In a world where almost everyone is connected, where personalized content is the source of information and where stories are told through video, the need for awareness and transparency is more important than ever. Sentiment is a service that brings the user a way to explore and recognize different points of view of a news story. Sentiment believes in illustrating and exploring perspectives of stories to gain a greater understanding of our world.

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The concept of the Filter Bubble was introduced in 2011 by the author Eli Pariser (2011). It was a notion of the time’s individualized Internet experience, where searches was personalized, recommendation was based on a person’s behavioural data and tapped into the preferences of peers and others with similar tastes. Currently, i.e. year 2020, the number of Internet users has exceeded the world’s population of 2015, making the number of people connected approximately 7.6 billion. Five years ago the personalization of the web was in vogue, people and businesses saw the potential for greater relevance when searching for information and content on the Internet. For users this meant less time spent finding relevant information and businesses saw the opportunity to optimize clicks and thereby their revenue.
FUTURE OF INTERACTIVE STORYTELLING

PROBLEMS WITH PERSONALIZED INFORMATION

Our generation’s Internet experience is often called the personalized web and since 2015 it has been even more adapted to our taste and preferences. Personalized to such an extent that we are often only presented with information and stories that we want to hear, hiding everything seemingly unpleasant but probably important. There is, and has been for a long time, a common belief among people that there is a positive linear correlation between information and wisdom. We at Sentiment don’t necessarily think this is true. Information and knowledge involves an understanding of how different bits of information fit together to reveal some truth about the world. Wisdom has a moral component, understanding how the world works and should work. If you are only presented with information in line with your preferences, some degree of parochialism is unavoidable, which in turn might ultimately lead to a distorted view of the world rather than one of nuance and understanding.

To some extent this problem stems from the human inability to understand new information, without the inherent bias of previous knowledge. A person’s knowledge creates his or her reality as much as the truth, because the human mind can only contemplate that to which it has been exposed. When objects are viewed without understanding, the mind will try to reach for something that it already recognizes in order to process what it is viewing, and when confronted with unfamiliarity, the experience will be an extrapolation based on previous events and experiences. Hence, our preconceived concepts about the world are the basis of Point of View-filters. (Bellinger, Castro, & Mills, 2004)

Even though we today, i.e. 2020, know that there are back sides to personalized information such as those described above, the concept of the Filter Bubble still holds true – only presented with information in line with our own preferences leads to filtering of information and isolation. There is still little done to illustrate the problem and to help people broaden their perspectives of the world. We at Sentiment think the problem is that information should not be presented in a way that lets us experience our already biased view of the world; it should be presented in a way that lets us see the world from a new and more nuanced perspective, where there is more than one side to every story. We want to offer people a way to grasp perspective and give them a tool to reach outside the filter bubbles covering the world, so that they can see their reality for what it really is – a Point of View.

SENTIMENT - OUR SERVICE

Sentiment is a service for exploring news stories presented in video format from different points of view. It enables the user to instantly recognize the position of any given video in a “point of view landscape”. This position can be used as a starting point to further explore video content of different points of view, providing the user with an intuitive tool for experiencing the same story from several perspectives. The purpose of Sentiment is to give you an accessible overview of the Point of View-Landscape surrounding any news story in video-format, with the goal of creating an understanding for how the point of view of this story might differ from that of others.

In the example shown in figure 2 Sentiment identifies the landscape in the chosen video as the COP21 climate meeting in Paris five years ago.

“THE LAST 5 YEARS THE NUMBER OF INTERNET USERS HAS EXCEEDED THE WORLD’S POPULATION OF THAT TIME, MAKING THE NUMBER OF PEOPLE CONNECTED 7.6 BILLION.”

---Figure 1. The Filter Bubble

---Figure 2. Conceptual figure showing the interface of Sentiment. Only two axes is shown and thereby only two different topics, and their corresponding sentiment, was extracted from the videos.
ago, so the topics for each axis are based upon this certain area. Sentiment analyses the chosen video, the content of it and then places the video in this Point of View-Landscape in order for the viewer to easily get an overview of the coverage upon the topic and that there is in fact different perspectives on this matter. The service enables the user to wander around in the digital landscape in order to widen their perspective. If the user chooses to watch a news story about another topic, Sentiment’s algorithm will then make another analysis of this new topic and then change the axes accordingly.

WHO SHOULD USE SENTIMENT?
While we believe that everyone would benefit from using Sentiment, it would be naive to think that everyone are actually seeking to gain perspective. The service will not make the problems with personalization and filtering disappear, rather it will illustrate the problem with point of view filters and give the users an easy way to explore the concept. Sentiment is for the people currently aware of the problems with filter bubbles which are looking for a way to move beyond awareness and actively challenge their perspective of the world and how others choose to present their views. Sentiment is a service for people who wants to challenge themselves and stay curious about new perspectives of the same story.

SENTIMENT - WHEN? WHERE? WHY?
Sentiment is meant to be present whenever you are connected and watching any kind of news stories. Analysing the content that you are watching in real time and putting it in context to other stories of similar kind. All in order for presenting the point of view of the present video content that the user is watching. Sentiment is not meant to choose or force any content on the user but instead analyse a video's point of view and present an interactive map in which the user can compare and find other video content about the same matter, presented from another point of view. This in order for the viewer to easily become aware of their present point of view and to be presented with other point of views that could challenge and broaden one's perspective.

TECHNOLOGY BEHIND SENTIMENT
Up until now we’ve only described Sentiment from a user perspective, but how does it work from a technical standpoint? Sentiment uses state of the art algorithms and categorization technology to map out the Point of View-Landscape and for each of these we will provide a brief explanation below.

SPEECH AND VIDEO CONTENT RECOGNITION
To be able to perform any kind of analysis, data is needed. For Sentiment, this data is harvested using automatic speech recognition (ASR) and video content recognition. ASR is the recognition and translation of spoken language into text by any computerized device performed in real time. ASR uses a combination of language and acoustic modelling. The language model provides a probability distribution over a given word sequence, meaning that it enables the ASR-system to differentiate between phrases that sound similar. The acoustic model is used to represent linguistic properties of an audio signal such as phonemes or any other unit of sound. For our purpose the ASR-system will be used as a way of identifying what is being said in a video, extracting that information and use it for further processing and analysis (Huang, X. D., Ariki, Y., & Jack, M. A, 1990). Apart from the speech recognition, Sentiment also uses video recognition to extract relevant data from videos. It especially uses text recognition in the video (Jung, K., Kim, K. I., & Jain, A. K.,2004) and facial expressions from people in the video (Linn, 2015) for extraction of data. Then this data is mapped against the corresponding data from the speech recognition engine thanks to the timeline in the video. When a facial expression is recognized the algorithm also knows what was said at that place in time.

“HUMANS ARE UNABLE TO UNDERSTAND NEW INFORMATION, WITHOUT THE INHERENT BIAS OF THEIR PREVIOUS KNOWLEDGE.”
PREPROCESSING
Sentiment’s algorithm uses a lot of preprocessing on the text from the speech recognition before the actual analysis. One of these preprocessing steps are the text tokenization which involves the methods and functions trying to make text easier to understand when doing text analysis. They were invented because the human language has a lot of words and variation that isn’t really needed to understand the meaning of a sentence. One of these methods is called Stop word removal which removes common words like “at”, “or” and “I” before using text analysis on the data (Aggarwai and Zhai, 2012). Stop word removal is needed in Sentiment since classification of content’s topic is based on rare words (Han, J., Kamber, M., & Pei, J. 2011). Stemming is another algorithm within the same field but it consolidates different variations of words, e.g. conjugation or plural form, into one common word. For example the word “walk” with the conjugations “walking” and “walked” is consolidated into the common word “walk” (Aggarwai and Zhai, 2012). As you see both Stop word removal and Stemming are important for Sentiment, since Sentiment is all about text analysis. Both of these functions are used to manipulate the data given from the speech and video recognition system before the next step of the algorithm is taking over, the actual sentiment analysis.

SENTIMENT ANALYSIS
To categorize the video content from a point of view, Sentiment’s algorithm first needs to find the topics that the content is actually about. This is done iteratively with the K-nearest neighbors algorithm (Han, J., Kamber, M., & Pei, J. 2011) starting with K = X with X as the number of axes selected in the interface. The next step is to find if the content has a certain opinion, or to do a sentiment analysis, on the topic found in the previous step (Pang et. al, 2002).

Our R&D department Sentiment Labs have spent years further developing a state of the art categorization model to extract news contents sentiment, a technology that historically mostly have been used on consumer product reviews or similar (B, Liu, 2012). The sentiment analysis in Sentiment’s categorization algorithm relies heavily on term weighting (TF-IDF) as well as part-of-speech tagging, since adjectives is important when extracting sentiment in content (Etirinaki, M., Pisal, S., & Singh, J. 2012). But the most important element in Sentiments categorization model is the machine learning. Machine learning is used when constructing Sentiments unique sentiment lexicon especially designed for news content. The lexicon includes words and phrases classification as well as its strength when it comes to polarization, i.e. it’s sentiment and to what extent this is either positive or negative. This is because sentiment analysis is very dependant on extracting positive or negative sentiments from words or phrases (Liu, B., 2012). This lexicon is what really helps Sentiment to extract the core opinion from the content being analyzed. It does so by checking the sentiment on the words and phrases that is relevant, i.e. near, the words extracted in the topic categorization in the K-nearest neighbors algorithm.

Most of the analysis is made on the text from the speech recognition system, with the video recognition data as a complement to this. Thanks to the sentiment lexicon Sentiment’s algorithm knows the “score” (or strength) for each word or phrase from the speech recognition data. This score can then be increased or decreased if for example a positive or negative facial expression is tied to this word or phrase.

The lexicon was and is continuously constructed and improved by analyzing tons of news content, in both video and text. However, if a clear opinion can’t be found on the given topic, Sentiment’s algorithm will fall back to the previous step and take the next topic (K = X + 1) and do a sentiment analysis on this new topic. This continues iteratively until the number of topics with a decided opinion are found in the content reaches the amount of axis in the interface.

Now when Sentiment knows the topics and the corresponding opinions the next step is to find other videos that shares one or multiple topics with the original video.

CONTENT COMPARISON
Due to the last couple of years with heavily increased amount of information and the lack of storage, the previous standard with inverted index that for example was used by the now forgotten search engine Google (Brin, S. & Page, L., 2012), Sentiment relies on real-time indexing. The real-time indexing allows Sentiment to avoid storing the result from the K-nearest neighbors algorithm and sentiment analysis in a database since all the categorizing and analyzing are done in real-time. The real-time aspect is very important for Sentiment since we are targeting news content which often has a very short life span.

Sentiment still have to crawl the web just as text information systems have done historically, so it relies heavily on computer power. Sentiment crawls the entire Internet when a user chooses to explore a video’s point of view in the service. It tries to find relevant videos to the original, i.e. with the same topics, and then maps the found videos together with the original in the X-dimensional space in the interface. To find these videos it uses the categorization model described earlier.

But to only find the relevant videos is not enough, Sentiment also have to rank their opinion within the given topics in order to map them in the X-dimensional space so the user for example can see which video that has the most extreme opinion. This is done with the sentiment lexicon described earlier. As described earlier the lexicon holds the positive or negative sentiment and the corresponding strength for all kinds of words and phrases. So Sentiment’s scoring function basically sums the strength of each positive or negative word or phrase found in the content and then divide this sum with the length of the content.
CONCLUSION

The ability to reconsider one’s point of view is something we at Sentiment value greatly. It is our firms’ belief that – almost – everyone has the potential to, if only for a moment, look beyond his or her own perspective and see that there are more than one side to every story. It has now been almost ten years since the concept of a filter bubble was introduced and our feeling is that not enough has been done to counteract the personalized Internet experience, where awareness and transparency have been discarded for the sake of convenience. Sentiment will not dissolve all the issues of point of view filters nor will it magically make people wiser, but it will provide people with a tool that lets them move beyond their preconceptions and expose their information bubble when watching news stories.

REFERENCES


Image 2: Martin Fisch Blister in the Sun, Creative Commons CC https://www.flickr.com/photos/martins75/5983944342/in/photolist-6UvThG-a7Mhbb