Visualizing Ambivalence: Showing What Mixed Feelings Look Like

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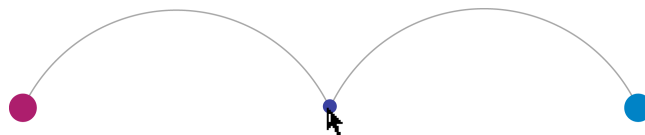
Abstract

Measures of ambivalence in public opinion have grown in prominence in recent years within a variety of fields because of evidence that they may better represent how people hold opinions than traditional Likert-type scales. Rather than assume people hold only positive or negative feelings toward a person or issue, these measures assume positive and negative feelings may co-occur as mixed feelings. Using information visualization and interactive storytelling techniques, we aim to show a broad audience how ambivalence data might be interpreted and demonstrate the utility of measuring ambivalence. Our resulting visualization, MixedFeelings.us, shows data from a survey of undergraduates on 14 topics of public interest and uses design elements like small multiples and animation as well as brief narratives to illustrate core concepts.

Author Keywords

Ambivalence; mixed feelings; public opinion; Likert; visualization; storytelling; small multiples; D3.

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

General Terms

Human Factors; Design; Measurement.

Introduction

One of the most well-known observers of public opinion, Philip Converse, coined the phrase "The Problem of the Overstuffed Middle" to describe a key difficulty with surveys that employ traditional Likert-type scales [4]. A number of possible attitudes are packed into the middle at "neutral," and we lose potentially valuable information about public opinion as a result. Respondents may select "neutral" because they feel indifferent, because they lack knowledge or don't know how they feel, because they have mixed feelings that "sum out" to neutral, or because they are forthrightly neutral, as in a "staunch centrist" [4, 1].

Measures of ambivalence offer a way to help "unstuff" Likert-type scales by allowing for more complex responses. In line with long-standing psychological evidence that positive and negative feelings represent separate processes in the brain, these measures assume that positive and negative feelings co-occur as mixed feelings, rather than sum or cancel out. These mixed feelings, known technically as ambivalence, are distinct from neutrality or indifference, and thus should not be stuffed with them into the middle [2, 3].

Indeed, when public opinion researchers ask people to explain their positions on issues, they find that most people's views are mixed to some extent. One of the most widely cited interview studies of public opinion concludes that, "given the opportunity, people do not make simple statements; they shade, modulate, deny, retract or just grind to a halt in frustration" [6]. An important result of our work visualizing ambivalence data is that it allows for public opinion to be represented with greater shade and modulation, distinguishing publics that are more complex than the

Figure 1. A version of Opinion Space used by the U.S. State Department.

sharply divided public commonly portrayed. And rather than grind to a halt in frustration, respondents are given the opportunity to express conflicting feelings.

In this paper, we describe our use of information visualization and interactive storytelling techniques to introduce a broader public to the kinds of data and findings that result from the use of ambivalence measures. We discuss related work and then the technical and design choices we made.

Related Work

Numerous visualizations of emotion and opinion have been offered by researchers, but two stand out as closely related to our efforts. In *Opinion Space*, Faridani et al. develop an interface for the collaborative filtering of a diverse array of comments from participants on issues related to U.S. politics (see Figure 1). Chief among their goals is to present opinions in greater complexity than the traditional binary ratings found online, which can lead to "cyberpolarization." They use a two-dimensional scatterplot of glowing points to represent the ideological diversity of commenters, and increase the size and brightness of comments that are rated more favorably by users from across the ideological spectrum, rather than those rated favorably only by people sharing the most similar beliefs [5]. Our work shares the goal of representing a public that is more nuanced and complex. However, rather than producing this complexity as a result of a deliberative process amongst individuals, we draw from the complexity and nuance of opinion within individuals.

Perhaps the most famous illustration of mixed feelings online is "We Feel Fine" by Kamvar and Harris [8], which crawls the web for phrases like "I feel…" and
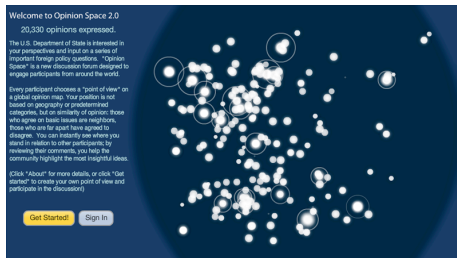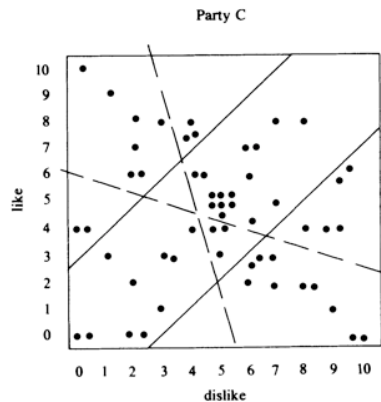
Party C

Figure 2. LaPonce's graph highlights an "ambivalence zone" between the solid lines where an individual both likes and dislikes a political party. The dashed lines show liking and disliking regressed on one another.

$$\frac{Positive + |\,Negative\,|}{2} - |\,Positive - |\,Negative\,|\,|$$

Figure 3. This formula, from Thompson et al., combines a respondent's ratings of positive and negative feelings to derive a measure of their ambivalence about an issue. The formula satisfies the properties thought to be central to the experience of ambivalence.

offers them up for searching and exploration. At the end of their 2011 study, they present findings of some of the common co-occurrences of feelings, saying for example that "we often talk about feeling happy and sad simultaneously" [8]. Like "We Feel Fine," our work centers on visualizing emotions and emotional complexity; however, their approach is emergent and incorporates all emotions, while our work explores a parsimonious measure that can be deployed in public opinion surveys.

We also drew inspiration from previous attempts by researchers to explain ambivalence data through tables, charts and graphs. One example, reproduced in Figure 2, shows how individuals may both like and dislike a political party by placing these separate ratings on the two axes [10]. The author, Jean LaPonce, then demarcates an "ambivalence zone" between two solid black lines where liking co-occurs for some individuals in roughly equal proportion with disliking. The chart for Party C in Figure 2 shows a majority of respondents in the ambivalence zone.

MixedFeelings.us

We designed our visualization with two goals in mind: to educate a broader public about ambivalence and what it reveals about public opinion, and to persuade them of the usefulness of measuring it. Our conception of the broader public includes journalists and others who may write about public opinion without being expert in its nuances. To accomplish our goals, we thought carefully about how to introduce the topic and display the data, balancing storytelling and guidance with exploration and interaction. We also sought to convey a sense of playfulness.

Data
One of the first steps in the design process for our visualization was to select data, which meant making an underlying decision about which measure would be used to generate the data. Researchers have primarily explored two measures, an "objective" and "subjective" measure. The "objective" measure asks respondents to separately and directly rate their positive and negative feelings about a person or issue [9]. Instead of asking a question like "Overall, how do you feel about Facebook?" the objective measure asks, "Thinking only of the negative aspects of Facebook, I feel…" and "Thinking only of the positive aspects of Facebook, I feel…". The "subjective" measure, on the other hand, asks respondents for their overall feeling on a traditional Likert-type scale, and then for an additional rating of how "mixed" they feel or how much conflict, tension or indecision they experience [7]. Unfortunately, the two forms are only moderately correlated [7]. We prefer the "objective" measure because it appears to be less clouded by the respondent's need for consistency [11].

With positive and negative ratings for each response, the next challenge is to combine them in some way to derive a measure of how ambivalent or "mixed" the response is overall. While there are at least five formulas in the literature [1], we choose Thompson et al. [12], shown in Figure 3, because it is widely used and meets the requirements that ambivalence be higher when positive and negative feelings are more equal, lower when they are more unequal, and increasing when positive and negative feelings both increase. The formula is the average of the positive and negative values (their "intensity"), minus the absolute value of their difference (their "similarity").

Very Positive

Divided
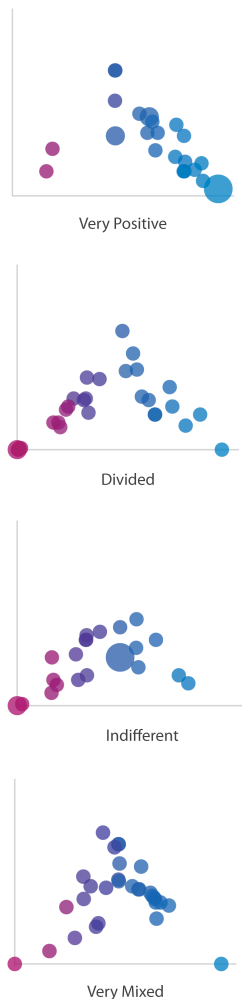

Indifferent

Very Mixed

Figure 4. Variations of the visualization's general upside-down "V" pattern.

The data for our visualization, MixedFeelings.us, comes from a lab-based survey of 30 Berkeley undergraduates on 14 topics, including Facebook, diet and exercise, President Obama and more. The students responded to each question using an ambivalence measure with two sliders. Values ranged from -300 to 0 on the negative slider, and 0 to 300 on the positive slider.

Using the Thompson et al. formula above, ambivalence values can be negative and range widely, and so we scale our values such that they range from 0 to 1. At zero, the respondent is maximally positive and minimally negative or vice versa. At one, the respondent is maximally positive and maximally negative. A total of 31 responses are minimally ambivalent (7%) and 3 responses are maximally ambivalent (0.7%). Also note that, theoretically, a rating indicating indifference or a complete lack of feeling (0, 0) is between these two states and maps to a value of .33. There are 23 of these responses (5%).

Visualization
The centerpiece of our visualization is a two-dimensional scatterplot. It first locates each individual's response on the x-axis by subtracting the negative rating from the positive rating. This mimics the traditional Likert-type scale, and shows how the individual comes down on the issue at hand overall. These dots are then positioned along the y-axis according to how mixed or ambivalent the individual was, which "unstuffs" the middle of the scale. This spread not only helps illustrate the composition of opinion on the issue, but also the usefulness of measuring ambivalence. On most topics, the data spans much of the y-axis.

The general pattern that results is a triangular, upside-down "V" shape (Figure 4). For those issues on which the public comes down generally on the positive or negative side, responses will cluster in the lower half of the plot, either on the right or left side. If the public is more divided but also lacking in ambivalence, responses will cluster in the lower half on both the right and left. Indifference is represented by clustering in the lower half toward the center. Ambivalent publics will cluster in the top half; individuals with a relatively clear position but some doubts will appear on one side or the other. Highly ambivalent publics are those where most responses cluster near the center of the top half.

The primary alternative we considered was to follow LaPonce and graph positives and negatives on the two axes. However, we wanted to show how ambivalence measures could help "unstuff" the middle of the Likert scale, and also believed that dedicating an axis to the level of ambivalence would be more persuasive overall than drawing a zone of ambivalence as LaPonce does. We also felt the zone of ambivalence unhelpfully equates indifference with ambivalence.

ANIMATION AND COLOR
A key advantage of using the "objective" measure of ambivalence, described above, is that we are able to show the positive and negative components underneath a respondent's overall rating. Rolling over a single dot expands it to display these components (Figure 5), while clicking on the scatterplot expands all of the dots at once, in dramatic fashion (Figure 6). These expansions demonstrate how underlying feelings can in fact be a great distance away from one's overall rating. In the visualization, this distance is shown in relative terms. An overall rating of -100, composed of -250 and
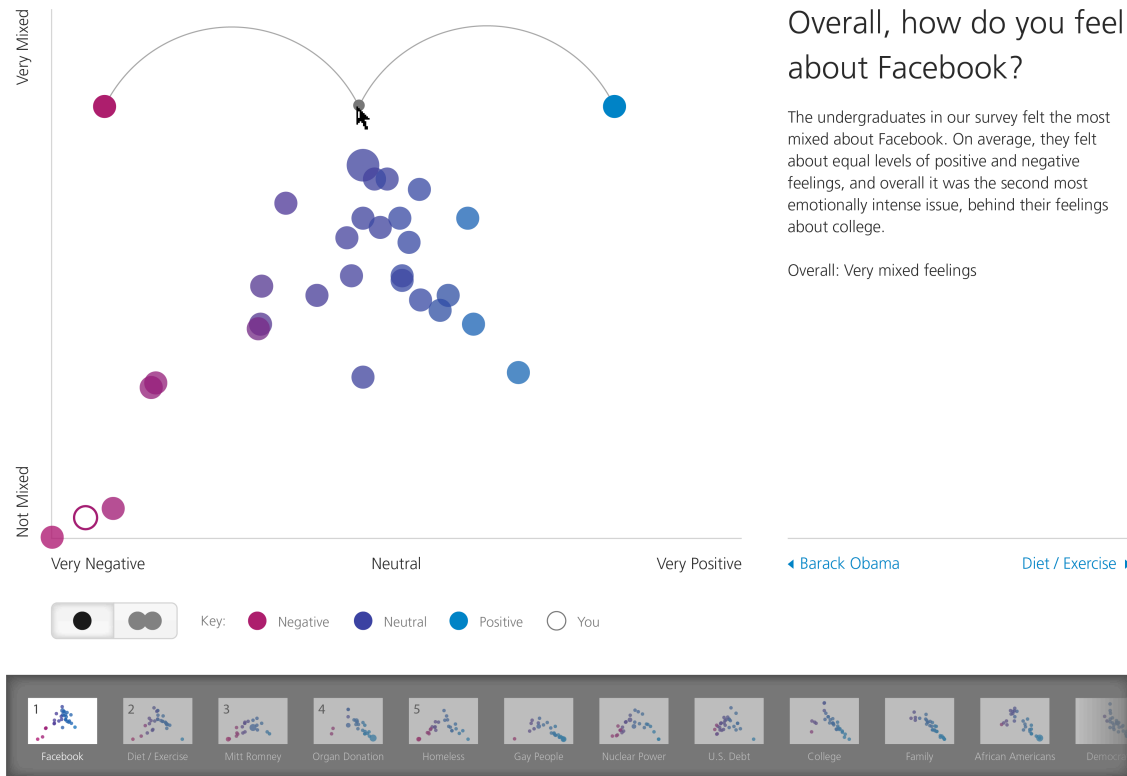
Overall, how do you feel about Facebook?

The undergraduates in our survey felt the most mixed about Facebook. On average, they felt about equal levels of positive and negative feelings, and overall it was the second most emotionally intense issue, behind their feelings about college.

Overall: Very mixed feelings

To illustrate the feeling of tension associated with ambivalence and lend a sense of playfulness to the visualization, dots are expanded on rollover using a "pop" animation that scales the force of the expansion to the level of ambivalence of the rating. Bouncing, zooming and falling animations are also used to expand all dots at once and to transition between questions. We also fade in labels for each dot following the "pop" animation for those interested in the underlying data. The overall effect is to make the data feel alive.

We use blue for positive emotions, red for negative and purple for mixed because the three colors are strongly associated with emotion in American culture. Purple is especially associated with mixing in U.S. politics. We size dots equally except where they overlap exactly, in which case we show their combined area.

IMPLEMENTATION
We used the JavaScript library D3 to graph and animate our data and JavaScript/HTML/CSS for the rest. Data entered by visitors is stored in a cookie.

Interactive storytelling
Animation was a key part of encouraging visitors to interact with the data. In general, we tried to balance guided storytelling with self-guided exploration and interaction. Our visualization at MixedFeelings.us begins with a few sentences introducing visitors to the concept of ambivalence and then invites them to take a short, five-question quiz that introduces them to the way ambivalence is measured. When they continue to the visualization following the quiz, their responses appear as a hollow dot along with the survey data for each question. The five questions were selected to show the variation in V-shape patterns (ambivalent,
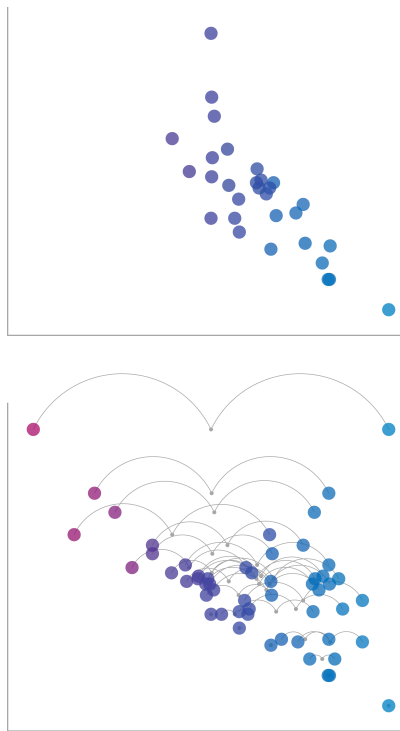
Figure 5. This example from MixedFeelings.us shows how survey participants felt about Facebook. The expanded dot shows the positive and negative feelings characteristic of ambivalence. We used storytelling techniques to help visitors make sense of the data. Small multiples at the bottom highlight patterns in responses.

+150, is graphed at -100. Upon rollover, two dots pop out, one extending the distance between the negative and the overall score, and the other extending the distance between the positive and the overall score, at -250 and +50, respectively. It's important to use relative positions so that the distance between the two dots reflects the actual level of ambivalence. A rating of +300 and -1 is very low ambivalence and should have little spread even though the two numbers are far apart on the number line.

Figure 6. Two views of participant ratings of the Democratic Party. The top view shows that most participants were positive overall about the party, with ratings spanning the neutral-to-positive range of the x-axis. Many of the dots extend well into the top range of the y-axis, however, revealing high ambivalence. This is emphasized in dramatic fashion by the expanded view below, which shows the underlying positive and negative components.

divided, indifferent, etc.), and they are accompanied by a brief paragraph that explains the pattern. Small multiples below the main plot area also show how the V-shape pattern can vary. Visitors are encouraged to view each of the five questions as a walkthrough, along with the remaining survey questions, but can interrupt the flow to explore on their own at any time.

WORDING

An important note to this discussion is that we do not use the word "ambivalence" in our visualization, instead opting to use the term "mixed feelings" because it is easier to understand. A quick test using Mechanical Turk confirmed that many people are unfamiliar with the term and confuse it with indifference.

Conclusion and Future Work

Overall, the goal of our visualization is to educate and persuade the public of the usefulness of measuring ambivalence, aiming to teach visitors through direct explanation and through their own interaction with the data. We apply information visualization and interactive storytelling techniques to explain the complex concept of ambivalence and the implications of ambivalence data. Our next step is to evaluate the design with users by testing whether they are able to easily navigate the interface and learn key details about ambivalence, as well as whether they are persuaded of its importance.

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