CSE 118/218
Final Presentation
Team 2 Dreams and Aspirations
Smart Hearing
Hearing Impairment

- A major public health issue that is the **third most common physical condition** after arthritis and heart disease.
- Can affect people of all ages and depending on the cause, can be temporary or permanent.
- Degrees of hearing loss: mild, moderate, severe, profound.
20% of all Americans report some degree of hearing loss. That’s 48,000,000 people.
At age 65, one out of three people have some kind of hearing loss.
Current Solutions

**Hearing Aids**
- Technology that fixes some hearing impairments
- Not every hearing impairment can be fixed with a hearing aid

**Live Captionists**
- Someone who is not hearing impaired that can type speech on a computer
- Not always practical for 24/7 usage; not cost effective

**Sign Language**
- A silent and more visible way to communicate with hand gestures
- Not always practical because everyone must learn it
Our Solution: Smart Hearing
Prototype Design

Log

1:00pm: This looks good.
1:01pm: Yeah, I agree!
System Features

Facial Recognition
Recognizes up to 4 different faces and can identify facial features.

Speaker Identification
Identifies who is speaking and pair an audio file with a face.

Conversation Logging
Displays conversation text on the side with timestamp for easy access to dialogue.

Multiple Language Support
Support for different languages currently in progress, but currently working on Spanish translation.
Product Risks

Incorrect Parsing
The audio file that is passed into the system to be parsed may not return the correct text.

Angled Face Detection
The rotation of a subject’s face affects the detectability of an individual’s face.

Slow System
The system may need a powerful processor in order to handle the level of computation needed.

Background Noise
Background noise or undesired noises may affect the accuracy of speech-to-text processing.

Faces Too Close
Proximity of faces may affect the distinguishability of each individual.
Software Architecture Design

- Audio Input
- Visual Input
- Kinect v2
- Smart Hearing
- Audio Listener
- Beam Angle
- Body Image Listener
- Face Frame
Technologies Used

**Hardware**
- Kinect v2
- Surface Pro

**Software**
- Windows 8+
- Speech Dictation
- Kinect SDK v2 (C#/C/C++)
- Visual Studio
- Git
Challenges Faced

**Slow Processing**
Surface Pro’s processing power.
- Still a problem.

**Visual Studio**
Quirks and issues arising from minimal knowledge of this complex IDE.

**Choosing Libraries**
SpeechRecognizer to SpeechDictation.
# Testing and Evaluation

## Success Rate of Word Identification

<table>
<thead>
<tr>
<th>Control</th>
<th>Slow</th>
<th>Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quiet</td>
<td>58%</td>
<td>33%</td>
</tr>
<tr>
<td>Noisy</td>
<td>23%</td>
<td>2%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Smart Hearing</th>
<th>Slow</th>
<th>Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quiet</td>
<td>74%</td>
<td>43%</td>
</tr>
<tr>
<td>Noisy</td>
<td>32%</td>
<td>13%</td>
</tr>
</tbody>
</table>

Test Phrase: *four score and seven years ago our fathers brought forth on this continent a new*
Team Collaboration

Coordination

- Online
  - Facebook Messenger
  - Trello
  - Google Calendar

- In person
  - group coding
  - projector
  - googlers
Team Collaboration

Difficulties
- only one Kinect -> work together
  - other commitments
  - agree upon meeting times
- different skill levels
Trello Board
Team Organization

Previous Structure
- 2 teams
  - Speech
  - Kinect

Current Structure
- 1 big team
Future Work

More Language Support
Add more languages so that this can be accessible to users around the world.

Device Compatibility
Package application so that this can be compatible with other devices as well for portability.

Handle More Users
Make code improvements so that processing is efficient enough to handle more than 4 users at once.

Improve Architecture
Improving the software architecture in order to speed up processing for smoother handling.
Future Work

More Features
- language detection
- instantaneous translation
- user learning and adaption
- conversation understanding
Reflection

Things that went well
- Getting started early
- Team chemistry
- Meeting productivity

Things that need work
- More thorough testing
- Better time management
- Feature prioritization
Conclusion

- Some product improvements are still needed
- Some features are still in development
- Easy to use and setup
- Hearing impaired can greatly benefit from Smart Hearing
Questions?
Credits and References

- [http://www.hearingloss.org/content/basic-facts-about-hearing-loss](http://www.hearingloss.org/content/basic-facts-about-hearing-loss)
- Photographs by [Unsplash](https://unsplash.com) & [Death to the Stock Photo](https://deathtothestockphoto.com) (license)