[A SOLUTION OF EMERGENCY SITUATION FOR DEAF PEOPLE]
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Introduction.

According to EU, 9% of the population has deaf of hard of hearing problem which is 44 million in total (Rocha, Paredes, Soares, Fonseca, & Barroso, 2017). To integrate with the normal society deaf community used three methods for teaching which was developed in 1880 in an international conference of Teachers of the deaf in Milan.

- Sign Language
- Oral
- Mixed (sign language and oral)

People who born deaf tried to socialize with deaf community to learn sign languages. Today when mobile technology is ubiquitous play his role to teach deaf community with modern techniques. The aim of this project to investigate the hurdle faced by the deaf community in an emergency situation and what technology-based solution make this society more inclusive than ever.

There are different factors which cause hearing impairments including exposure to loud noise, diseases, injuries, prenatal issues or malformation of ear structure. In a report by (WHO, 2017) on deaf and hearing loss, it is estimated that deafness and hearing loss will reach more and more people due to non-observance of hearing hygiene like being exposed to loud noises and not wearing suitable protection like earplugs, etc.

Taking into consideration that approximately 5% of world population is hearing impaired, we wonder how those people find themselves in an acoustic world. Most alarms use sound as the main way to notify people, visual effects are an addition.

Problem Statement

- Curiosity: How hearing impaired / deaf perceive an acting world?
- Safety: Do they feel safe? What kind of prevention do they use to feel safe?
- Geeky: How the technology can improve their life?
- How to improve the safety of deaf people in emergency cases?
- How to improve their feeling of being secure outside?
- How can technology help them to feel safe?
- How is the culture of mobile/tech usage?
- Can they be active/mobile and feel safe?

Literature Review

The deaf community is socially separated in the extraordinary situation like an emergency situation especially file alarms. In a mobile interface solution design by (Constantinou, Ioannou, & Diaz, 2016) introduce in Cyprus in which they have designed a mobile interface for emergency numbers. The weakness of this project is that they send SMS via GSM network which has some delayed and some time. In a second research (Ribas, Fadel, Vanzin, & Ulbricht, 2016) in which they have designed the accessible icon for the deaf community. The alerts for fire alarms in the form of sound and text are not accessible for the deaf community so we need solutions where visuals or vibrations alerts can notify the deaf community about the emergency.
The universal design is a good approach for our project. (#246 et al., 2008) conducted the case studies presented in the mentioned article found out that disabled users do not want to feel stigmatized so our device would need to correspond to usability and trend design. They stated that the device which is advertised “for handicaps” will not be marketing blast and people would reject it.

Researchers underlined also that the most important thing is to know users’ needs. That’s why developers have to get in touch with the sample of the user group and discuss what are their expectations, needs, and wishes. The one thing is pragmatism so creating something which would safe people’s life, but on the other side, that thing has to be universal so disabled people do not feel being exposed. The following points describe what mobile interface should offer the deaf community.

- The device we create has to have a clear purpose and people need to know what it is for. In the article, researchers mentioned that significant group of users did not realize the presence/usage of displays.
- Also, the information should be easily accessible and understandable.
- The idea of connecting a device to public display seem interesting for us. It could be used when users are outside, for example in case of emergency their phone would read the fire alarm pattern (as Shazam reads music), and then all screens which are nearby could display the info about the danger. Let’s say a person is in a train, the alarm goes on, so all screens notify people about it. (In that case, a person does not feel stigmatized - everyone can see and read the screen)
- Also, the navigation concept was good. User notified by his device may approach a screen a find the easiest way out.

According to Boyce, Fisher, Smither and Hancock in their article Design of instructions for evacuating disabled adults the level of stress during the emergencies should stay as little as possible. That is why clear instructions and understanding of a situation is important. People should understand how to use our device, how/in which cases it works and what to do during emergencies. It was also suggested to use “buddy systems “ - a group of people to take care of disabled people in case of emergency. But it is very often that hearing impaired people are alone in the building/room and they have to take care about themselves. This article is useful for our project due to their research design and different experimental procedures.

Baudish and Hincley in Blindsight: eyes-free access to mobile phones give a great example of combining multiple functionalities in one device - something which is very useful in our project.

**Research Method**

In the book (Shneiderman, 2016) has suggested new techniques how to test ideas and prototype in the progressively realistic way. Researchers and practitioners in HCI used several techniques like sketching, scenario writing, mock-ups, and paper or functional prototypes. However, in this study, we chose smart prototyping technique Wizard-of-OZ. Inspired by the study (Müller et al., 2016) in which they defined the difference between the traditional and new way of prototyping for new technologies especially for user interface design.
We would like to make a technical assessment on the existing solutions. After that, we will see if new we can scale up the mobility of the current solution, add functionality, increase efficiency, increase usability, or find out what we can learn from other projects if we found the perfect solution.

As described down we have approached and create link with some companies in the sector. Based on our findings, We may do a (low/high) fidelity prototype for the proposed solution.

**Data Collection**

We will use both qualitative and quantitative data collection. We have contacted few organizations which work with deaf / hearing impaired people and we hope to have few interviews with their members. For doing that, we might need a language sign translator if the person is completely deaf and does not use hearing aid.

We have created a (anonym) survey which we will distribute among deaf / hearing impaired people to get quantitative data for our study. The survey englobes subjects as:

- Feeling safe in mass events?
- Feeling safe in public buildings schools, hospitals, shopping centers...?
- What kind of safety devices/systems used to be alarmed during the emergency?
- What is their experience in this kind of situation?

**Specific case study at UIO**

We will have an interviews with people working with safety and alarm related issues at HSE department. Trond Gran Larsen shows his willingness to contribute in our research. During the interviews, we will find out what kind of procedures they use to make sure that everyone is alarmed/notified about the emergency and how do they check that all people (including deaf) got this information. Also, we will ask what would make their job easier when it comes to handicap people.

**Observation**

We will have short interview and observation together with UIO property administration (Eiendomsavdelingen). We have contacted Arvid Thorstensen and Kyrre Karlsen. We will investigate the alarm system functionalities and universality. In addition, we will ask their recommendations for better solution.

**Other sources**

So far we have talked with Jon Arve Brekken from Kiwa Teknologisk Institutt. He gave us some ideas about the current progress in the market. He forwarded our questions to an expert in the fire alarm systems. We are planning to do the interview in few days.

In addition, we are planning to meet a fireman (waiting for confirmation) and we would like to ask him about his experiences with deaf people.
Findings

We have seen some products and applications which are on the market. They are not perfect solutions specially in connection with mobility.

Three Types of Fire Detection Devices
Extra Loud Sirens: For those that aren’t completely deaf, it’s possible to install sirens that are louder than the usual sirens installed inside a home. Extra loud sirens can also help to alert nearby neighbors, who might be able to provide some assistance for elderly residents.

Color-Coded Flashing Lights: Flashing lights can be strategically placed throughout a home to give occupants a signal to the type of danger at hand. One color can be set to signal the detection of a fire and another can be used to indicate a potential burglary, because it’s vital to react appropriately to the type of danger at hand.

Vibration Devices: For those with extreme hearing loss, sirens and flashing light might not be enough to wake them from a deep slumber. Shaking devices attached to the bed and a favorite chair can help jolt occupants from a sleep, and help ensure they’ll be able to get to safety in time.

Mobile-based solution. A sound recognition platform that functions through recognizing and analyzing sounds from the environment and converting these into visual and sensory notifications and alerts is one it that we consider as a bouncing spring. The technology capable of detecting a wide range of sounds which can be displayed on a smartphone, smart watch or other portable smart devices to alert the users to an extensive variety of indoor and outdoor sounds.

Prototyping
We will invite few deaf people to help us to create a device which they would be willing to use. We will ask them what they would need and will try to make “quick and dirty” prototype to illustrate if it corresponds to user needs.

We think that participatory design approach might be useful in our case, because users will create a device they will not be ashamed / feel stigmatized to wear. Also, we will know their needs better because we will work together on that.

Further steps:
- Interviews with people mentioned above
- Data analysis
- Prototyping session with users
- Testing
References


Li, K., Baudish, P., Hincley, K: Blindsight: eyes-free access to mobile phones, ACM


