

HANDLEED

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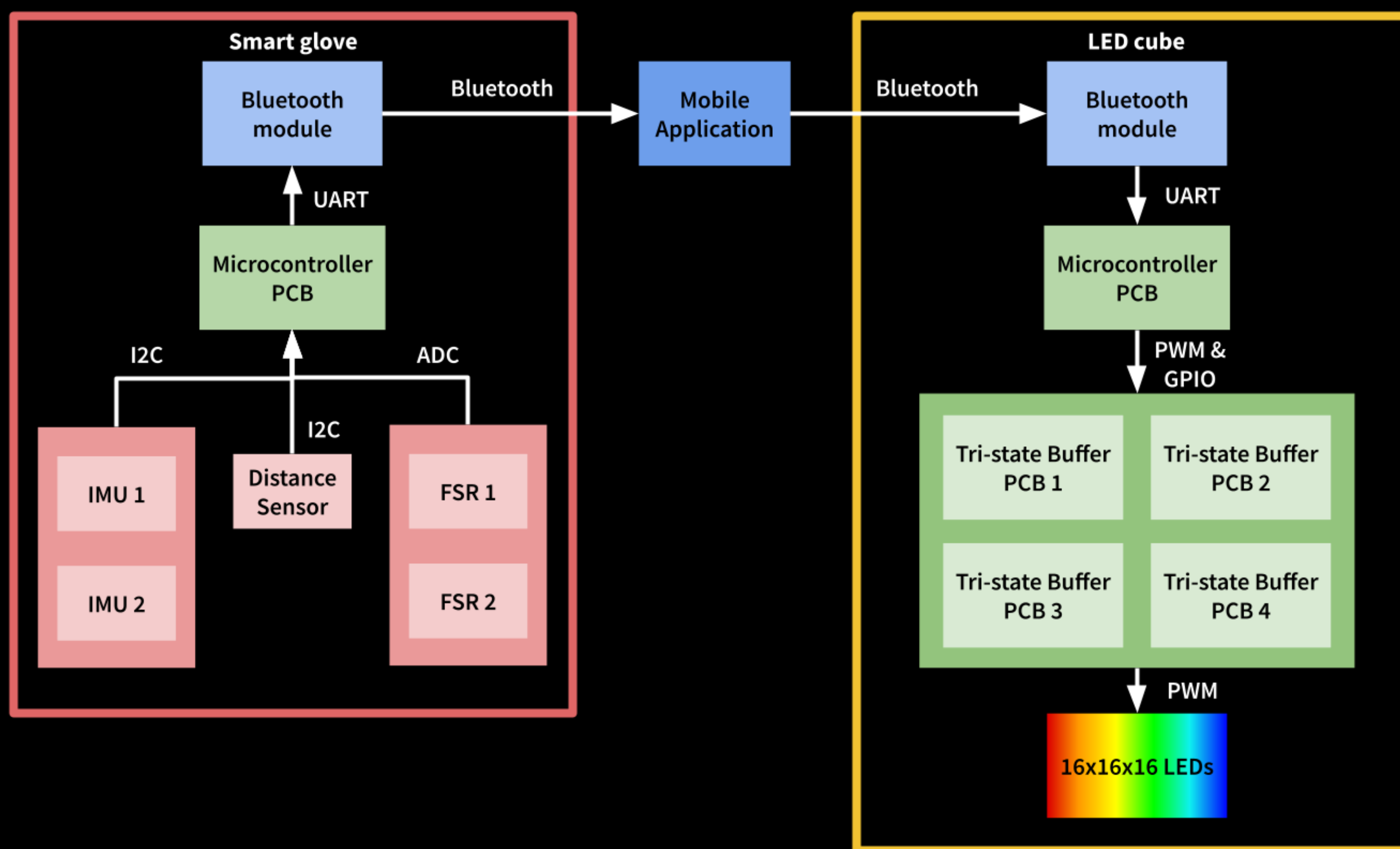
Abstract

Visualizing 3D figures on a traditional 2D display is a challenge because of the lack of a realistic and immersive experience. We built a 3D RGB LED matrix display controlled wirelessly by a smart glove and mobile device to generate a representation of 3D mathematical graphs and models.

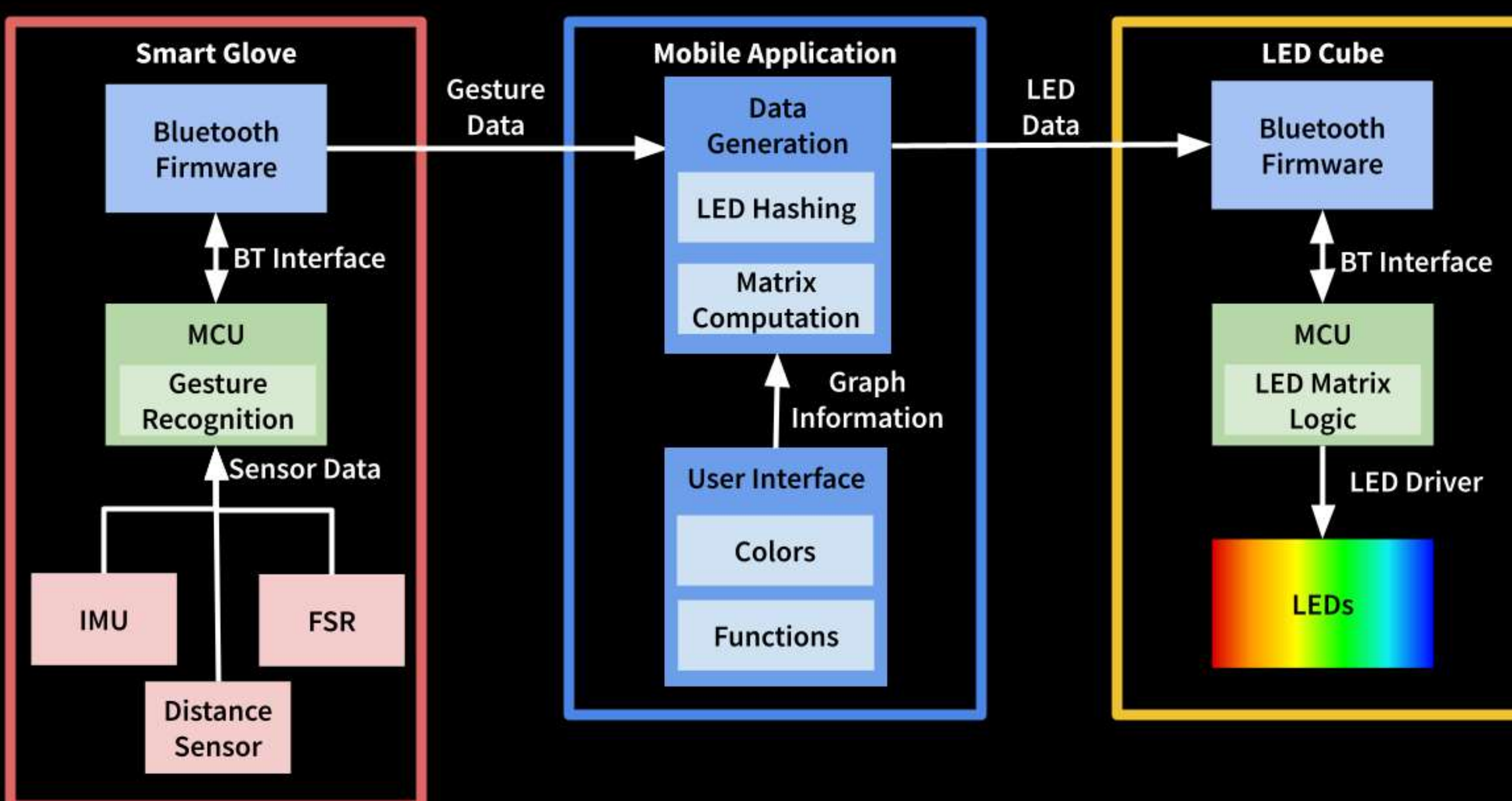
Key Features:

- Input math function from mobile application connected via Bluetooth
- Display figure on 16x16x16 LED matrix
- Control figure with hand gestures sent through smart glove connected via Bluetooth

Hardware Flow



Software Flow

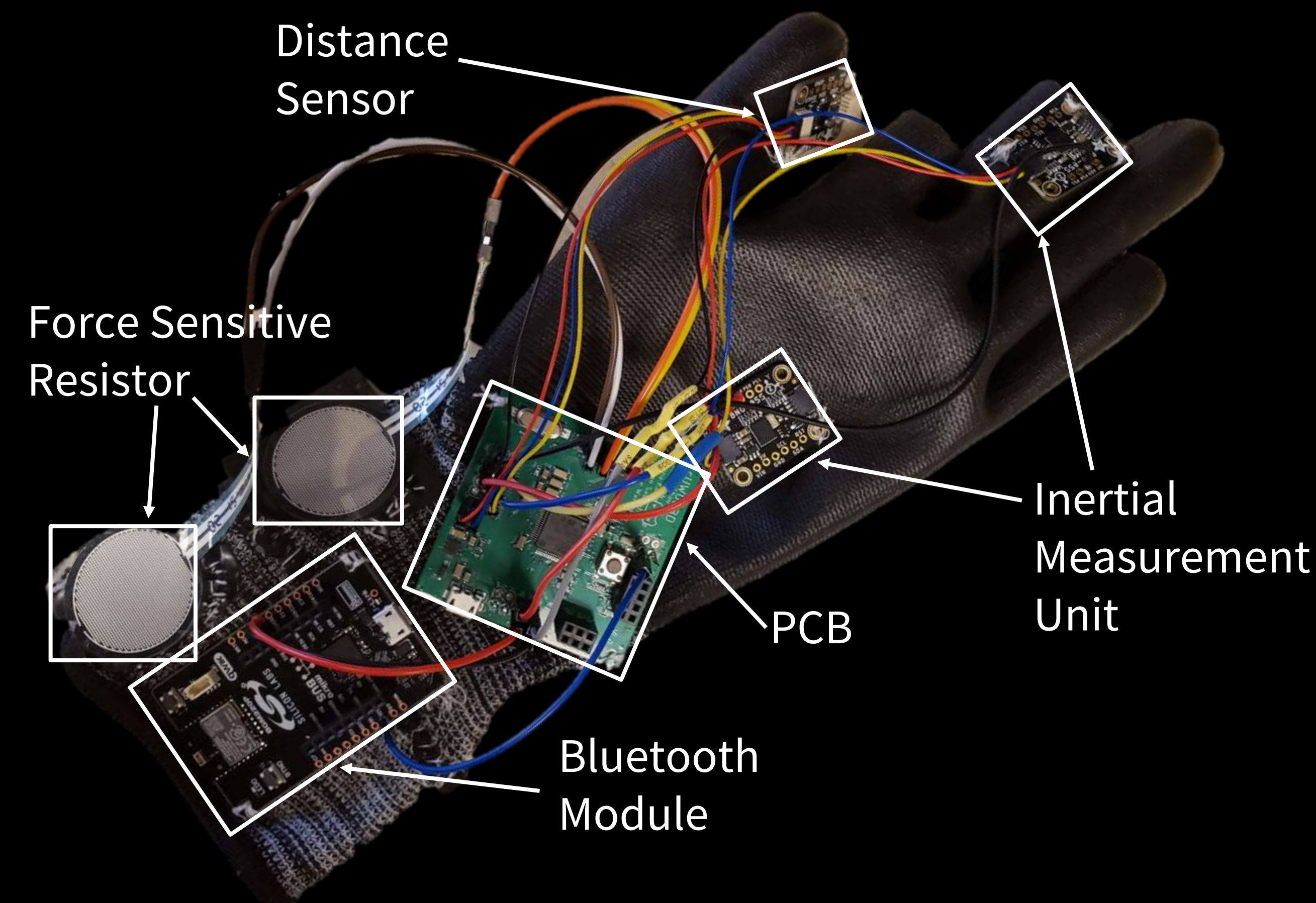


LED Cube



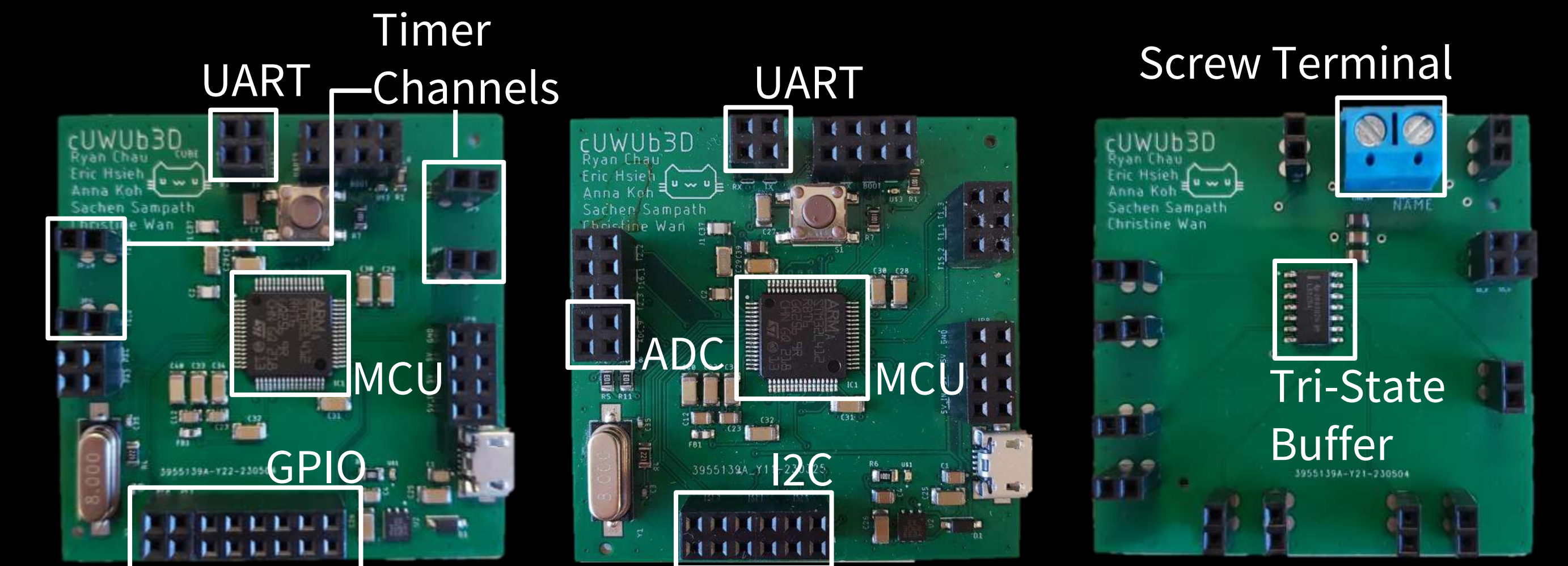
- LED matrix built with individually addressable LEDs
- Runs on 4 separate power supplies connected to wall socket
- Metal base plate as a heat sink to prevent overheating

Smart Glove



- 10 gestures defined with different levels of precision
- IMU measures finger movements and palm rotations with linear acceleration and angular rotation
- Distance Sensor measures distance between thumb and pointer finger for magnification control
- FSR serve as haptic buttons for gesture selection

Custom PCBs



LED Matrix MCU PCB

Receives input and drives LED matrix with a STM32

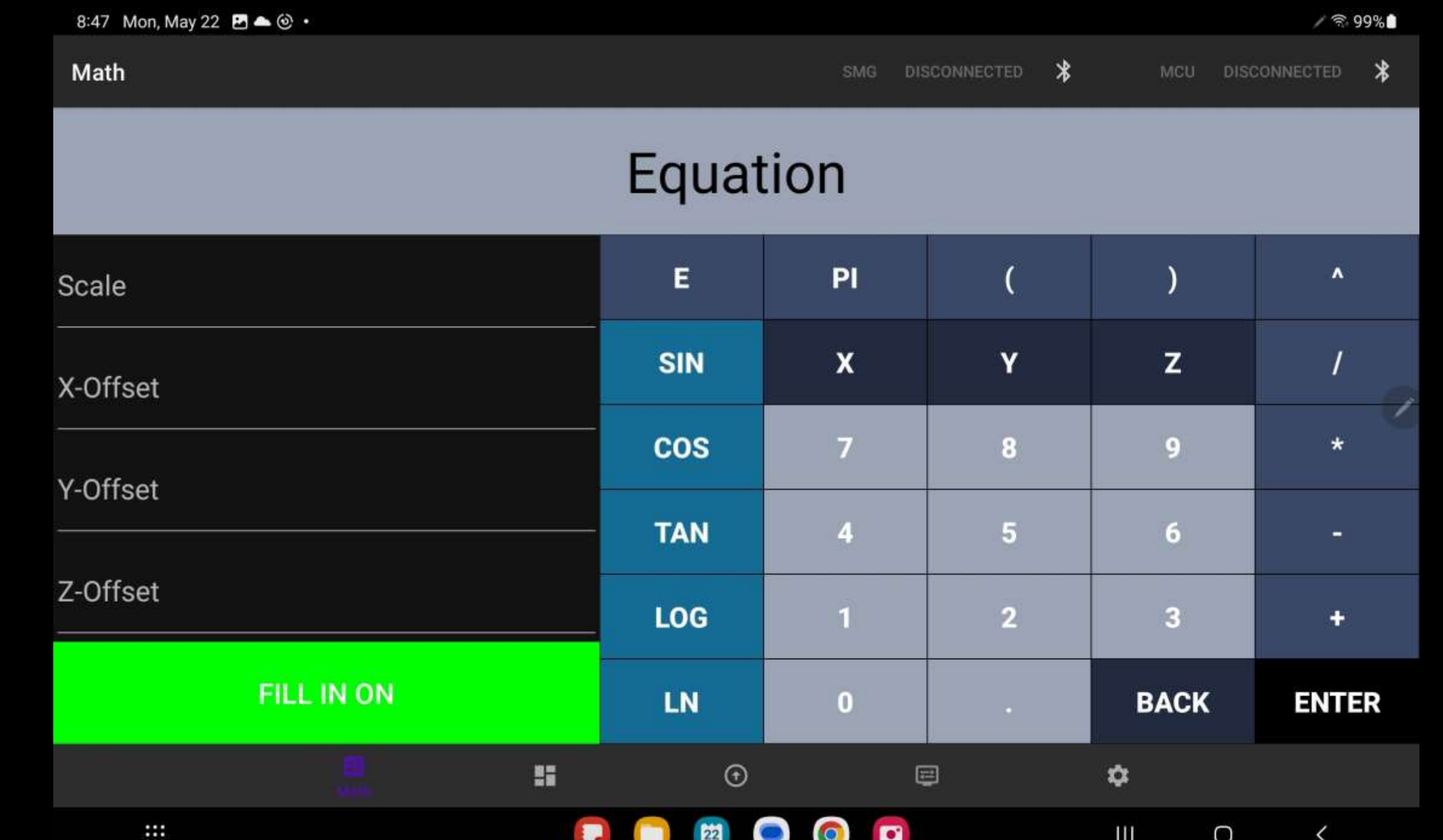
Smart Glove MCU PCB

Reads glove sensors and determines hand gesture with a STM32

Tri-State Buffer PCB

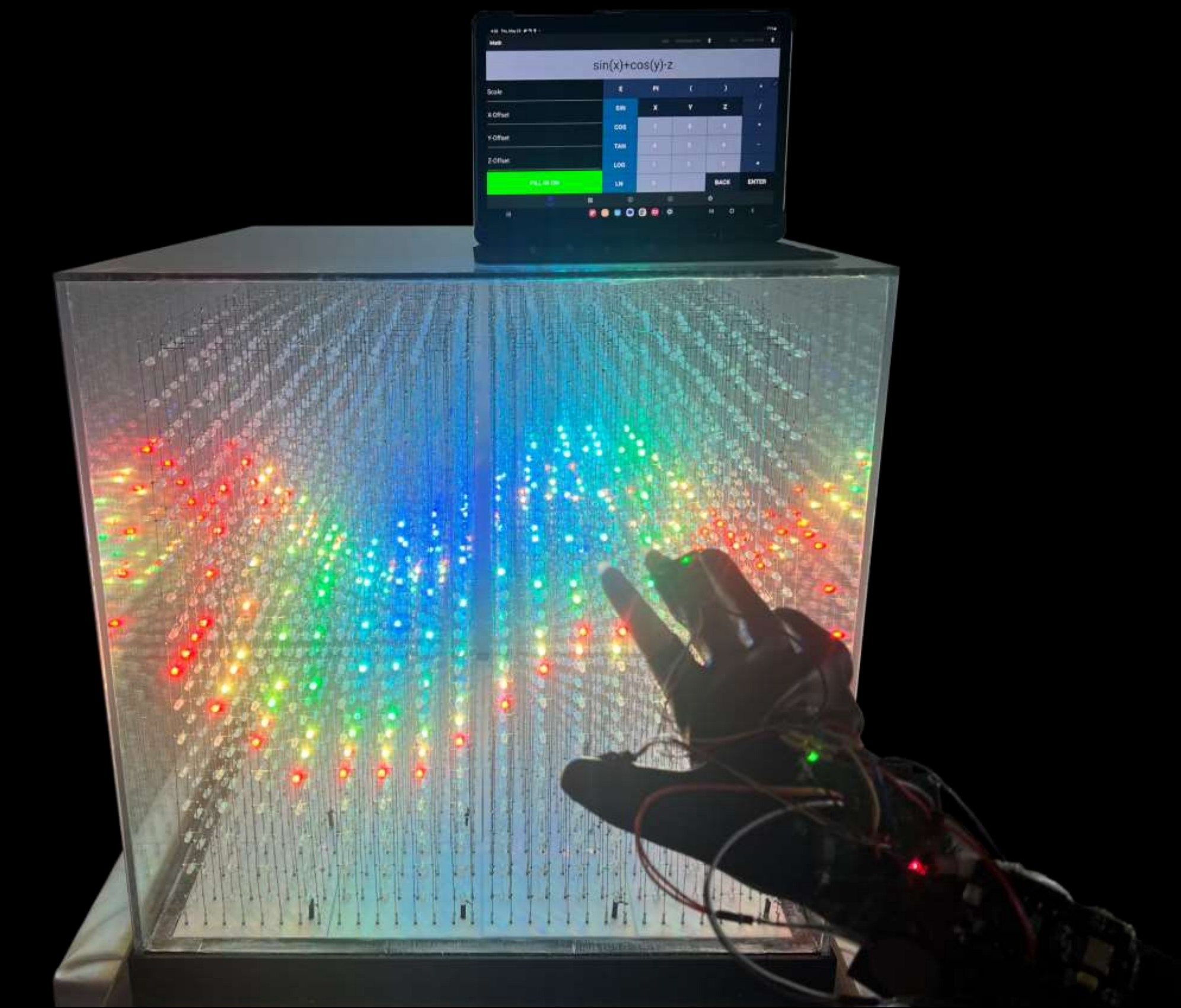
Opens input and output pins for tri-state buffer

Mobile Application



Mathematical Equation Input User Interface

Final Product



Acknowledgements:

Special thanks to Yogananda Isukapalli, Venkat Krishnan, Jimmy Kraemer, Alex Lai, Christopher Wimmel, Adam Yu, Simon Yu, Michael Cheng, Min Jian Yang, Lucy Lue, Eric Zuo, and Malt Whiskey



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