HCI Project Report

ABSI - Assisting the Blind in Social Interaction

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Team

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Contents

1. Purpose of the Product

People who are blind or visually impaired exhibit inappropriate social behavior as they do not understand the reactions of people whom they are interacting with. We propose to develop a system that will capture the images of a person with whom the blind person is interacting and identify their emotions. The results will be sent as private audio messages to the blind person.

2. Related Work

A Thesis paper 'Wearable-Assisted Social Interaction as Assistive Technology for the Blind' by David S. Hayden is a related work for our proposal. This paper was presented in June 2014 at MIT.

This work is based on the motivation to provide blind people with the ability to engage in social interaction independently. It also explains the problems of blind in interaction and about the inappropriate behaviors exhibited by the blind in public. Ability of blind or visually-impaired to initiate social interaction is a noticeable issue which is given little or no consideration. This ability can be accounted as a gap between the blind and normal people in terms of social interaction. Considerable amount of work has been done to help the blind engage in education and workforce but there is no work advance in technology or interface that helps blind in social interaction.

The design consists of a wearable system that can learn and assist wearer's social interaction. The following are the three scenarios of design:

- Spotting acquaintances when they are passing by or in a crowd
- Quickly identifying proximate acquaintances that have just approached
- Alerting the wearer about the presence of a specific acquaintance

This requires the system to accurately distinguish between acquaintances and non-acquaintances. Face detection and recognition techniques are used to identify an acquaintance. After the identification, notification of full names is sent wirelessly to a wristwatch which can communicate information by a text display and vibration-encoded messages. At the end of a day, the wearer is provided with an offline summary of social interaction and asked to label people whom they would like to add as an acquaintance.

Figure: Person wears mobile around the neck which acts as the camera and notifications are sent to the wristwatch.

3. System Architecture
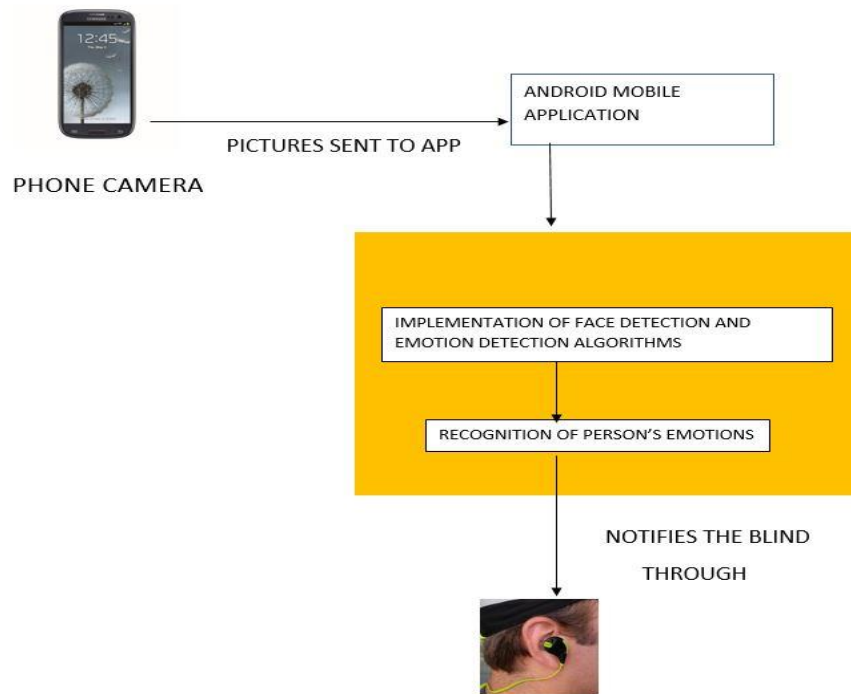
4. Requirements

Requirements to use the application:

1. Android Mobile with minimum API level 16 (4.1, Jelly Bean)
2. Bluetooth headset or Earphones
3. Mobile connected to WiFi

Web Services used:

1. Microsoft Cognitive Services (Face API, Emotion API)

5. Phase Timelines

Phase 1 (January):

1. Analyzing the problem
2. Deciding on approach
3. Requirements Gathering

Phase 2 (February):

1. Designing UI Prototype
2. System Architecture
3. Face Detection on Images

Phase 3 (March):
1. Extracting image frames from videos
2. Configuring camera into application
3. Emotion recognition on Images
4. Pilot Survey

Phase 4 (April):
1. Working on Live camera feed data
2. Face detection and Emotion Recognition on the video streams
3. Implementing 2 approaches (Screen Tap and Automatic approach)
4. Testing of the application
5. Usability testing

6. Surveys

6.1 Consent Form

UNIVERSITY OF TEXAS AT ARLINGTON

CONSENT FORM FOR HUMAN-COMPUTER INTERACTION CLASS

Study Title: Assisting Blind in Social Interaction Project Usability Testing and Survey
Principal Investigators: Likitha Seeram, Harish Nambiappan, Venkatesh Ramanathan

Why are you doing this study?
The purpose of the study is to do usability testing and collect feedbacks about user experience from the participants. This would help us to understand how easy and helpful is our system to use.
What will I do if I choose to be in this study?
You will be asked to
- Blindfold yourself and connect your Android mobile with a Bluetooth or Earphones.
- Interact with a person and follow two approaches (Explained below) in testing the application.
- Provide us your feedback and comments in a google form (Survey).

Approaches:

S.no	Action
1	Double tap on mobile screen to get the response
2	No action required. Response is given frequently.

Study time: Study participation will take approximately 15 – 20 minutes. Participants are required for only one session.
Study location: Any location comfortable to participant at the university.

I would like to audio-record and video-record this interview to make sure that I remember accurately all the information you provide. I will keep these tapes and they will only be used by principal investigators. If you prefer not to be audio-recorded/ video-recorded, I will take notes instead.

I may quote your remarks and use your recording in presentations or articles resulting from this work.

What are the possible risks or discomforts?

To the best of our knowledge, the things you will be doing have no more risk of harm. As with all research, there is a chance that confidentiality of the information we collect could be breached, we will take steps to minimize this risk.

What are the possible benefits for me or others?

You are not likely to have any direct benefit from being in this research study. This study is designed to learn more about blind people's capabilities in Social Interaction. The study results may be used to help other people in the future.

Financial Information

Participation in this study will involve no cost to you. You will not be paid for participating in this study.

What are my rights as a research participant?

Participation in this study is voluntary. You do not have to answer any question you do not want to answer. If at any time, you would like to stop participating, please tell me. If you withdraw from participation, we will not be using your data.

Consent

I have read this form and the research study has been explained to me. I have been given the opportunity to ask questions and my questions have been answered. If I have additional questions, I have been told whom to contact. I agree to participate in the research study described above and will receive a copy of this consent form.

_____

Participant's Name

_____   _____

Participant's Signature   Date

6.2 Survey Link

https://docs.google.com/forms/d/e/1FAIpQLSf_Z9Fk-1GT99paVFTLng80-bmxavXBpNrZr_CCLjvms-Wp3g/viewform
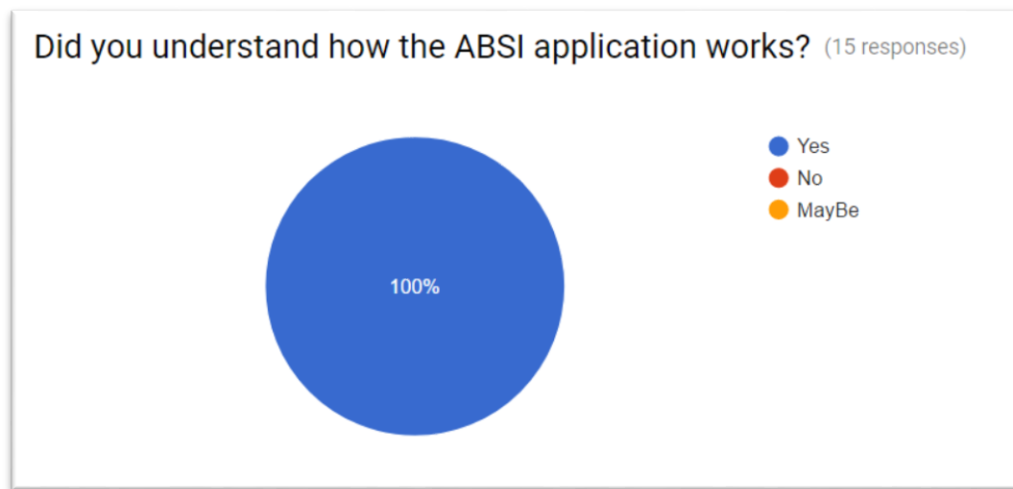
7. Data Visualization

Figure 1: 100% YES when asked about understanding how the application works
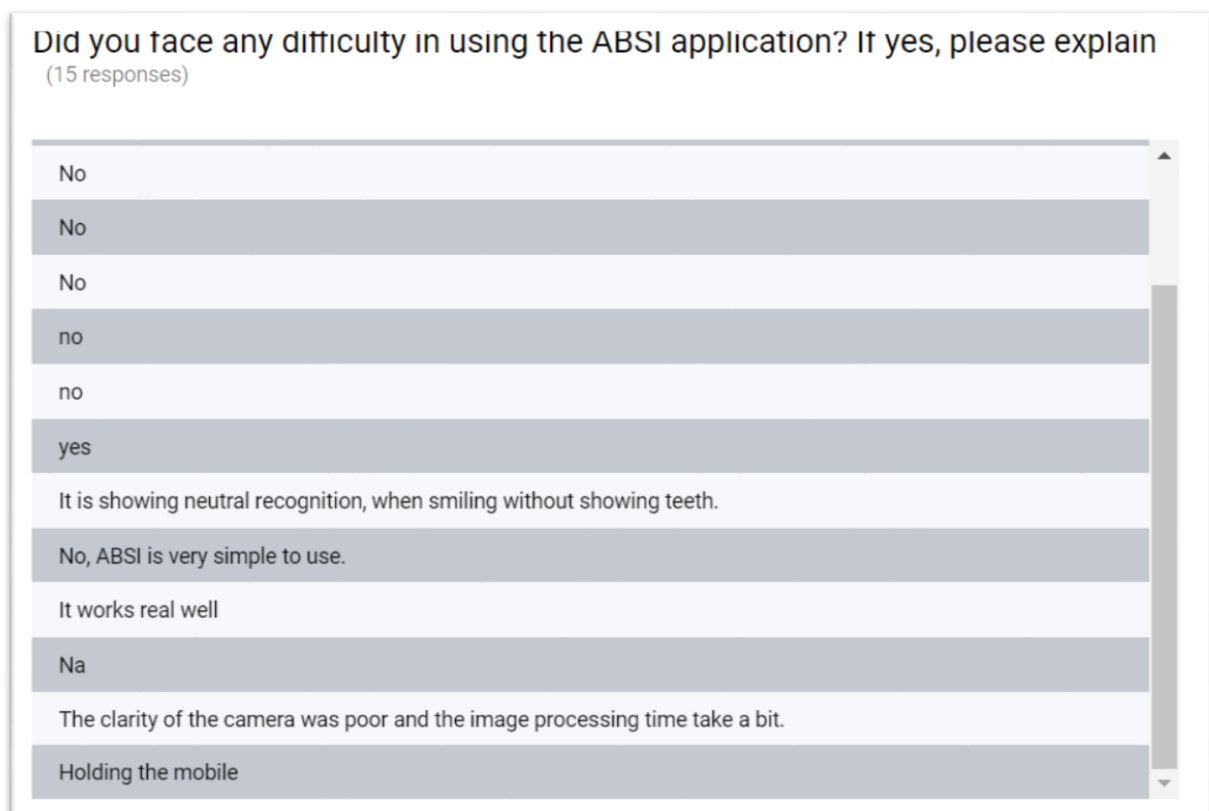

Figure 2: When we faced if there is any difficulty while using the application, most of the participants said no.
A few asked about the clarity of the camera and discrepancies while recognizing emotions accurately.
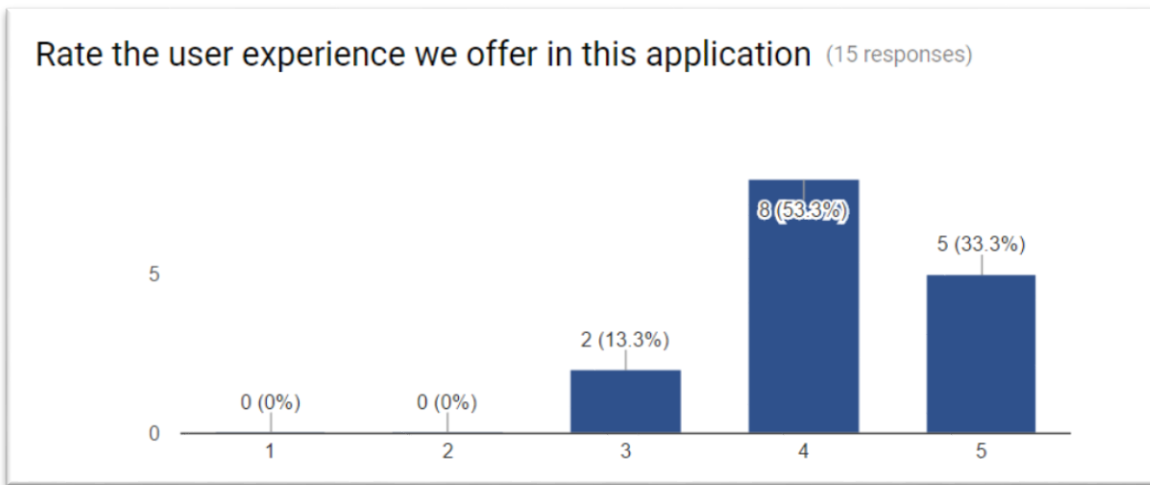
Figure 3: When asked about rating the user experience we offered in this project on a scale of 1-5
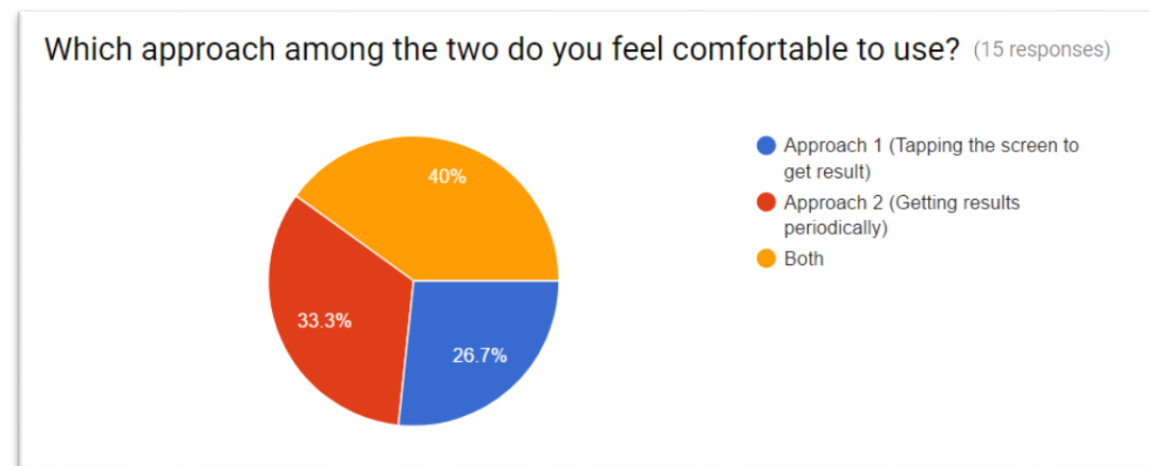

Figure 4: Question about which application is comfortable to use
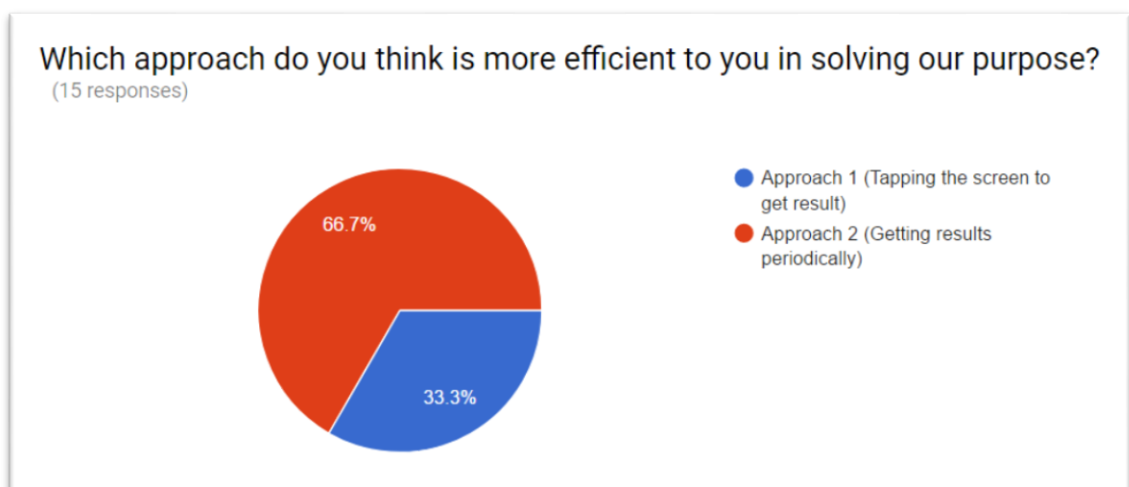

Figure 5: Question about which approach is more efficient

What do you think would be the appropriate time frequency of the output messages in approach 2?

(15 responses)

- Every 5 seconds
- Every 10 seconds
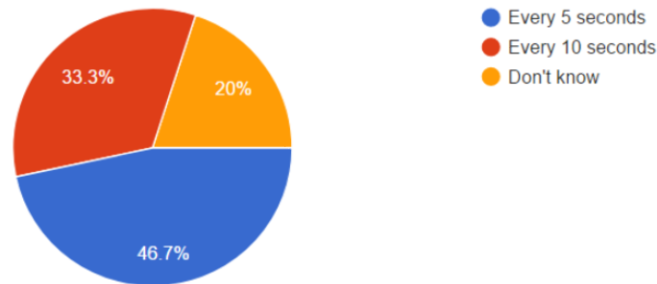- Don't know

33.3%   20%   46.7%

Figure 6: When asked about the frequency of audio messages

Would you suggest about this application to any of your acquaintances who are visually impaired?

(15 responses)

- Yes
- No
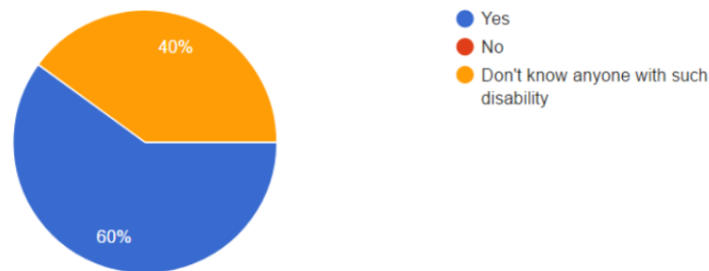- Don't know anyone with such disability

40%   60%

Figure 7: Most of the participants said YES when we asked if they would recommend this application to visually impaired people

Would you also like the response message to include 'gender' and 'age' of the person?
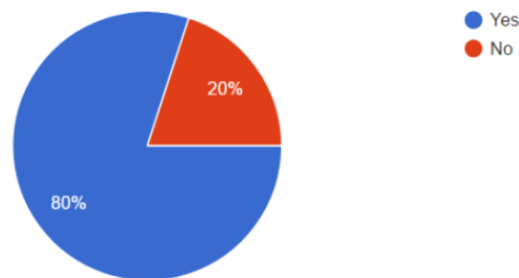
(15 responses)

- Yes
- No

20%   80%

Figure 8: Most of the participants said YES when we asked if they would like to listen to gender and age of the person in the response

What do you think are the possible areas where face detection and emotion recognition methods can be used?
(15 responses)

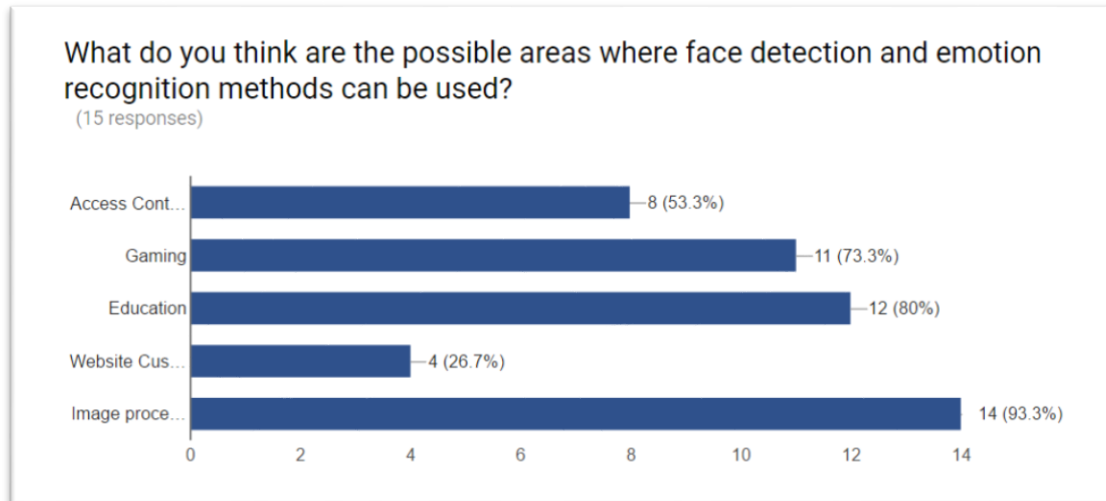| Category	Value
Access Cont...	8 (53.3%)
Gaming	11 (73.3%)
Education	12 (80%)
Website Cus...	4 (26.7%)
Image proce...	14 (93.3%)

Figure 9: Possible areas where face detection and emotion recognition can be used – Access Control Systems, Gaming, Education, Website Customization, Image Processing applications
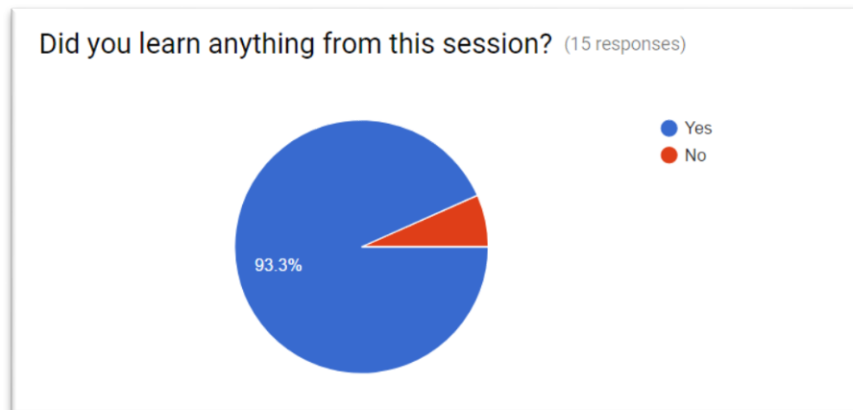
Did you learn anything from this session? (15 responses)

- Yes
- No

93.3%

Figure 10: When we asked if they learned anything from this session

Please provide any suggestions or comments on this application (15 responses)

Excellent.

It's a good application for blind people.

This is a very good application which is meant for a noble purpose. It works fine, but has some trouble recognizing the anger emotion.

N/A

It's a really great application for the visually challenged ppl.

Excellent

Great job 😊

Good application for anyone who is visually impaired. Use of face detection and AI is a great step to help anyone with such disability.
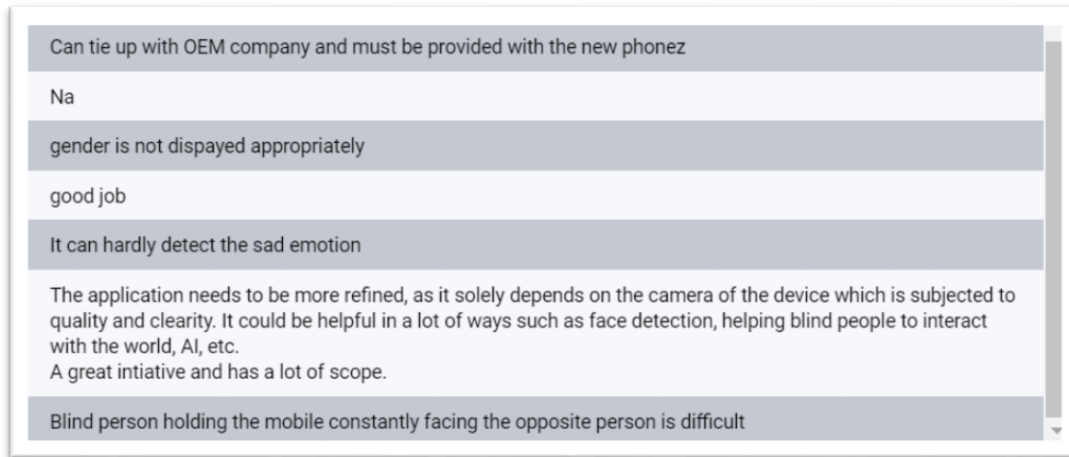
Figure 11: For the question 'Comments of Feedback', most of the participants gave a positive response. Few of them gave constructive feedback like 'Holding the camera is difficult', 'Emotion recognition is not accurate', ''Age, gender are not being displayed properly'

8. Future Work

- Implementing the approaches using Spy Camera
- Providing user interaction in such a way that blind person could easily operate
- Evaluating the emotion of the face more accurately
- Working with many faces in a single image
- Personalizing the application in a way that the app detects the known faces (people who are acquainted to the blind person)

9. Conclusion

We have learned about face detection and emotion recognition technologies, which are booming in software industry. We have also got   exposure to a project where we think from user's perspectives at all stages of development.

This project also helped us understand the problems faced by blind people in social interaction and how these problems can be addressed using various technologies available in market. We have got a chance to develop one such approach.

10.   GitHub and YouTube links

- ➢ https://www.youtube.com/watch?v=C-mvnF6YKTQ&feature=youtu.be
- ➢ https://github.com/harishram-nambiappan/ABSI
- ➢ https://github.com/Likitha-Seeram/Face-Detection-and-Emotion-Recognition

11.   References
1. Related Work
   - Wearable-Assisted Social Interaction as Assistive Technology for the blind (http://rvsn.csail.mit.edu/Pubs/master_hayden_2014jun_wearableassistedsocial interactionasassistivetechnologyfortheblind.pdf)
2. Microsoft Cognitive Services
   - Face API
     I.   https://www.microsoft.com/cognitive-services/en-us/face-api
     II. https://docs.microsoft.com/en-us/azure/cognitive-services/Face/Tutorials/FaceAPIinJavaForAndroidTutorial
   - Emotion API (https://www.microsoft.com/cognitive-services/en-us/emotion-api)
   - COC(https://www.microsoft.com/cognitive-services/en-us/legal/DeveloperCodeofConductforCognitiveServices20161121)
3. YouTube: https://www.youtube.com/watch?v=8yAqzi1dyaU
4. Android Developers site
   - https://developer.android.com/reference/android/hardware/Camera.html
   - https://developer.android.com/reference/android/media/MediaMetadataRetriever.html?
   - https://developer.android.com/reference/android/app/Activity.html
5. GitHub
   - https://github.com/Microsoft/Cognitive-face-android
   - https://github.com/Microsoft/Cognitive-emotion-android
   - https://github.com/josnidhin/Android-Camera-Example
   - https://github.com/josnidhin/Android-Camera-Example/blob/master/src/com/example/cam/CamTestActivity.java
6. Stack Overflow
   - http://stackoverflow.com/questions/3401579/get-filename-and-path-from-uri-from-mediastore
   - http://stackoverflow.com/questions/29546381/open-camera-directly-in-the-activity-without-clicking-on-button-and-without-inte
   - http://stackoverflow.com/questions/10749198/nullpointerexception-while-setting-image-in-imageview-from-bitmap
   - http://stackoverflow.com/questions/20097698/getting-image-data-continuously-from-camera-surfaceview-or-surfaceholder