and have text-to-speech to give information based on the place in the map the user is. They haven't conducted user tests yet.

How does what they're saying inform how we design interventions / feedback for people? This paper talks about how AISP has issues with dealing with spatial problems, and other methods are needed to help with accessibility in these cases. This paper's touch based mechanism was designed as one such solution, blending audio and touch together as a means of accessibility.

Authors: Frank Elavsky, Cynthia Bennett, Dominik Moritz

Title: How accessible is my visualization? evaluating visualization accessibility with chartability.

Link: https://onlinelibrary.wiley.com/doi/10.1111/cgf.14522

Aim: Provides a set of accessibility evaluation heuristics known as chartability. It is meant to be used in tandem with another accessibility audit to address failures.

Conclusion: This framework includes 7 main principles: Perceivable, Operable, Understandable and Robust, from the preexisting POUR principles, in addition to Compromising, Assistive, and Flexible. Among these principles are 10 critical heuristics and 35 non-critical heuristics. Chartability's workbook, which describes how to perform tests in detail, is used to perform chartability's tests. Through preliminary evaluations with data visualization and accessibility practitioners, the authors found that these heuristics increased confidence and decreased the intimidation factor of accessibility. Novice practitioners were able to produce audit results similar to the authors'. Additional research can be done into the principles as well as resources and tools to help make the process more efficient.

How does what they're saying inform how we design interventions / feedback for people? We can look at this framework and address the critical components and any other components that we can of it in our visualization. This is a newer set of heuristics that goes over what is already being used in the field and refines it, so it should give us a good overview of what we need other than a compliance audit.

Authors: Dustin Carroll, Suranjan Chakraborty & Jonathan Lazar

Title: Visualization in Meteorology—A Survey of Techniques and Tools for Data Analysis Tasks

Link: https://ieeexplore.ieee.org/document/8126857

Aim: This paper provides an overview of research and describes the current state of weather visualization. It goes through a history of weather visualization ranging from the 1960s to state of the art visualization techniques in the modern era. It handles the approach from the visualization aspect and the meteorology aspect, and goes over common techniques used in the field.

Conclusion: The large and heterogeneous amounts of data in meteorology makes visualization an ideal medium for processing data. 2D and static maps are common, and interactive visualizations are receiving interest, with many younger users being more familiar with interactive maps. The paper mentions each new visualization must have a demonstration of the benefits as well as limitations. It brings up the potential of interactive visualizations and suggests methods that are not as commonly used, such as flow visualization and IVA techniques. It brings up a challenge of displaying data at different temporal and spatial resolutions, and that seamless visualization must be considered. It also mentions the progress and needs in uncertainty visualization and 3D visualization. The paper concludes there must be cooperation between the two fields in the future for progress in this area.

How does what they're saying inform how we design interventions / feedback for people? This paper provides us with an overview of current best practices in weather visualization. It will help us understand the basics of what makes a good weather visualization as there will also be a visual component since the app is aimed towards everyone with extra accessibility evaluation. It also touches upon interactive visualization and new methods which we could consider incorporating in our visualization.