Different Perspectives

An immersive experience using 360° video and Google Cardboard

Karl Berg
Chalmers University of Technology
Gothenburg, Sweden
karl@differentperspectiv.es

Marie Larsson
Chalmers University of Technology
Gothenburg, Sweden
marie@differentperspectiv.es

Fanny Lindh
Chalmers University of Technology
Gothenburg, Sweden
fanny@differentperspectiv.es

Pierre Reimertz
Chalmers University of Technology
Gothenburg, Sweden
pierre@differentperspectiv.es

Bruno Söderström
Chalmers University of Technology
Gothenburg, Sweden
bruno@differentperspectiv.es

ABSTRACT

Becoming aware of your own or other people's behaviour in social situations is hard, you can only see the world through your eyes, your experiences. In order to better share and understand each other we have designed a cheap but effective technology through the use of 360 degree film, binaural audio, and Google Cardboard goggles. Our focus is the school environment, while we initially dealt with bullying, we eventually shifted the issue to ambiguous social situations, to avoid the stigma of concepts such as victim and bully. Through participatory design we managed to implement a mobile application that allows a user equipped with headphones and Google Cardboard to experience the 360° film recorded. This will then be followed by a discussion with her or his peers - preferably with supervision of a professional such as a teacher, hopefully raising awareness of their attitudes and preconceived notions.

Author Keywords

bullying, social dynamic, google cardboard, 360 degree film, binaural sound, interaction design.

ACM Classification Keywords

Design, Experimentation, Human Factors.

INTRODUCTION

Approximately 60,000 children and young people experience bullying each year in Sweden [Friends 2016]. How can we help? What would it be like to see the world from someone else's eyes? To experience a situation from their perspective? Different Perspectives is an immersive Virtual Reality (henceforth: VR) experience that uses 360° films and Google Cardboard as a jumping-off point for

Figure 1. Exhibition

discussions and workshops. For now the target group is upper-secondary schools, however our intent is to expand to other age groups, and possibly different demographic groups that could benefit from empathy training. Our hope is that the immediacy of seeing a situation through the eyes of another will evoke an emotional response, and elicit reactions that can be shared, and reflected on.

THEORY AND RELATED WORK

We wanted to explore if VR could provide a user with a perspective changing experience. Furthermore we wanted to find out if adding of binaural sound to the virtual environment could enhance the experience even more. Of relevance to this paper is therefore both research in the technology of VR in conjunction with empathy building as well as research in the use of binaural sound.

As this particular study of different perspectives has been directed towards the school environment it has been important for us to have a close contact with the anti-bullying organisation Friends in order to make sure that we do not exasperate the problems we want to display.

Virtual Reality

The modern usage of the term VR was popularised by Jaron Lanier through the company VPL Research, which holds a major part of the first patents related to VR technology in the 1980s [Springer 2012]. Since then, numerous companies have tried to enter the market, such as Nintendo and Sega, but all of them has failed due to the lack of a high quality user-experience. It is thanks to the recent evolvement of smartphones and the introduction of cheap gyroscopic sensors that we now can see an upswing in this market that has become a multi-billion market [Digi Capital 2015].

Google Cardboard

To be able to create an immersive experience that is available for a wide audience, it is important to choose a technical medium that as many as possible can take advantage of. Smartphones now constitutes a quarter of all cell phones currently in the market which makes it a good medium to display the experience [Fehske et al. 2011]. To further improve the experience, Google Cardboard, a cheap, easy to assemble VR-headset can be used to fully immerse the user with stereoscopic vision (see Figure 1).

Binaural sound

Research in binaural sound shows that it can create a great immersive effect when the right demonstrations are used. With Different Perspectives we are trying to put together the virtual world with the sounds of the surroundings using binaural recording, binaural sound recordings has been available since the 19th century [BBC 2014]. Our hope is that the combination of 360 film and binaural sound will create a more immersive experience for the user. After the completion of this project in late 2015, there is now a Unity SDK that allows for directional sound, which would alleviate this issue [Unity Technologies 2015] by positioning audio in 3D space.

Empathy building experiences

The machine to be another is an interesting project that has a similar approach to the use of VR as Different Perspectives [BeAnotherLab 2015]. By offering the users a possibility of interacting with a piece of another person's life story by seeing themselves in the body of this person, BeAnotherLab aims to create empathy amongst the users. It differs from Different Perspectives in the way that they are using a performer who follows the user's movements during a real time experiment. The user can move and interact with objects inside a room, while listening to the performer's thoughts through a set of headphones. The BeAnotherLab research has shown endless possibilities and the next steps of the investigation would be to measure empathy generated among users. This further consolidates the interest and the opportunities that exists for products like Different Perspectives in this new area of using VR.

Approaches to the bullying situation

During a phone interview with a project leader from Friends we found out the importance of not pointing out the bully, the bullied and the bystander in a situation because these roles are not definite [Cox 2015]. The roles in a bullying scenario change depending on the surroundings, a person being the one bullying in one situation can be exposed in another. It is therefore of high importance not to point out specific roles in a scenario, as Cox mentions; this can be more harmful than helpful. Forum Play is a way of working around this problem. It aims to teach the participants in how to elaborate on their ability to use empathy [Nilsson and Sandell 2006]. By letting the participants change the surroundings, the aim of the exercise is to make them aware of the ambiguity of situations and to teach them in understanding different perspectives of a situation. The theory behind Forum Play goes in hand with what was said during the interview with Olle Cox and has worked as a fundamental principle throughout the work.

DESIGN PROCESS

Throughout the project, a Participatory Design (PD) process has been used, involving different stakeholders and users from beginning to end. Using a PD process makes the users play an essential role all through the design process [Gulliksen et al. 1999]. The usage of VR technology was decided before ideation, which sparked creativity and saved time as the implementation of the solution was set early.

Inspiration

The inspiration phase aimed to learn more about the users and the context of design. Through ethnographic studies such as interviews and observations, a picture of the users and their opinions regarding the subject were created. An expert interview with Olle Cox at Friends was conducted in order to gather facts about bullying and on how to handle the subject. When the information was gathered,

Figure 2: Participatory design

bodystorming was used as an inspirational preparation amongst the group of designers in order to put ourselves in the shoes of the target group. This method also helped in finding the frames of what later on would be possible regarding the film recording.

Ideation

The ideation phase aimed to involve the target audience using workshops, at first with teachers from Kattegattsgymnasiet in Halmstad and later on with students from Mikael Elias Gymnasium in Gothenburg (see Figure 2). This was done in order to create a discussion regarding the shooting and to let the students influence the story. By using participatory design we aimed to make the design process as a part of the project just as important as the final

product or outcome. This phase was also influenced by meetings with people from areas of interest such as the interactive institute and a Johan Paus, a director.

Implementation
The prototype was made by recordings together with the students and the video was then programmed into a VR application that could be used with a VR-handset solution together with a mobile device.

Limitations
As motion sickness is a common occurrence in VR applications, we decided to lock the position of the camera in scenes. This effort removed the discrepancy between camera and user movement. We chose a camera fitting the constrained budget, sacrificing resolution. Compared to other solutions, this camera targets a consumer market with a low price tag while being easy to set-up and use which was crucial as we lack domain knowledge in filmmaking. A constrained budget also led to the film being produced during one day only, which eliminated iterations and saved time, probably compromising quality. A substantial amount of time was saved by purchasing a film texture plug-in, though a substantial amount of time was spent on confirming the visual quality and behaviour of the video.

Unity
The mobile application was implemented using Unity, since it support all major mobile platforms [Abraham 2015] and is easy to work with, which enable the future goal of turning Different Perspectives into a collaborative, global-wide, open sourced project.

Recording apparatus
Our videos was recorded with a 360° camera, Ricoh Theta M15. As 360° films allows for a new dimension of freedom it also requires a different storytelling than ordinary shooting. Keeping the viewers attention could be difficult enough when recording regular films but in 360 films the viewer might even have his or her back towards the scene of interest. In order to keep the viewers attention we used binaural sound, which provides a sense of direction through audio cues [Gilkey and Anderson 2014]. The binaural sound was recorded with two small microphones lodged into 3D printed ears, simulating natural human ears in order to mimic the human ability to detect sound sources. The audio recording device was placed within a mannequin head, partly because the cranial shape enhance the illusion of binaural sound but also because the camera could be placed on top of the mannequins head to obscure the recording apparatus. The human shape probably eased interaction with the camera for the actors as well.

Navigation system
Since we used Google Cardboard v1.0, which lack a physical way of interaction, a new type of menu system was implemented into the app. Interactions are activated by aligning certain items in center of the field of view, and if the item stays centered for more than 5 seconds, the action is activated, such as pausing a video or navigating back to the main menu.

FINDINGS
During the inspiratory phase, several important findings were identified for further ideation. The initial idea for the design was an anti-bullying application where the student could immerse in different characters in the same scenario. However the contemplated characters of a bully, a victim and a bystander would according to the expert interviewee Olle Cox at Friends imply a risk of being harmful. The situation of bullying in schools have a higher level of ambiguity and bullying should not be framed as an identity but rather as an action. The complexity that the same person could perform both the actions of bullying and acting as a victim created an incentive to design an ambiguous scenario where the material creates a discussion around the different impressions.

When creating the script for the scenarios several iterations were performed. The initial scenario was brainstormed after performing a secondary research on videos touching on the subject of bullying. The ideas were then drafted to teachers at Kattegattgymnasiet for evaluation. The input strengthened our grounds of an ambiguous context with the approach of focusing on actions rather than labeled characters.

The second iteration of the scenarios was briefed with the director and actor Johan Paus. This created valuable input on how to create an inspiring workshop for the students that would later be the actors of the film. Enabling improvisation but still provide a framework clear enough for the students to follow was an insight collected in collaboration with the director and actor.

The workshop performed together with the students at Mikael Elias Gymnasium worked as a combined inspiration and implementation activity. Since the students were given a framework, or rather a context to work with, instead of a script the perspectives could be collected from the point of the students themselves. This approach was successful since the students could provide first hand information on how to create convincing interactions and to find the right level of ambiguity. Three different scenarios with varying contexts and social constructs were recorded during the workshop.

Bus Stop Scenario
The participant immerses in an experience where she or he is in the middle of an unwanted conversation with a classmate. The participant texts a friend which arrives in order to rescue the participant from the situation, leaving the other classmate feeling left outside.

Group Room Scenario
The participants takes part in a conversation with some classmates in a group room in between classes in school. Everyone is engaged in the conversation, except for one. She is trying to get a word in edgewise, but the rest of the group carries on talking without really responding to her inputs. When everybody leaves for classes, nobody waits for her to gather her belongings, but simply leaves without a glance back at her, one however, does stop to check if the participant is coming.

Corridor Scenario
It is Friday and of the girls in class is having a party this weekend, several of her classmates are invited but not the participant. People are streaming out of various classrooms to get their belongings from their lockers. Students are talking about the upcoming party but as they pass the participant standing by his/her locker their conversations die. Two students run into the girl who is having a party and one of them persuades her to allow for one more friend to come. She agrees and says what more harm can one person do? The participant overhears the conversation but is still not invited.

After evaluating the final results of the different scenarios it resulted in only focusing on the corridor scenario. This is due to the difficult balance of creating an ambiguous scenario that is clear enough to elicit feeling and thoughts when immersing in the experience.During the creation of the scenarios the insight arose that in order to get a good understanding of the scenario and the context an introduction was needed. Hence, fixed films were created with a voiceover to introduce the subject.

Final Design
The final design is an empathy building immersive experience to help students to see a scenario from different perspectives. The corridor scenario is displayed via an application for smartphones together with google cardboard to create a VR environment where the participant can explore the environment from a fixed position but in 360°.

The goal of the experience when using the Different Perspectives application is to open up for discussion together with other students in a classroom and with the teacher as a moderator. Because we all have different backgrounds and different ways of interpret social situations the perspectives on this experience would probably differ from individual to individual. The immersive quality of different perspectives together with the ambiguous situation that opens up for interpretation is created to build an increase empathy in a school environment.

DISCUSSION
Our intentions with this project has been to create a discussion based on situations seen from different perspectives. In the particular case of this project the aim was to create something for Mixed Reality in Education and collaboration has been done with secondary schools in Halmstad and in Gothenburg.

The final presentation, an exhibition focused on Mixed reality in education — a project in Interaction Design held at Lindholmen Visual Arena, clearly demonstrated how our product can start a discussion and it also showed how important it is to discuss the different questions brought up. In an auditorium with about 40 people we got almost as many different reactions. The discussion held after the presentations lasted longer than the presentation itself and that shows just how important the subject is. Insights gathered from both the exhibition as well as the presentation shows that the different perspectives approach can be taken in so many more situations than in the school environment. The use of different perspectives can be applicable in several fields, the question is just how.

Another insight reached during the process of the project was the fact that the more we learned about the area, the less we knew.

Choice of Terminology
Bullying situations are seldom as clear-cut as we imagine. The image some of us have of bullying is of children, usually young boys, it most likely involves physical violence. There is also, naturally, a stigma surrounding the concepts of bullying and of victimisation. Do you identify as a victim? Would you call yourself a victim in front of others? How about bully? Does anyone ever self-identify as a bully? One of our main insights from our telephone interview with Olle Cox, of the anti-bullying organisation Friends, was that: Bully is something you do, not someone you are. In subsequent workshops with teachers at Kattegattgymnasiet, as well in group discussions, we decided to avoid the term bullying. As we moved away from bullying as a term, we also shifted our focus to more ambiguous social situations. The image of bullying, as mentioned above, of physical and verbal violence, is certainly a very serious problem. However, as people grow up this kind of bullying changes, it does not go away, but it changes into something else. Harder to grasp, more subtle, but equally devastating. It mainly manifests itself in social situation, in interpersonal interactions. So we decided on the term Ambiguous Social Situations. Because, while the situation could, of course, be about very obvious social ostracism, it could just as well be about a look. A titter as you pass someone in the corridor, or silence.

Reflections on 360 Cinematography
In preparation of the exhibition we decided to only present our third scenario. We judged the first one to be too short, and the second one was too long. There were also cinematic considerations that pushed us to kill our darlings, as it were. The first scenario at the bus stop had a person standing to the participants left, talking to the participant, then a second person comes into the shot, also from the left. Leaving no time or incentive to explore the 360° of the video. This is not necessarily a problem, though, since the mere opportunity to explore might be enough, since it is immersion we are after. Being in a 3D world would, we believe, be enough to create the immediacy we are after, even if the participant is only really looking in one direction. However, it would make a poor demonstration for the exhibition as the scenario was quite short and a bit too ambiguous. Similarly, the second scenario featured a group of people talking, seated around a table. The scenario ran quite long and the conversation was not the most engaging, this of course, was not the point of the scenario, the point was that a group of students were not very inclusive to a new girl. Cinematically however, it was also quite lacklustre, there was not much going on, and since the participants point of view characters did not have any lines of dialogue, you got the feeling that they were a fly on the wall rather than a fellow student.

Apart from lessons learned about bullying and the technological issues with VR, the group also learned a lot about shooting. The difficulties with shooting in 360° are too numerous to list in the scope of this report, but the most obvious is the fact that everything is visible, you cannot really have additional light sources or audio recording devices unless you hide them well. We solved this with layering the menu system in the bottom of the field of vision, obscuring the binaural recording rig and camera stand quite well. Other issues we found were which should be the home angle, that is to say, which angle should the camera start from, and how will this affect how the participant views the scenario. For the corridor scenario we had the cameras home be a view of the lockers, this incentives the participant to start to look around, since they hear sound around them but cannot see anyone initially.

Reflections on the implementation
Our mobile application worked very well considering the bottleneck that our 360 camera imposed, with a low resolution and limit of 15 frames per second. Still, the majority of our users did not seem to experience this as a problem. Furthermore, the binaural audio setup we used is normally combined with a static video. But still, testers did not find these issues as a drawback. Both these observations further strengthen the possibility of this concept to become a worldwide initiative, since the equipment we used was cheap and widely available. Still, it would be very interesting to iterate on it to observe what impact a high quality production would have on the experience.

CONCLUSION
As the lack of empathy can be seen as a humanitarian problem in various situations in our present society, the starting point of Different Perspectives is exploring the possibility to use an immersive experience for empathy building. By using VR technology and an open source approach, the hope with this project is to help exposed or vulnerable humans by addressing that we all have different perspectives. Moving forward we would like to further test our project with different groups of students and teacher, and determine how to expand. We also hope that Different Perspectives could work as a platform for other designers to contribute their own content with similar themes.

REFERENCES
1. ABRAHAM, 2015. What VR could, should, and almost certainly will be within two years blog. http://tinyurl.com/ abrashblog. Accessed: 2015-10-27.
2. BBC, 2014. Listen up! Binaural sound bbc. http://www. bbc.co.uk/blogs/researchanddevelopment/2013/03/listen-up-binaural-sound.shtml. Accessed: 2015-10-20.
3. BEANOTHERLAB, 2015. The Machine to be another website. http://www.themachinetobeanother.org/. Accessed: 2015-10-20.
4. COX, OLLE, 2015. Olle Cox phone interview. Accessed: 2015- 09-24.
5. DIGI CAPITAL, 2015. Digi Capital article. http://tinyurl. com/digicapital. Accessed: 2015-10-27.
6. FEHSKE, A., FETTWEIS, G., MALMODIN, J., AND BICZOK, G. 2011. The global footprint of mobile communications: The ecological and economic perspective. Communications Magazine, IEEE 49, 8, 58.
7. FRIENDS. 2016. About Bullying › Friends. Retrieved 5 February 2016, from http://friends.se/en/facts-research/about-bullying/
8. GILKEY, R., AND ANDERSON, T. R. 2014. Binaural and spatial hearing in real and virtual environments. Psychology Press.
9. GULLIKSEN, J., LANTZ, A., AND BOIVIE, I. 1999. User centered design in practice-problems and possibilities. Sweden: Royal Institute of Technology 315, 433.
10. NILSSON, H., AND SANDELL, M. 2006. Drama i skolan-hur kan forumspel pa˚verka barns utvecklande av empati?
11. SPRINGER, P. 2012. Pioneers of digital success stories from leaders in advertising, marketing, search, and social media. Kogan Page, London Philadelphia.
12. UNITY TECHNOLOGIES, 2015, http://docs.unity3d.com/Manual/AudioSpatializerSDK.htm