

Sensible: Experiments with a Real Time Emotion Recognition tool.

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Abstract

Due to the need of enhancing communication between people that are located far away from each other, we can observe the rise in the need for sharing emotions in the technological space. There are various mediums by which man has tried to communicate across larger distances - letters, telegrams, followed by phone calls, e-mails, SMS's, and now video calls, etc. On the mobile phone, we can see the gradual increase in technological capabilities for sharing/expressing one's emotions via photos, statuses, emojis, GIFs, stickers, memes, content creation, emoting in easily shareable short videos, extended reality, 'like' or 'care' reactions on social media, etc. In this report, we explore emotion recognition as the topic of a design fiction.

Preface

This report is written as part of the Trends in Interactive Technology module at IDC School of Design. During the initial lectures of the module, we read up many papers on the topic of design fiction, in order to understand its roots, related ideas, and growth, in the recent past. The keywords that stood out for me were as follows: A narrative, which suspends belief for its audience in order to encourage discourse towards a specific scenario [1]; A 'crises' that could alter the story line; Criticality, to be incorporated in the narrative in order to encourage the audience to think; Elements such as mystery to be incorporated in order to make the design fiction enjoyable, etc.

Scenario

"What if, in the future, humans create devices that make human emotions completely transparent to each other?"

The Oxford Dictionary definition for the word 'Emotion', is a 'Noun, A strong feeling deriving from one's circumstances, mood, or relationships with others' or, 'An instinctive or intuitive feeling as distinguished from reasoning or knowledge.' According to Merriam-Webster, it is 'a conscious mental reaction (such as anger or fear) subjectively experienced as strong feeling usually directed toward a specific object and typically accompanied by physiological and behavioral changes in the body', or, 'a state of feeling'.

In 1872, through his work 'The Expression of the Emotions in Man and Animals', Charles Darwin introduced the biological aspects about human expressions [2]. It is interesting to note how man, like animals, has used emotive self expression as a subtle mode of communication. One can find literature related to emotions, in various disciplines, such as psychology, biology, history, neuroscience, etc., and there is certainly a lot more scope in the research that is possible in this domain.

Psychologist Robert Plutchik, stated that there are 8 basic emotions [3]. He created the wheel of emotions in order to state, understand emotions, and their complexity. The eight basic emotions, opposite to each other, as stated by him, are joy vs sadness, trust vs disgust, fear vs anger, and surprise vs anticipation. The wheel shows us the different relationships between such emotions, and that even though there are just eight basic emotions, the varying degrees in the wheel give us a wider spectrum of emotions that one can feel [3].

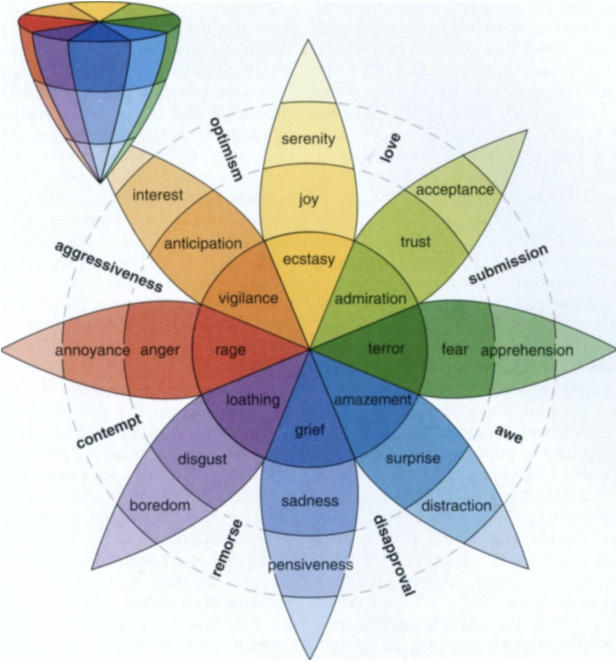


Figure 1: Wheel of emotions. [3]

There are multiple ways through which humans express emotions. Prominently, using one's facial expression, but also through body language, tone of voice, and physiological reactions. A lot of exciting research has been going on in the space of human computer interaction that explores the topic of emotion recognition. This has been enabled due to the technological advances in both software as well as hardware.

Emotions can be translated to readable information via resources such as signal processing, image processing, artificial intelligence, etc. We can get information from all sorts of mediums. For example, through images, videos, or live feeds (facial recognition), through audio, or voice assistants (speech recognition), via text (the choice of words used), or by wearables (physiological signals).

Today we have wearable sensors that are capable of measuring different physiological signals such as body temperature, heart rate (HR), electrocardiogram (ECG), electroencephalogram EEG, electromyogram (EMG), respiration rate (RR), blood pressure (BP), arterial oxygen saturation (SpO2) and electrodermal activity (EDA) [4]. The collection of all of the above in different measures can also help in the research of concepts such as affective computing, emotive internet, etc.

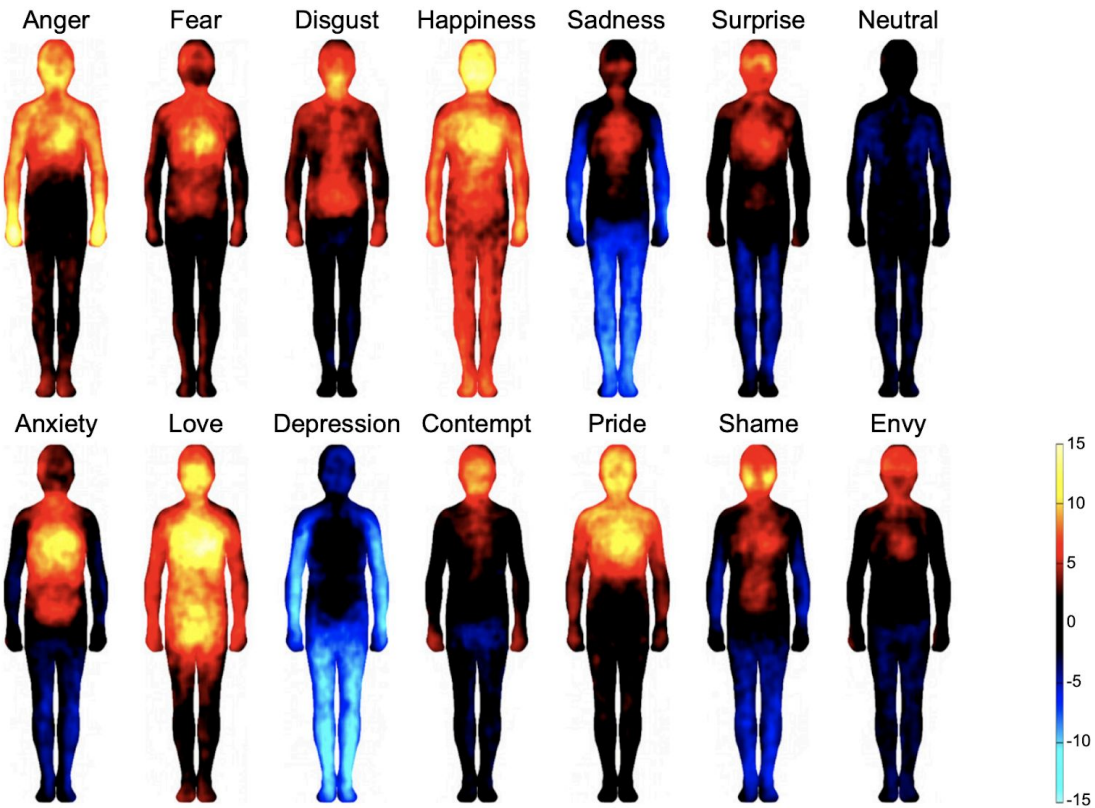


Figure 2: Bodily topography of basic (Upper) and nonbasic (Lower) emotions associated with words. The body maps show regions whose activation increased (warm colors) or decreased (cool colors) when feeling each emotion. [5]

In a study conducted in 2013, a group of researchers worked on a self reporting experiment where participants were shown words, stories, movies, or facial expressions as stimuli, and were asked to color the bodily regions whose activity they felt increasing or decreasing while viewing each stimulus [5]. According to them, unraveling the subjective bodily sensations associated with human emotions could potentially help in better understanding mood disorders such as depression and anxiety [5].

With the advancement in this technology, there rises the question regarding the ethical nature of these tools, whether they fall within the moral boundaries of the involved individuals, if such tools could be misused, or, on the other hand, really pave the way towards a new transhuman state for mankind. It would be interesting to see if emotion recognition would have a key role in the future of telecommunication. To explore the topic as a design fiction, would be an opportunity to raise discourse related to the probable consequences of the same, where one could look at it critically with the help of a narrative.

Diegetic Prototype

Quoting Bruce Sterling's definition [1] about a design fiction, "It is the deliberate use of diegetic prototypes to suspend disbelief about change." For this design fiction project, I proposed to create a diegetic prototype in the form of documents. I considered a research paper, accompanied by fieldnotes, which would be written by an ethnographer.

The diegetic world is based in the year 2030, in a fictional village named Silent Pines. The narrative is from the point of view of an ethnographer, Dr. Kai Pracket, who goes to this village in order to conduct the experiment. Dr. Pracket, a researcher, and the central character of this design fiction, is out to study the effects of an emotional recognition artifact in human subjects. The artifact is a wearable created by the team at Sensable Inc. The wearable itself is called Sensable. It is a real time emotion recognition sensory tech, in the form of a wrist wearable. Through this tech, one can make calls, and it includes facial, and voice recognition, along with physiological sensors at the back - in order to gauge its wearer's emotions and transmit that detail to whoever they are 'on call' with. The inspiration for the colours on the screen come from the Wheel of emotions [3]. It is a tool that promises to recognise its wearer's emotions at an accuracy of 99.93%. Still existing in its beta stage, Sensable requires participants for testing. The facial recognition software it utilizes, became especially popular, perhaps after video calling became the only accepted etiquette as a mode of communication between people.

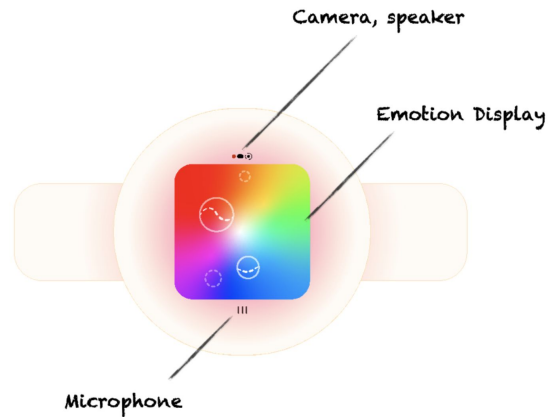


Figure 3: "Sensable", An emotion recognition tele-wearable device.

The reasons for such an accepted form of a mode of communication between people can be due to a crisis in the timeline of the diegetic world, which alters the narrative in certain ways. For example: A pandemic that occurs in the year 2020, that forces humans to stay indoors. The increase in distance between people would force most to realise the importance of truly being connected with their loved ones; thus the rise in funding towards tools that enrich modes of communication with emotions of its participants. Apart from this, even the rich conglomerates across the globe reach a point of economic standstill post a trade war, and there is a sharp increase in the need to understand people's emotions in the online world.

The field notes jotted down by the ethnographer, would introduce the audience of this design fiction to the characters of the narrative, their society, and their way of life. The language of these notes would be humanised, as opposed to the scientific writing of the research paper. This would give the audience a better glimpse of the needs of the characters, and observe how their behaviours would be affected after using the emotion recognition tool. There are numerous scenarios that can unfold when a person's emotions are laid bare in front of another, the lives of the characters could potentially be transformed. This is where the narrative for the diegetic world would unfold. The prototypes of this design fiction would disclose the various unexpected turns the study can take, due to the utilization of the artifact.

Through the insights gained from the study, I plan to incorporate the various sides of/ways by which such a technology will alter the living for people, and highlight the subsequent choices that people might make, in order to explore the narrative of the fiction. There can be both immediate reactions, as well as long term responses. To incorporate situations that help us critically look at the diegetic world, it was important to list down the various socio, ethical themes that surround this topic.

The few social aspects related to emotion recognition:

1. On ethics
 - a. Privacy Issues
 - i. How much information one is willing to share [How much is too much?]
 - ii. If there are any tools to protect [Anti emotion recognition softwares]
 - iii. Surveillance - Is the tech authorised to keep a watch?
 - iv. Hidden sources of recording data/user emotions [Hidden T&C's]
 - b. Manipulation using emotion data
 - i. Emotion tracking
 - ii. Behaviour change
 - iii. Reward/punishment
 - iv. Humans become the product
2. Transhumanism
3. Affective Computing
4. Reactions in different social scenarios
 - a. Professional
 - b. Casual
 - c. Cultural
5. Resistances against the tech
 - a. Who should be allowed to use this tech, and why?
 - b. How correct the tech is in understanding how one really feels [There is a huge degree of uncertainty involved. For example, a person may show some emotions, but truly feel completely differently, due to the inability of expressing themselves properly, or fooling the tech on purpose.]
6. Unexpected social reactions
 - a. People don't want to share emotions
 - b. Emulating/Absorbing someone else's emotions [or, if two different people are similarly judged as the emotion they show, they can be categorised belonging to the same group.]
 - c. People see through manipulation and control, and never trust again
 - d. Not finding a need to converse/escaping real talk [Humans are not finding a need to converse as more and more people depend on the tech, that might offer a rosy picture to understand what the other is feeling.]
 - e. Taking physically closer companions for granted

The structure of the research paper:

1. Title information
2. Author information
3. Abstract
 - a. A brief on the timeline/history of the rise in importance of emotion recognition across large distances
4. Keywords
5. Introduction
 - a. Our understanding of emotions
 - b. Current research/tools available on emotion recognition
 - i. Types/ways/methodologies of the current tech available
 - ii. The fictional [artifact]
 - c. Purpose of the study
6. Methodology
 - a. Setup
 - b. Experiment
 - c. Survey
7. Results
8. Conclusion
9. Future scope
10. References

[The research paper prototype includes work from this report. The same can be found [here](#).]

Fieldnotes of the ethnographer

A study on using Sensable to understand the causal effects in human behaviour.

#1

Date: April 3rd, 2030.

Time: 13:45 hrs.

Location: HCI Lab, HQ, Sensable Inc.

We have just confirmed information regarding our participants. A man named Milton Riley answered the advert that our team sent out, and told us about this location. The description of this particular village fulfills the needed requirements. Mr. Riley was originally a citizen of

this remote village, who first ventured out about 10 years ago. Unfortunately, yes, it was the year of the pandemic. The changing world outside that was more and more comfortable staying indoors, coaxed him enough to stay. Milton has assured us that his village has a small population, with residents not more than 47 in number. The villagers have been completely abstinent in using communication technologies till now. Mr. Riley says that he would seldom converse with his family through 'letters' in 'envelopes' - How archaic! Anyway. This is good news for us. We have found the much needed raw participants that our study demands. My initial fear to conduct this experiment remains if such people would even accept to participate. But Milton assured me that after so many years, the villagers had finally conceded to the use of technological communication devices. In exchange of their services, our team has decided to assemble a small network tower near their locality, finally allowing them to communicate with the rest of the world more efficiently. I'm sending the installation team to the location immediately.

#2

Date: April 22nd, 2030.

Time: 22:23 hrs.

Location: A small shack located within Silent Pines.

My trip to Silent Pines itself has been a strange one. A village that isn't connected to the internet in this day and age? Needless to say, one wonders how these people managed to even *survive*! Silent Pines is located deep within a forest, practically in the middle of nowhere. Spread within an area of about 6 square miles, it seems to sustain itself through simple agriculture and occasional hunting. The ancestors would venture to the nearby cities some 20 years back, but remained untouched by visitors from outside. Regrettably, the 2020 pandemic forced them to stayput indefinitely. 10 years since, Milton is back to his roots, and along with him, me, a foreigner. The population that lives here does not depend on the global connected space, unlike the rest of the world, and are entirely self-sufficient. I'm sure my time here will be interesting, but hopefully, a short one. It feels strange to be completely cut off from the rest of the world.

#3

Date: April 23rd, 2030.

Time: 10:30 hrs.

Location: Base, Silent Pines.

Checked the tower in the morning. The signals are working fine. The devices have been prepped and are waiting for the initial user data. I plan to conduct this study and wrap it up within a month, as long as I don't feel any need for an extension. My motivation is to better understand Sensable, and the subsequent causal effects in human behaviour. I was wondering if it is okay to include conversations with the participants that may induce stress, but was assured by Mrs. Riley, Milton's mother, who said that the villagers had completely agreed to do whatever it took to finally get that network tower.
So be it.

#4

Date: April 23rd, 2030.

Time: 16:30 hrs.

Location: Base, Silent Pines.

About 7 inhabitants of this village have agreed to participate in this experiment. Milton, ofcourse, pitched in first, for that would motivate the others to follow suit. For the sake of anonymity, I'm marking him as participant A. This was followed by his mother, participant B; an aged grandfather, C; Milton's distant cousin, D and E; and their father, F; I have 10 Sensable devices with me. I shall distribute them to the participants tomorrow. Cannot wait to begin. I must add though, a few of them don't seem too excited about this study.

#5

Date: April 23rd, 2030.

Time: 22:12 hrs, right after dinner.

Location: Base, Silent Pines.

Another person has agreed to participate. F's friend. Let's call him G shall we. 7 people? Not bad. The fact that they know each other well, or are even related, is going to be super helpful to gather insights about their emotional responses towards each other. Milton's been a great help. The next few days are going to be very eventful. I feel like I'm on the shoulders of giants. What an astonishing progress!

#6

Date: April 24th, 2030.

Time: 11:30 hrs.

Location: Base, Silent Pines.

Just finished the first briefing with the participants. I showed them the device, and taught them how to operate it. Some took a lot of time to get a hold of it, and displayed more unease and distrust as compared to the rest. I asked them to sign the ethical clearance in order to build trust and to be honest, just to get on with it. These participants are the ones who are more on the older side of the age spectrum. I guess their distrust is understandable. Either way, it's not uncommon to find participants that often slow us down.

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#15

Date: April 27th, 2030.

Time: 22:30 hrs.

Location: Base, Silent Pines.

The participants *have* been told that their emotional interactions and conversations are being recorded, but it seems a few hardly care. Milton and his mother began conversing on call, on their devices almost immediately, after the trials. Their initial reactions seemed on the **happy** spectrum, for both of them - before reaching a saturation and stabilizing. Milton's mother seems happy that her son has returned home after so many years. He's usually off to work in a nearby field where he gets on call with his mother at home. The other participants took their own slow time before they were confident enough to be on calls using Sensable. As expected, most of the conversation was related to the device, how the participants found it amusing when the colours shifted on the screen, describing the emotions of the person on the other end. The cousins have been goofing around with it a lot. Their father tells me that they've never spoken to each other so much. And their conversation? Full of the talks one would expect between siblings, like the usual unrequited advice, name calling, and more. First mostly around **anticipation**, and **surprise**, their emotional graph has now been going all over the place. Fun. The father and his friend haven't really used the device much. The old man, not at all. I'm curious, and really feel I'd get my hands on some interesting data if he displays a little bit of vulnerability.

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#17

Date: April 28th, 2030.

Time: 16:30 hrs.

Location: Base, Silent Pines.

Participants F and G have convinced me to be an 8th participant of this experiment. I tried explaining that it really doesn't work that way. The on call conversations that they've had till now are heavily about the device. But their emotions are always peeking towards **disgust**. It's clear they don't trust this device yet. Something makes me feel they don't trust me either. Really wondering if I should get on as the 8th participant. I think I'll ponder over this for a while.

...

#22

Date: May 12th, 2030.

Time: 21:00 hrs.

Location: Base, Silent Pines.

I gave in as the 8th participant. Things aren't going well between Milton and his mother, and I feared they might ask me to stop the experiment soon. Their colours are always blue now. I believe the villagers are heavily divided with respect to installation of this network tower, and some have even threatened the Riley family. Some fear that this might disrupt the peace of its inhabitants. They're blaming Sensable for it. Can you *believe* it? These people haven't even used phones and they're out to judge this extremely high tech. Truth be told, they should feel *lucky*. The cousins don't seem to be complaining.

#23

Date: May 13th, 2030.

Time: 11:30 hrs.

Location: Fields, Silent Pines.

Was on call with the father, F. He was pretty **disgusted** when I called him. Me? I was **sad**. I was finally disrupting the experiment with my own input. But it's okay. I have a little data saved anyway. I'd hopefully be able to pull out some interesting patterns. Took me some time to convince F. I could see the Sensable on my wrist turning light green. I guess he's happy about me giving in, and finally **trusts** me a little.

...

#32

Date: May 17th, 2030.

Time: 18:30 hrs.

Location: Base, Silent Pines.

Participant C finally spoke up. He gave Sensable a good swing for sure. He called Milton, his mother, displayed immense **sadness** as he spoke about how unjust it was to have Milton leave without a care and return with things he didn't even understand about. He seemed **surprised** and even **happy**, on speaking to the cousin brothers. They now displayed emotions of respect and **admiration**, that he'd never really trusted enough to have in them. He called the F immediately, displaying immense **joy**, but things changed when he spoke to G. They had a long conversation with varying emotions on the things that had happened in the village because of the tower. The very fabric of love and admiration that the younger generation had had for the elders was on the verge of shaking. They were in disbelief about the world outside and wanted to venture out to play with such *gadgets* too. This is when he finally decided to call me.

#33

Date: May 17th, 2030.

Time: 20:30 hrs.

Location: Base, Silent Pines.

Participant C is **angry**. He knows I'm **scared**.

...

#41

Date: May 23rd, 2030.

Time: 20:53 hrs.

Location: Base, Silent Pines.

This is it. Today marks my last day here. The study has to be stopped. The participants are certainly shocked, and I think I have enough data to understand the human behaviours to a certain degree. Further tests would have to be conducted somewhere else. I am not sure if all

the participants are comfortable with Sensable, or even the network tower anymore. There's a deep distrust in a part of the community. Even though a few seem glad. Anywho. The results I could gather seem promising. I think I can confidently generate valuable insights on how humans behave when their sentiments are put across with a 99.93% degree of accuracy.

#42

Date: May 24th, 2030.

Time: 07:30 hrs.

Location: Base, Silent Pines.

I'd thought that Sensable would be a great tool to bridge the gap between people. Turns out, it could actually also do the opposite. But I've had another idea now. What about using it as a tech to help people understand their own emotions? Now that might be an interesting thought. For all one knows, Sensable could be the only emotional support that one would ever need...

Narrative Flow

I decided to take inspiration for the narrative from the hero's monomyth [6]. The 'hero', or the 'central character' of this design fiction is the ethnographer Dr. Kai Pracket. The call to adventure is the requirement of research for Sensable. He receives an aid of sorts from Mr. Milton Riley, and proceeds to conduct his experiment. The transformation, challenges, all relate to the use of Sensable in the village of Silent Pines, where we see the growth of the ethnographer's character.



Figure 4: Hero's journey, or monomyth [6], as a template for inspiration.

For the narrative, I sort of went meta and weaved in the emotions of the characters as displayed on Sensable, with the storyline. The main aim of the narrative was to fold in the many social issues that could surround the scenario, and encourage discourse via the prototype.

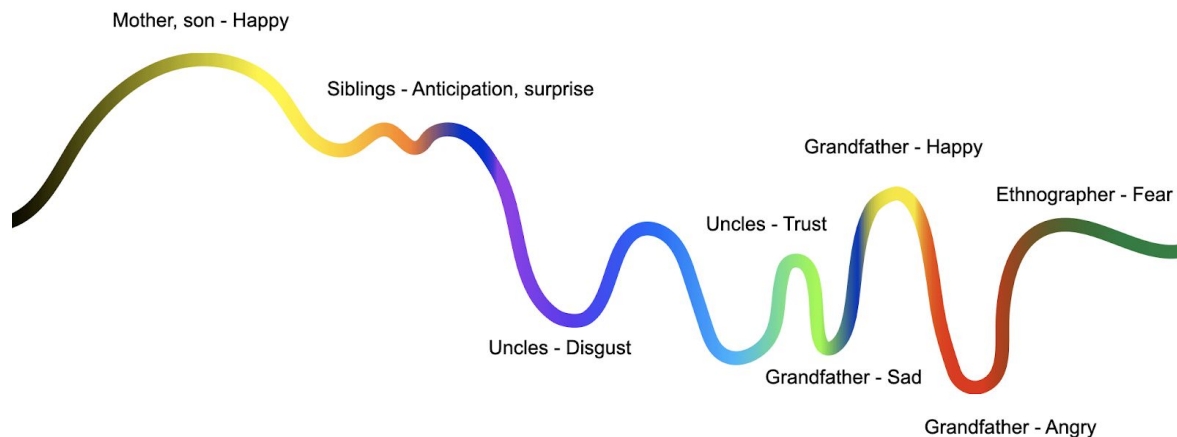


Figure 5: The emotions of the characters translate to the plot twists for the narrative.

Learnings & Conclusion

From the weekly readings and conversations that took place during the course of the module 'Trends in Interactive Technology', to actually participating in this activity and constructing a diegetic world, the journey has been an interesting one. This was a good exercise in practising research, creating narratives, pushing the boundaries of imagination, and understanding more about design fictions. The various research and work that HCI researchers, designers, creators, etc. have done in the field of speculative fiction is very interesting. I've always been drawn towards science fiction, but design fiction certainly allows one to think more critically. My favourite part of the module would be about the freedom that the module offered, that enabled one to pick any topic under the sun, and create a cohesive scenario out of it.

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