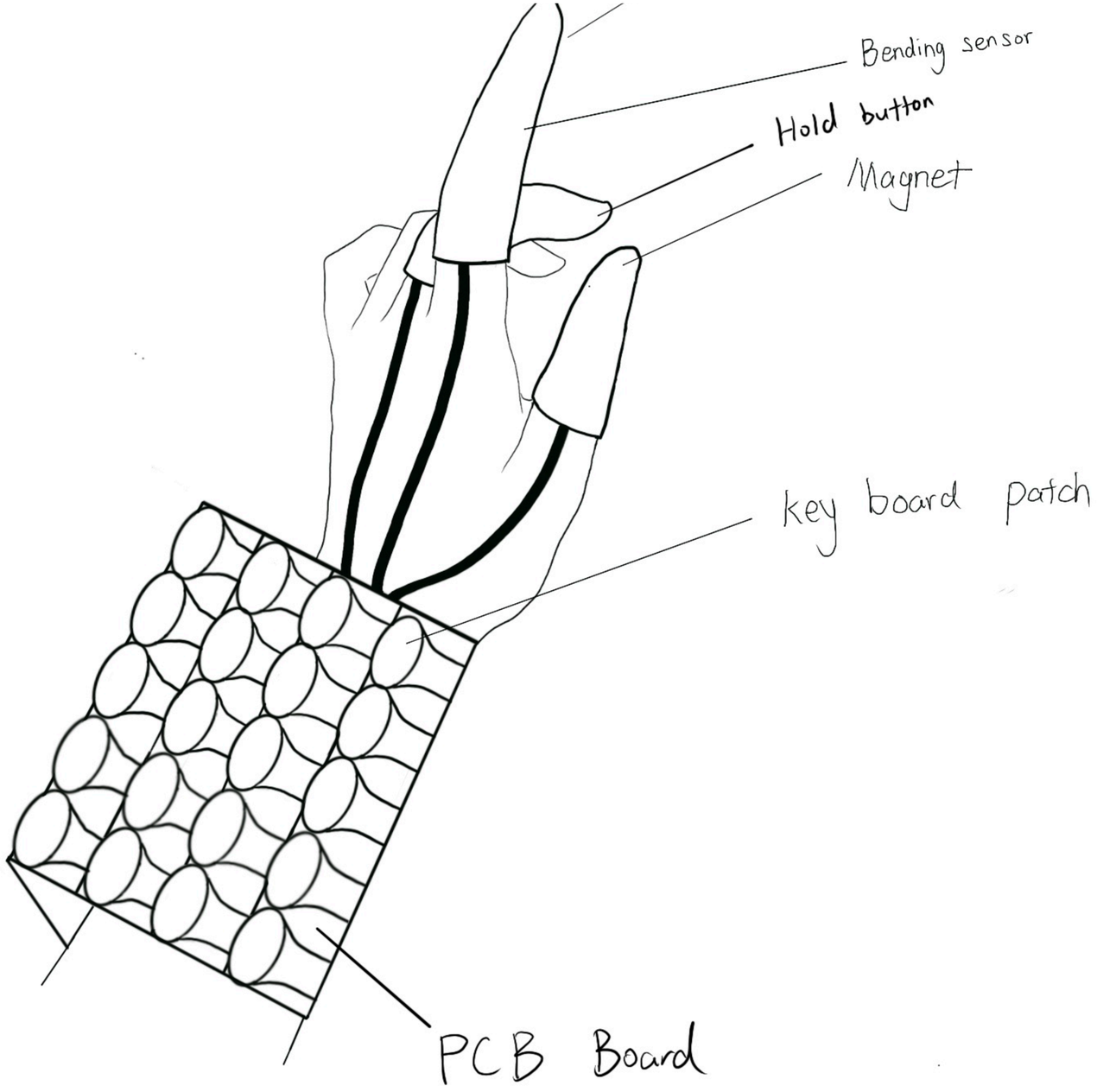
PanGu

Spatial Audio, Live Phase Controller, and Composition Assistant for Spatial Sound

Charlie Shi, MTEC-498, Sep/10/2025

Creativity Matter!

Capture That Also Matter!



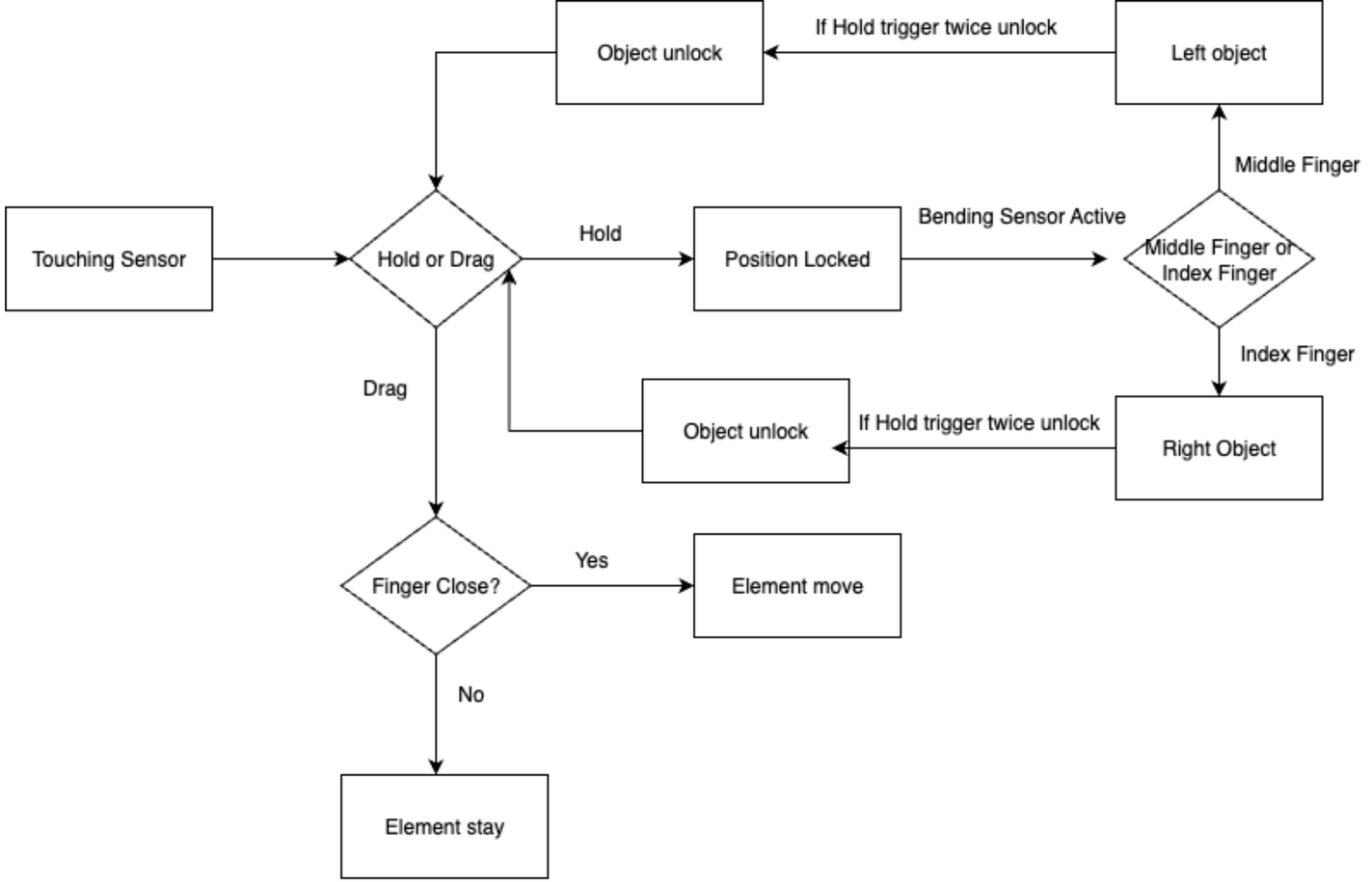
PanGu

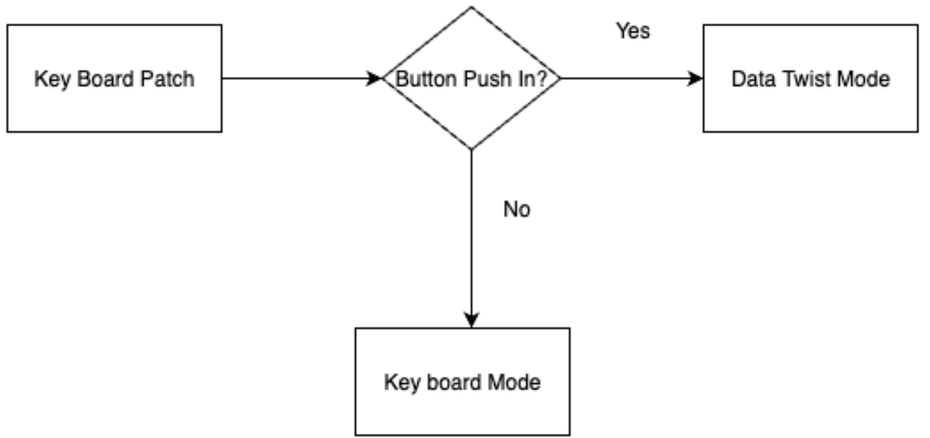
Spatial Audio, Grab-and-Place, Pan Controller, and Wearable MIDI Platform for creative Performance.

100 Sudbury St, Boston, MA, 02114 APE 2401

LiShi - Concept Develop & Design

Xinyu Li - Sketch & Design


Object unlock
If Hold trigger twice unlock
Left object
Middle Finger
Touching Sensor
Hold or Drag
Hold
Position Locked
Bending Sensor Active
Middle Finger or Index Finger
Index Finger
Drag
Object unlock
If Hold trigger twice unlock
Right Object
Finger Close?
Yes
Element move
No
Element stay


Key Board Patch
Button Push In?
Yes
Data Twist Mode
No
Key board Mode

The Elevator Pitch

AIMING

- I’m creating a next-generation spatial audio performance platform: a wearable arm-mounted Circle MIDI controller that lets you first select a position in 3D space and then instantly play or place sounds there — turning spatial audio into an expressive instrument for both composition and live performance.

Project Overview - Problem/Vision

Problem Statement

In current music creation and performance, spatial audio tools are either too technical—limited to post-production and DAW workflows—or too experimental, with unreliable gesture recognition and little integration into real creative practice. Musicians lack an intuitive, real-time way to treat sound as a tangible object that can be positioned and played with in space.

Creative Vision

My vision is to build a next-generation spatial audio platform that turns sound into something you can literally grab, move, and perform with. By combining a pan controller with a wearable hexagonal MIDI interface on the arm, musicians can first select sound positions in 3D space and then perform them as part of a song—transforming spatial audio from an engineering task into a new kind of instrument.

Significance

Spatial audio is rapidly expanding in gaming, VR/AR, film, and live music. Yet its tools lag behind in accessibility and playability. This project is timely because it bridges cutting-edge sound spatialization with embodied musical performance, offering creators a more intuitive and expressive entry point into immersive sound.

Personal Connection

As both a composer and technologist, I've long been frustrated by the disconnect between the imagination of sound in space and the cumbersome tools available to realize it. This project emerges from my desire to collapse that gap—making spatial sound design as immediate and playful as strumming a chord or hitting a drum.

Primary Users

Musicians, producers, sound artists, and audiences interested in new performance formats.

User Profile

Ranging from students to professionals, with an interest in music and technology.

Use Cases

Studio: Quickly testing spatial audio effects during composition and production.

Live Performance: Serving as an expressive instrument for immersive shows.

Art Exhibitions: Allowing audiences to intuitively experience spatial audio interaction.

User Needs

Intuitive control, real-time feedback, and low learning barriers — turning spatial audio from a complex technical tool into an accessible medium for creation and performance.

Your Background & Qualifications

Why Are You the Right Person for This Project?

- **Relevant Coursework**: EDI prototyping, Programming in C, Programming in Max
- **Previous Projects**: Box of World, Ultra Sonic Headphone
- **Personal Interests**: Multichannel music composer, music technology developer
- **Technical Strengths**: Python, C/Cpp, Max/Msp , Circuit design
- **Learning Goals**: Develop spatial audio skills

Technical Specifications

Programming Languages & Frameworks

Core Technologies

- **Primary Language(s)**: Python,C/Cpp,Max
- **Frameworks/Libraries**:Max/MSP, Some Arduino Libraries
- **Audio Technologies**: TorchAudio,DSP
- **AI/ML Tools**: PyTorch,SckitLearn,Numpy

Influences & Inspirations

Key References That Inform Your Work

- **Influence #1: [Lumatone]**
- Medium: Product
- Why It Matters: I like the idea of rebuild performing and playing system
- **Influence #2: [MIMU Gloves]**
- Medium:Product
- Why It Matters: It give creation way much fun and immersive
- Influence #3: **[PanMan]**
- Medium: NIME Paper
- Why It Matters: The way of panning system in spatial audio and the idea of split the component in to module

Time Line

Project	Timeline	
Semester	Overview	
• **Phase**	1 (Weeks 1-3):	Component checking, make sensor work, Circuit design
• **Phase**	2 (Weeks 4-7):	3D modeling, 3D printing, Tec developing
• **Phase**	3 (Weeks 8-10):	OS Design, Tec developing
• **Phase**	4 (Weeks 11-13)	Check for improvement
• **Phase**	5 (Weeks 14-15)	Paper writing, function checking, preform a little bit with NIME

Risk Assessment & Contingency Planning

Potential Challenges & Solutions

- **Technical Risk 1**: Latency→ Better IO
- **Technical Risk 2**: Endurance→ Larger Battery
- **Creative Risk 1**: OutFit →80/20 or some good texture 3D supplement
- **Time Management**: To many function → finish them by module

Next Steps

- **GitHub Repository**: [Your repository URL]
- **Contact Information**: cshi@berklee.edu
- **Office Hours**:Monday 1pm - 9pm, Tuesday 1pm - 4pm, Friday 1 pm - 6pm
- **Collaboration**: Open to peer feedback and potential partnerships

Future Development

Beyond This Semester

- **Version 2.0**: Individual instrument can play with out computer, user can be pre-install instrument and play it in the stage.
AI co-worker with creativity concern.
- **Scalability**: Become a New idea of Midi keyboard
- **Collaboration**: EE engineer, product designer, DSP engineer, AI engineer
- **Commercial Potential**: Yes, can be a product.
- **Research Opportunities**: What questions does this project raise?

Thank you !
Passion makes Future

Charlie Shi