University of Idaho
Department of Computer Science

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Department of
Mechanical Engineering

Spectralink

Augmented Echolocation

Sponsor: Dan Scheider
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Matthew Mills
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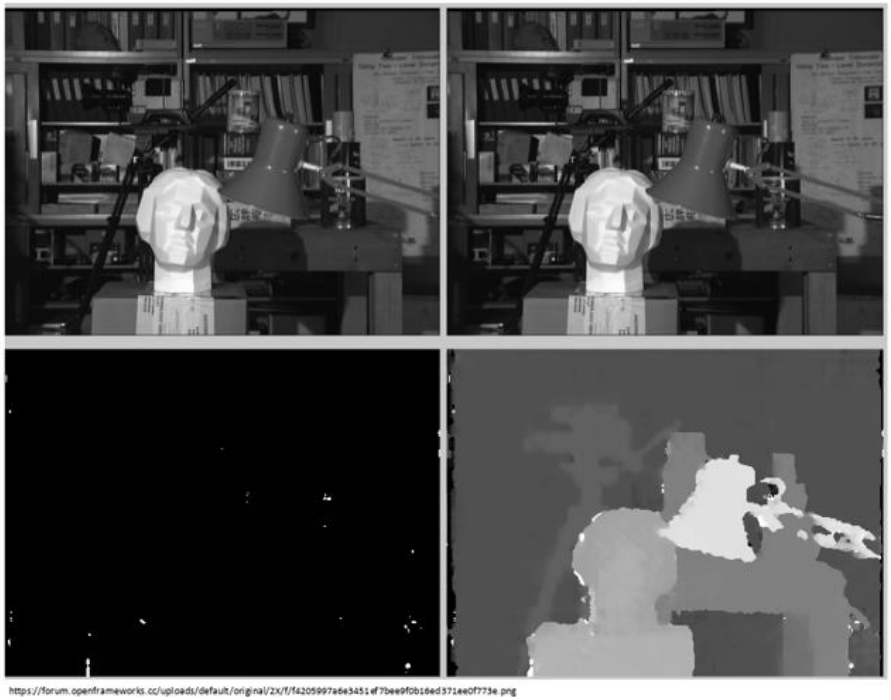

Visual Depth and Velocity Mapping

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Problem Statement:

Although there are extensive resources available for most disabilities, there are very few aids for the vision impaired. This project aims to write software to map visual stimuli to an auditory field using Real Time Disparity Mapping (RTDM) using a dual camera system and simple processor. The unit should be wearable and functional in the sense that somebody could walk around campus with it on their head. By February 15, we expect to have our first prototype running and functional.

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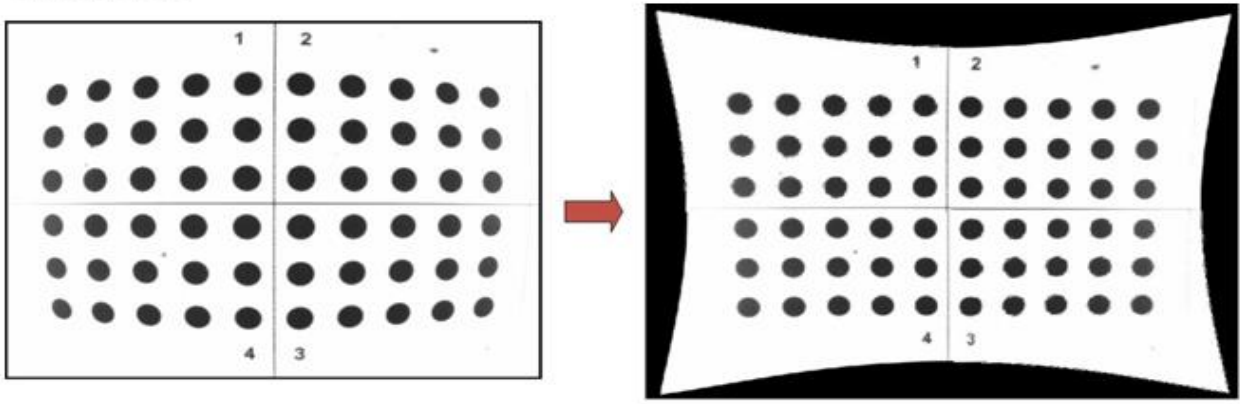
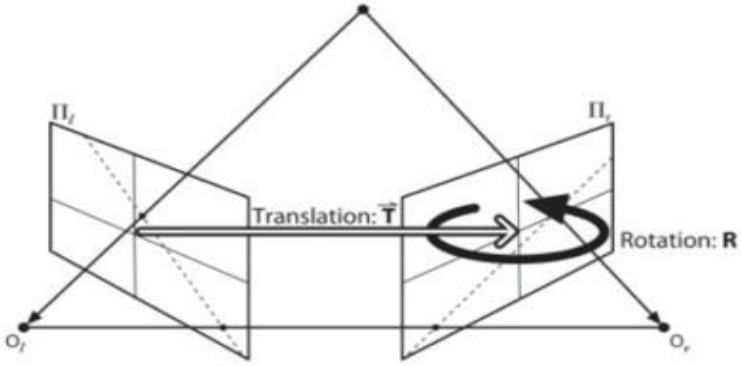
Project Learning

- Calibration



- Epi-polar Geometry



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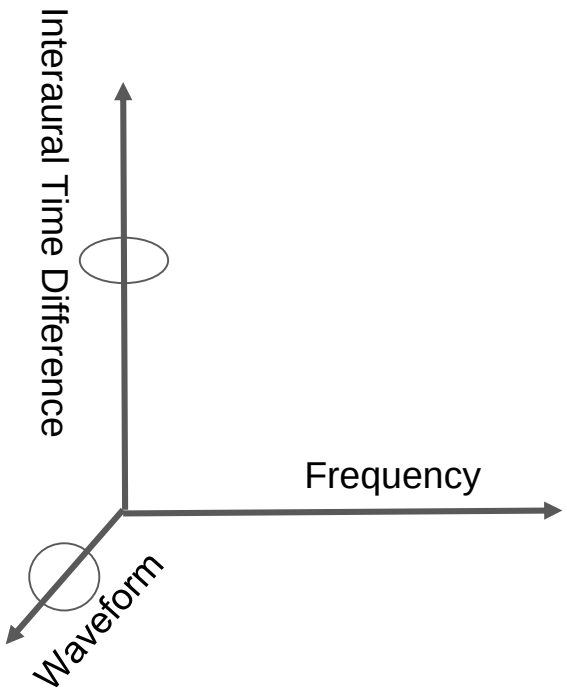
Aural Coordinate System



Three spatial dimensions must be mapped to 3 distinguishable sound characteristics for audio transmission. The three characteristics that will be used are waveform, frequency, and interaural time difference.

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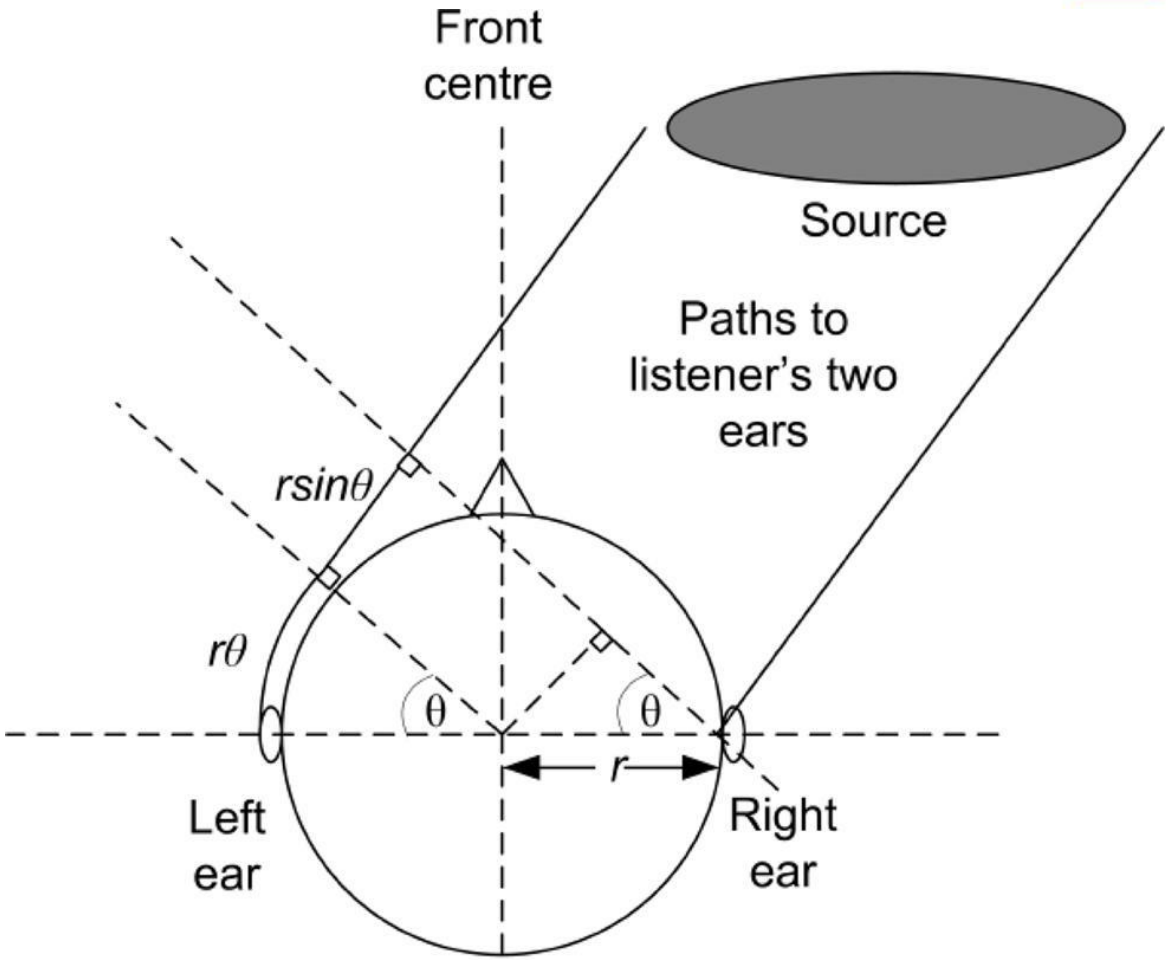

Brendan Glackin, Julie A. Wall, Thomas M. McGinnity*, Liam P. Maguire and Liam J. McDaid

A spiking neural network model of the medial superior olive using spike timing dependent plasticity for sound localization

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Spatial Mapping

Visual Depth and Velocity Mapping

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Edge Detection: The output of feature extraction is analyzed to filter out data in planar surfaces. The only data points left are those that lie along edges and curves in the image. This allows meaningful information to be conveyed without overwhelming the system with data points that do not convey information about the spatial layout of the objects in the image.

https://becominghuman.ai/detecting-lane-lines-udacity-sdcnd-b52bf36193cb

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4 Functional Requirements:

User Interface Requirements:

A set of headphones and a camera shall be attached to a helmet or hat.
The device should be secured to the body in a configuration suitable for walking and sitting.
The device should not impede user's ability to interact with objects in front or to either side of him or her.
The device should not expose the user to any severe electric or mechanical hazards (electric shock or burning).

What the product should do:

sufficient for traversing a room without the assistance of eyesight.

5 Mechanical Requirements:

Spatial Requirements:

The Board shall fit within the requirements below:

Overall Length	400	mm
Overall Width	400	mm
Overall Height	30	mm

Weight/Mass Requirements:

Maximum weight	10	lbs

6 Electrical Requirements:

Voltage:

Board	5.1	V
Camera	5	V

Power:

Board	12.6	W
Camera	3.8	W

7 Software Requirements:

Specifications:	Property	Min	Nom	Max	Units
	Working Element		2048 (min)		
	between	1.5	3	4.5	degrees
	between		1.5		degrees
	Framerate	15	30	60	FPS
	field (max)	15	20	30	m

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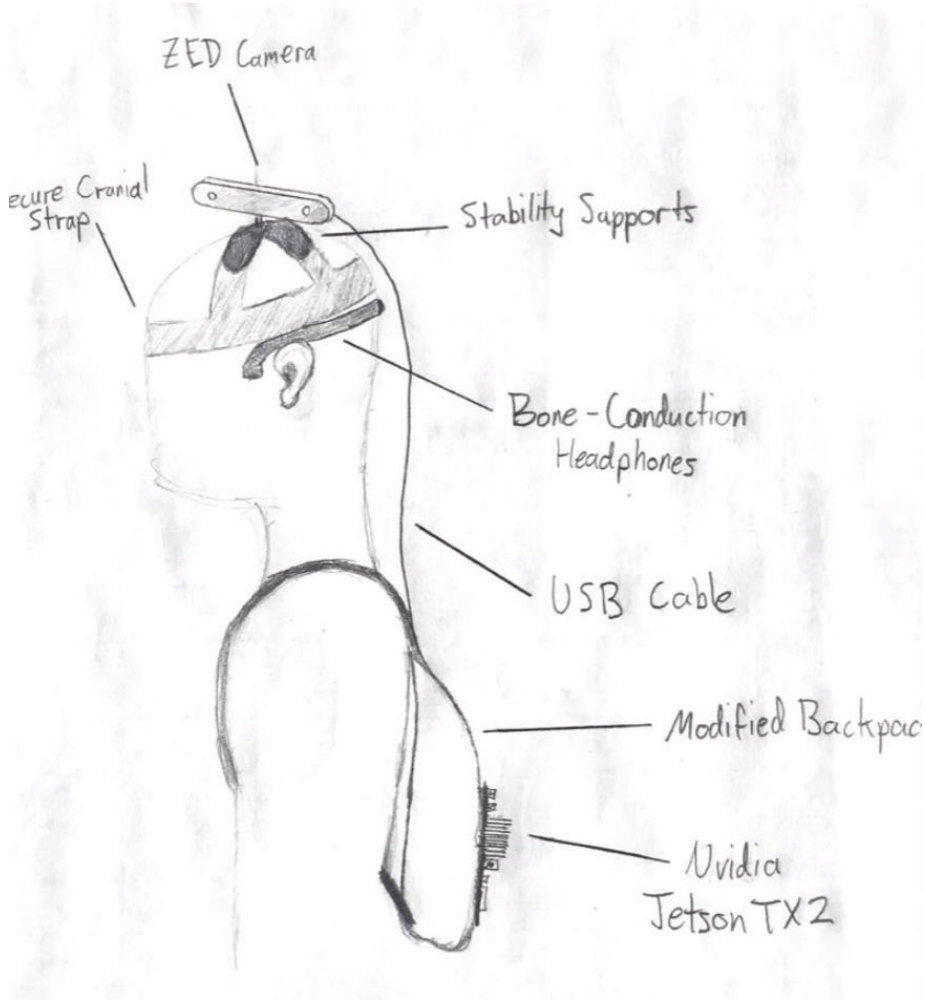
Hardware Layout Diagram



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