Schizophrenia

A life long mental disorder involving a breakdown in relation between thought and emotion that leads to a faulty perception of reality.
Common Symptoms

- Delusions
- Hallucinations
- Disorganized Speaking/Thought

Statistics

- 2.2 Million people in America (about 1% of world population)
- Around 20% of that commit suicide
- One of the highest teen suicide rates of any mental disease
Current Solutions

mood and pill tracker

simple test

lexicon of schizophrenia
Motivation

We believe no one should have to live in fear of something that cannot hurt them physically, and we will do anything we can in order to help them.
Auditory Hallucinations

False perceptions of sound that are described as the experience of internal words or noises that have no real origin in the outside world.

**Motivation**

Create a tool to help users identify hallucinations.

**Approach**

Provide the user with a way to record the environment, and ask if the audio has an origin.
Visual Hallucinations

Manifestations that are perceived to be seen in the outside world, but do not really exist

**Motivation**

Create a tool so people do not have to feel afraid of what cannot physically hurt them

**Approach**

Show the user a flipped image of the scene to convince them that this is a hallucination
Smooth Pursuit

The ability to track a moving object in a straight movement

Motivation
Detect early signs of Schizophrenia

Approach
Track eye movement and show the results
The System

- **main**
  - MainActivity
  - FileManager
  - Enums

- **audio**
  - AudioActivity
  - HistoryActivity
  - QueryActivity
  - QueryResult

- **visual**
  - TakePictureActivity
  - GalleryActivity
  - VisualActivity
  - RelaxActivity
  - PictureResult

- **eye tracking**
  - SmoothPursuitActivity
  - AnalysisActivity
  - EyeTrackingActivity
  - AnalysisView
  - BallView
Audio Feature Architecture

1. Connect and record
2. Get results
3. Process, timestamp
4. Compare, process, survey
5. Store

Google Speech API

Record
Query
History

4. Store
3. Check for a match
2. Display
1. Connect and record
1. Get query results

Google Glass Local Storage
Visual Feature Architecture

- **Take Picture**
  1. Take picture, survey user

- **Gallery**
  2. Mirror image, display

- **Relax Mode**
  Open live feed, display
  color overlay, change color

Google Glass Local Storage
Devices and Systems

- Google Glass
- Android application (Java)
- Google Speech API
- Windows development machine
- Android Studio IDE
## Verus Features

<table>
<thead>
<tr>
<th>Auditory Hallucinations</th>
<th>Visual Hallucinations</th>
<th>Eye Tracking Diagnosis</th>
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</thead>
<tbody>
<tr>
<td>● Record audio of the environment.</td>
<td>● Take a picture of the hallucination</td>
<td>● Smooth pursuit test.</td>
</tr>
<tr>
<td>● Allow the user to ask the app.</td>
<td>● Review images mirrored.</td>
<td>● Results and diagnosis.</td>
</tr>
<tr>
<td>● Review history and diagnostic answers</td>
<td>● Relax mode.</td>
<td></td>
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Auditory Feature

Record

Record the environment

Speak your message
Auditory Feature

Ask

Did you hear that sound?

Yes, the audio was recorded in your environment
Tab to answer some questions 11-27-2015

No, the audio was not recorded in your environment.
Tab to answer some questions 11-27-2015
Visual Feature

Take a picture
Take a picture of the hallucination

Human figures
What did you see?

My Home
Where are you?

Anxious
How do you feel?

No
Did you take any medications today?
Visual Feature

Gallery

View your pictures

Hallucination: Human figures
State: Anxious, Took Meds At school, 12-02-2015
Smooth Pursuit Diagnosis

Follow the ball

Eyes: x = 130, y = 125

Smooth pursuit test analysis

Ball

Eyes

Test date: 11/27/15 7:54 PM
Test Result: Healthy
Probability: 85%
Color Feature

Tab to change color

just now

Tab to change color

Tab to change color

Tab to change color
Testing in the Verus World

- Patient X
  - Female
  - 21
  - 110lbs
  - High GPA
  - Color Test: Light Blue

- Patient Y
  - Male
  - 35
  - 210 lbs
  - Athletic
  - Severe Case of Schizophrenia
  - Color Test: Light Blue
Feedback

**Controlled Environment**

- **Base Heart Rate**
  - Avg 95% on Audio Test
  - Avg ~60% on Smooth Pursuit Diagnosis

- **Elevated Heart Rate**
  - Avg ~50% on Audio Test
  - Avg ~40% on Smooth Pursuit Diagnosis

**Uncontrolled Environment (~6 hours)**

- **Patient X**
  - Experienced Auditory Hallucinations

- **Patient Y**
  - Experienced Audio and Visual Hallucinations
Smooth Pursuit Test
Team Collaboration

- **Design Approach**
  - Focus on the illness before the device
  - Research the symptoms
  - Apply research to the capabilities of device

- **Communications**
  - Bi-Weekly meetings to review and assign task
  - Talked mostly through online communications
  - Google Drive to store schedules and information
Team Collaboration

- Task
  - Members share an equal level of experience
  - No assigned roles or components
  - Set task on a priority scale based on our timeline
  - More flexibility, better collaboration
Team Challenges

- **Devices**
  - Only one Google Glass until week 9

- **Schedules**
  - Conflicting schedules

- **Experience**
  - Little experience working with Google Glass
Future Work

- Filter out background noise
  - Helps in crowded areas

- Interpret the results
  - Heart rate

- Emergency contact
  - Based on feedback from patients

- Involve psychologists and doctors
  - Based on feedback from patients
Conclusion

- We were able to prove the feasibility of the idea.
- We implemented audio, visual, and simulated eye tracking features.
- Limits:
  - Can’t record all the time (storage, API limits, privacy)
  - Needs internet connection to use the Speech API (must carry a smartphone)
  - No eye tracking in Google Glass
Questions