MoBIUS

An Alternative to Touchpads

https://lawu103.wixsite.com/mobius

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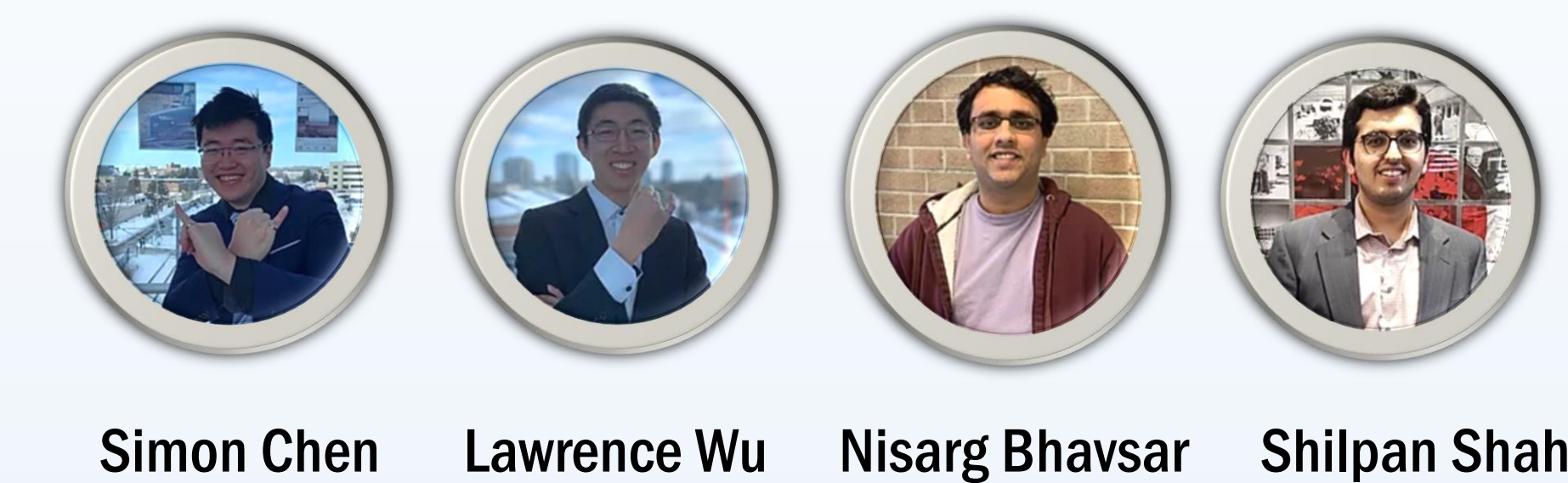
Problem / Motivation

- Laptops are ubiquitous computing devices
- 2D locators in the form of wired and wireless mice and touchpads are prevalent, suitable for specific environments
- Space-constrained environments don't favour existing modes of input

Objectives / Goal

- Develop an input device for users to quickly and comfortably input both low and high level primitive inputs in space-constrained situations
- Compact, usable throughout the duration of a typical commute
- No additional flat surface needed
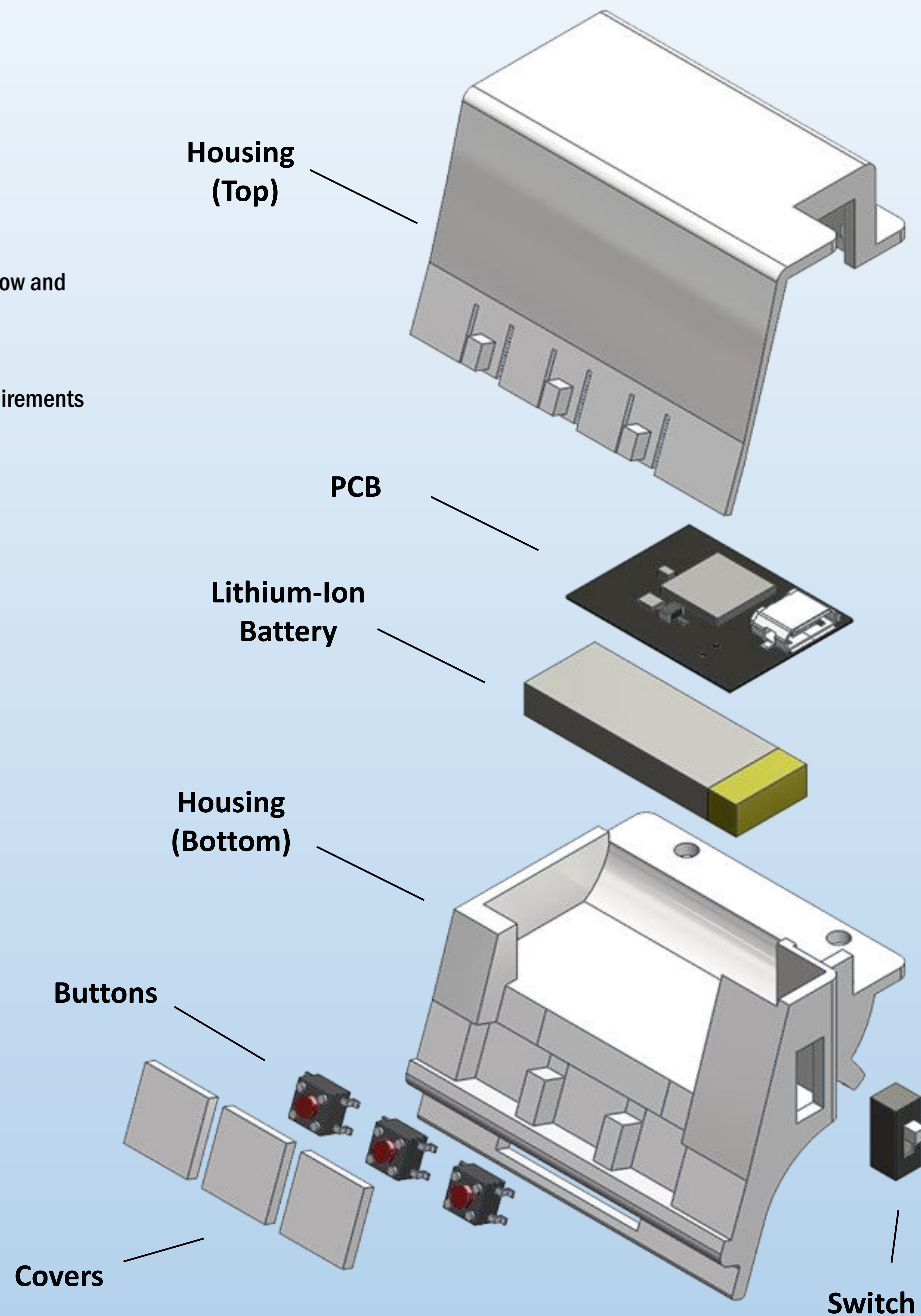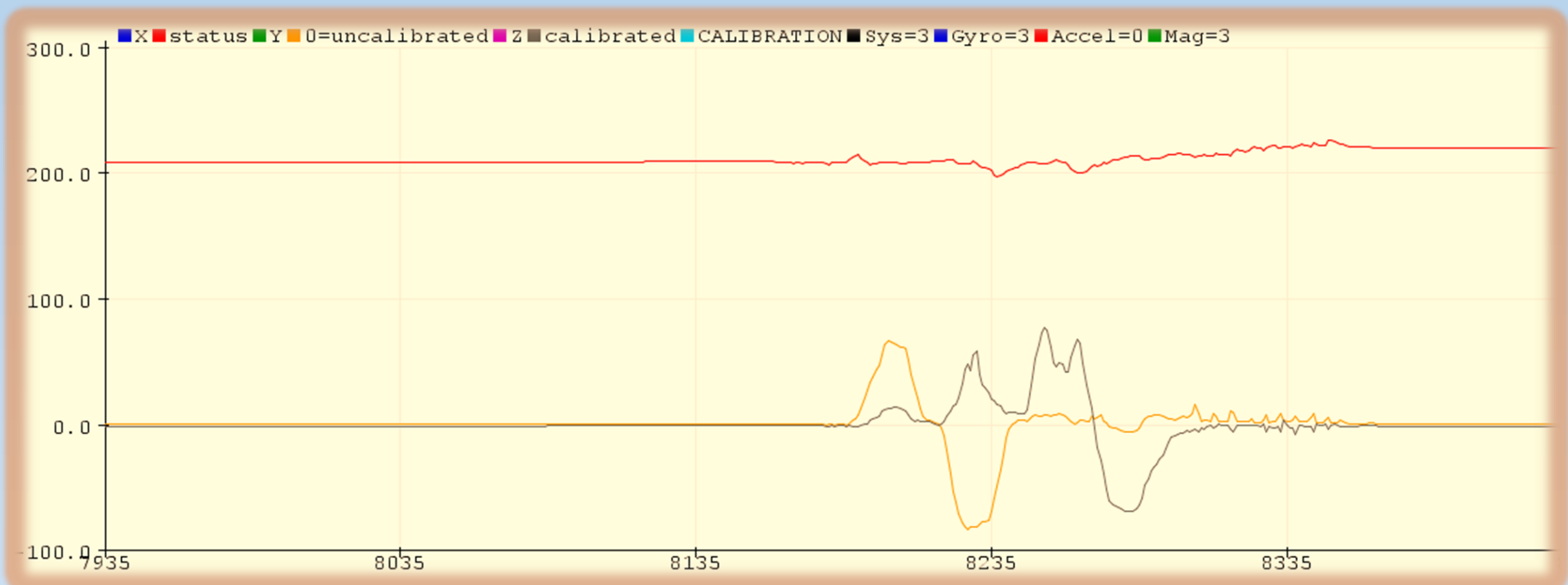- Emulate a conventional mouse experience without additional space requirements

Solution

- Ring based wearable solution with a 9-axis IMU as the primary means of sensing user intent
- Emulate a joystick control mode to achieve frictionless user experience

Market Comparable

Tactigon Skin

Features
- Open source environment for hobbyist development
- Suite of gesture recognition classes

Drawback
- High price point
- Limited functionality without licensed middle-layer software

Mycestro

Features
- Customizable cursor parameters

Drawback
- High price point
- Higher level primitive inputs lacking in functionality
- Additional hardware needed

How it Works

- Orientation and acceleration data read from IMU
- Data preprocessed with low pass filters for initial pass
- Data processed using Kalman filter for input to fuzzy logic decision block
- Processed data packed into BLE HID profile packet
- HID profile packet sent over BLE to receive

(Exploded assembly labels)

- Housing (Top)
- PCB
- Lithium-Ion Battery
- Housing (Bottom)
- Buttons
- Covers
- Switch

Mechanical Design

- 3D printed ergonomic case housing PCB and peripherals
- Lightweight design to accommodate other actions such as typing
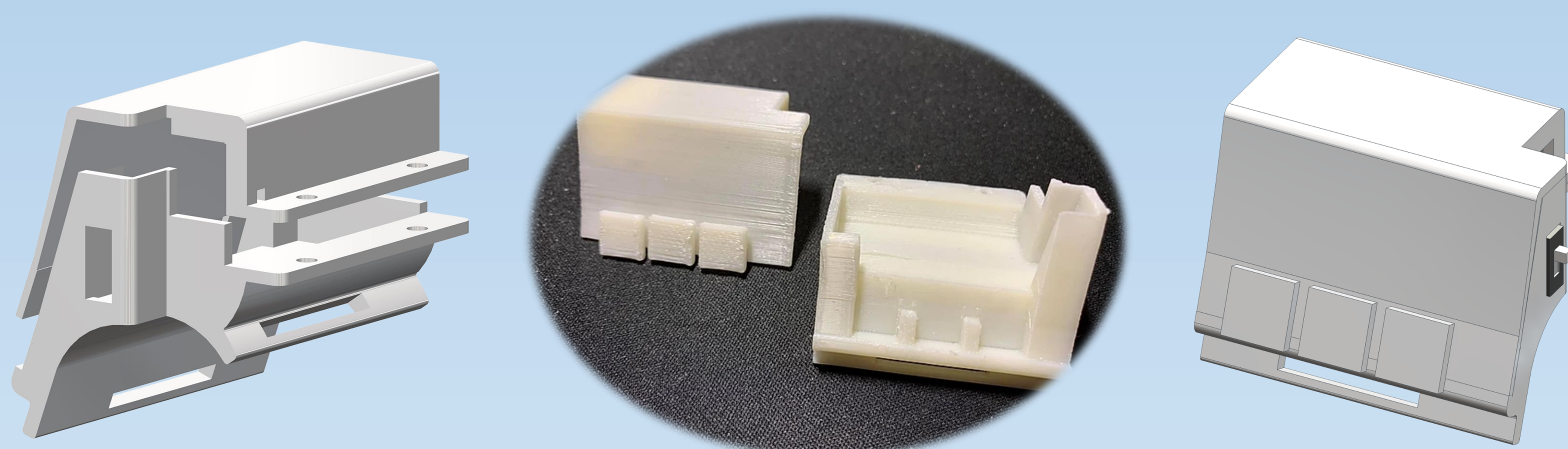
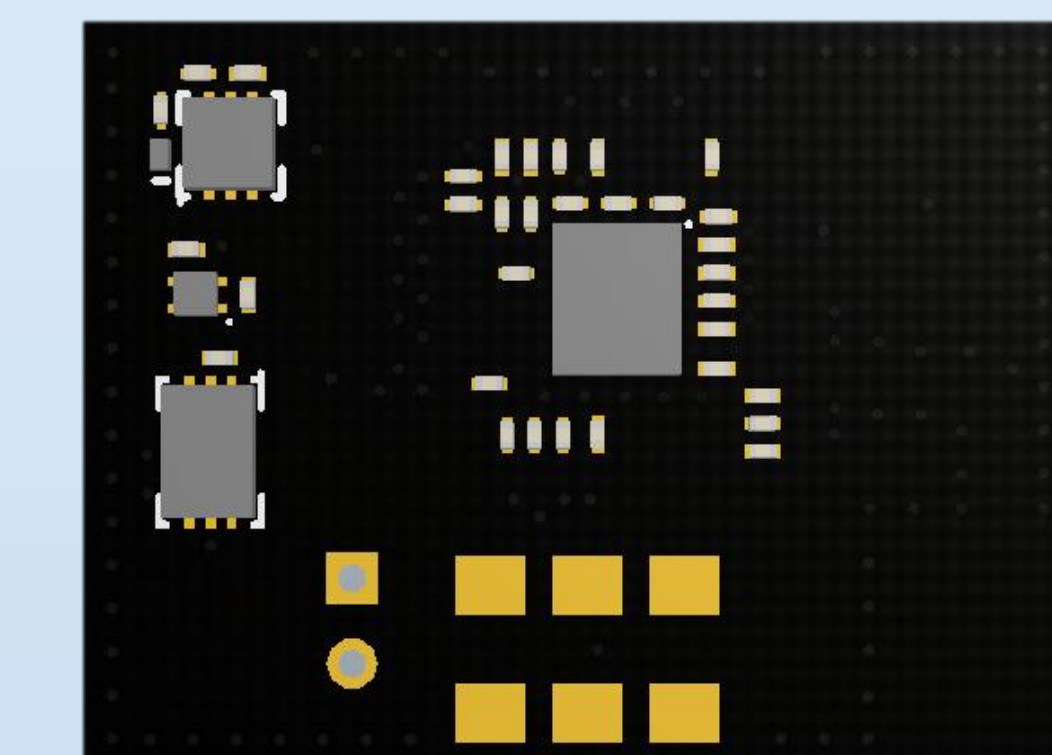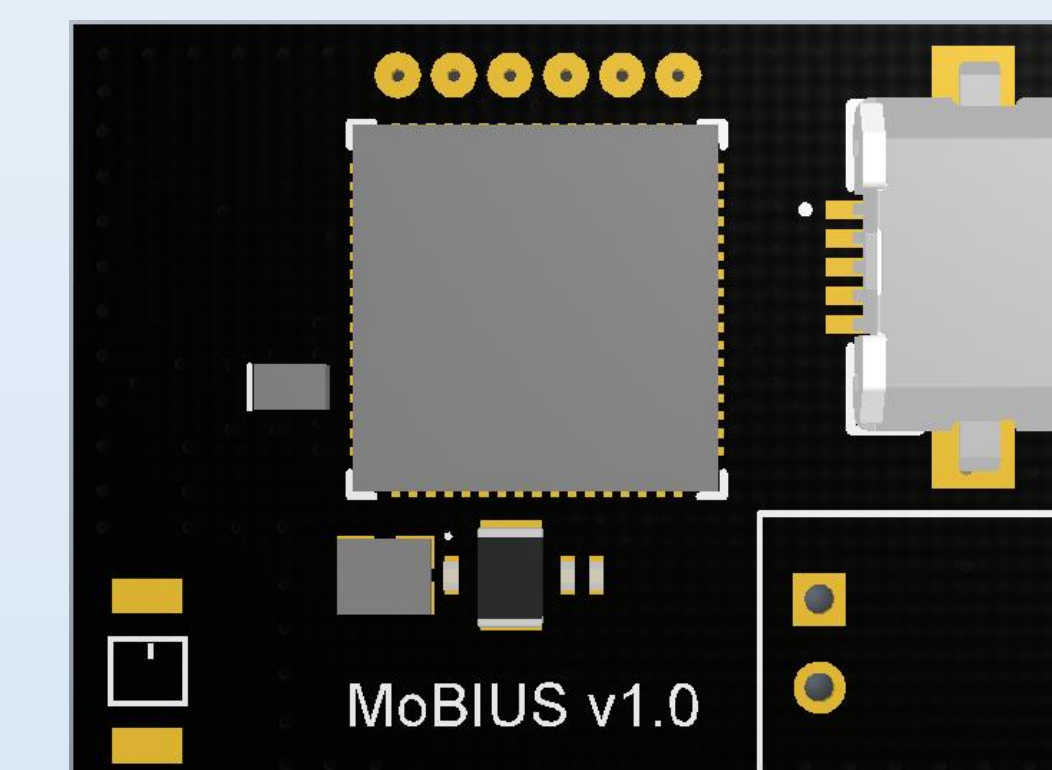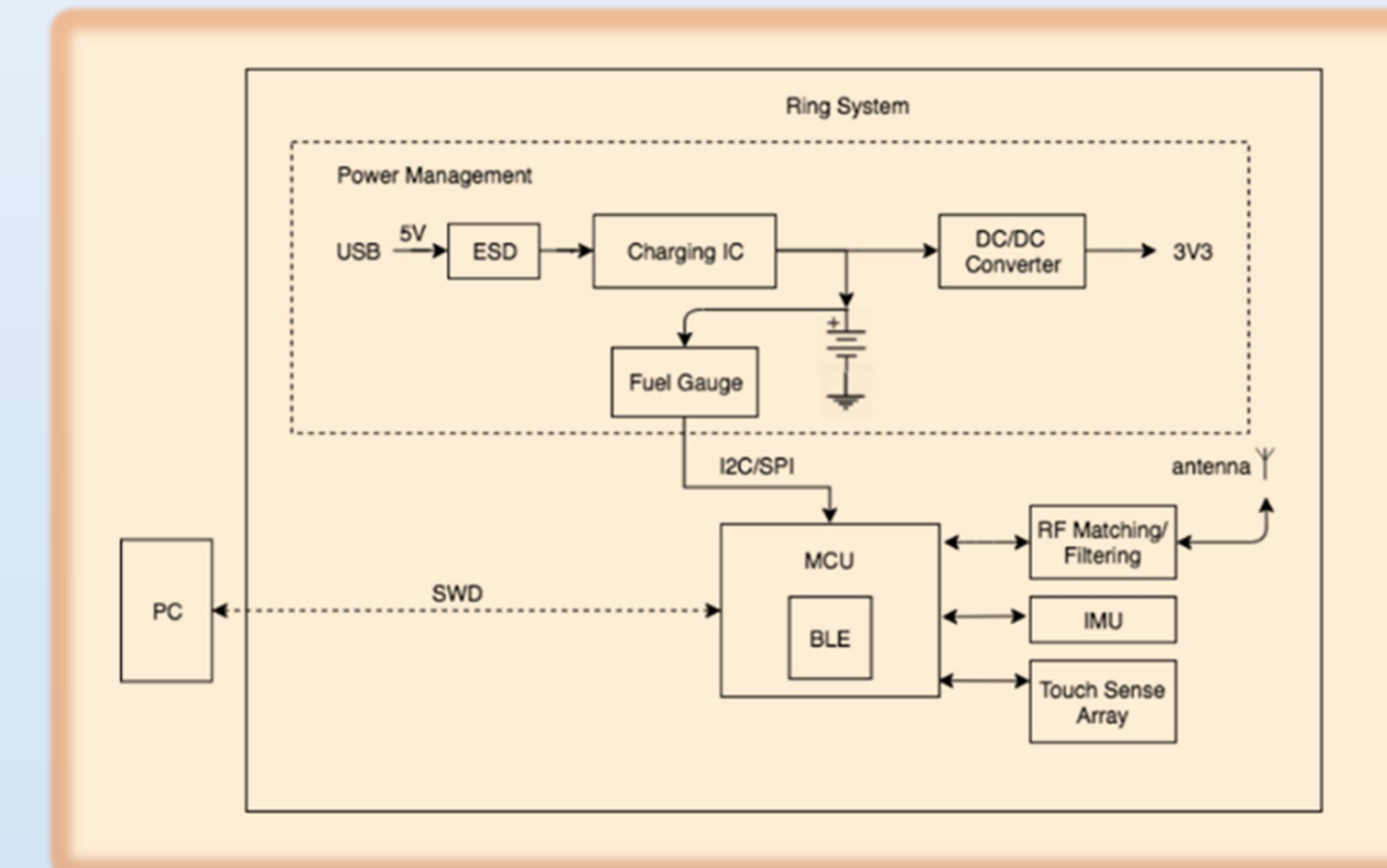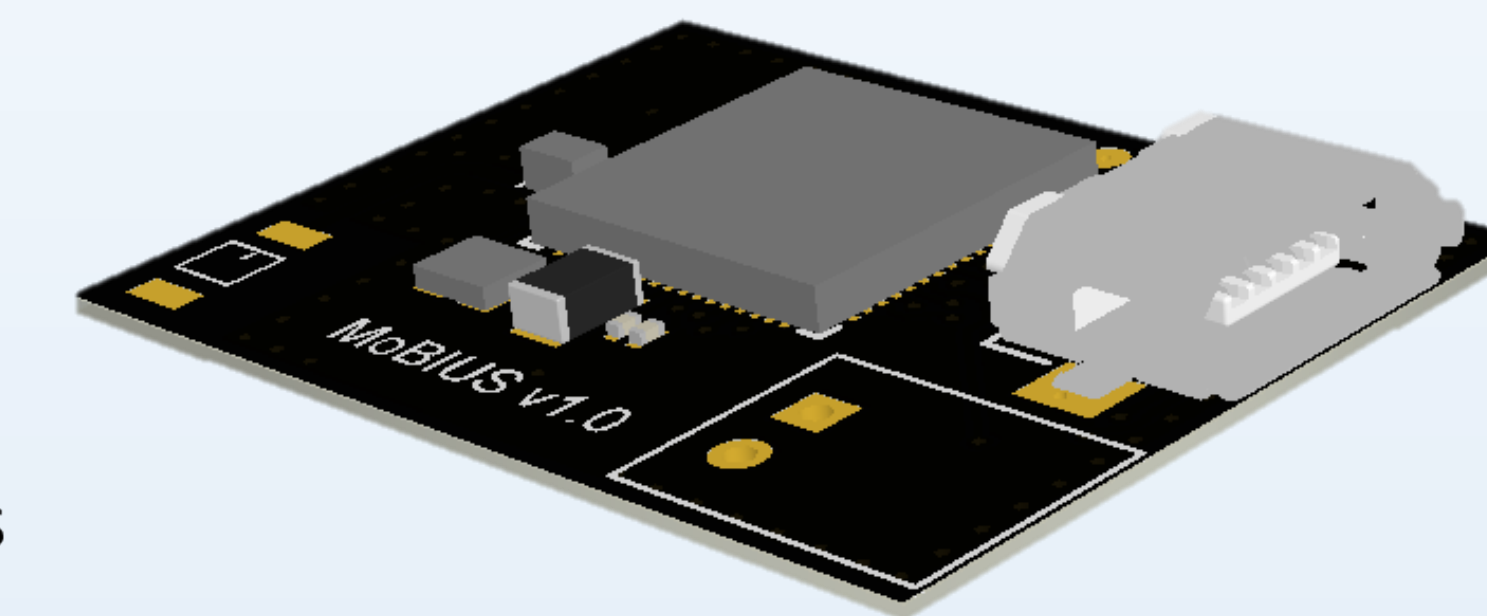## Electrical Design

Power Management
- Provides 3.3V to power MCU and peripherals

System Processing
- MCU processes, packages, and transmits IMU data through integrated BLE layer
- RF matching and filtering circuit is used for signal integrity

MoBIUS v1.0

Software Design

- High level state machine implemented with smooth mode switching
- Low latency IMU preprocessing, filtering and calibration ensuring cursor responsiveness
- BLE protocol used for data transmission

Data Pipeline

User Input → MCU → BLE → Portable Device → OS Mouse API
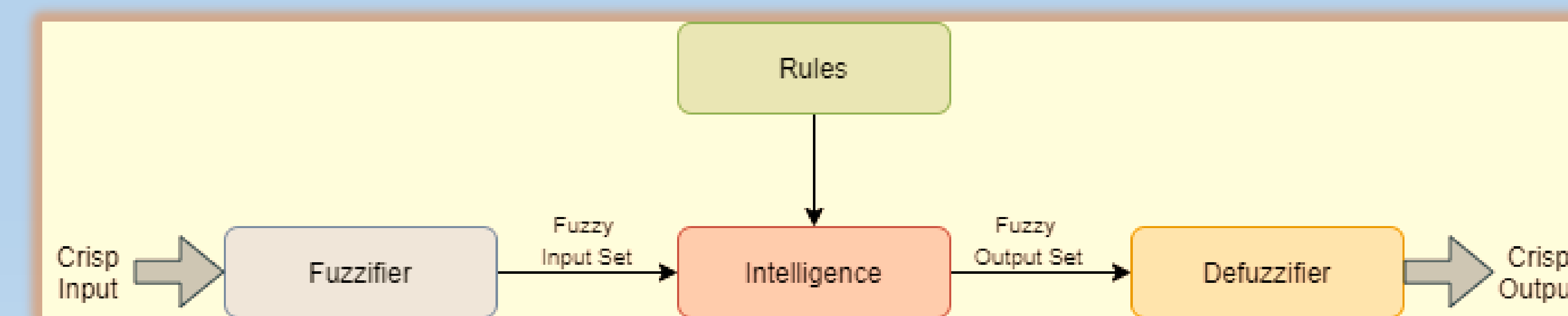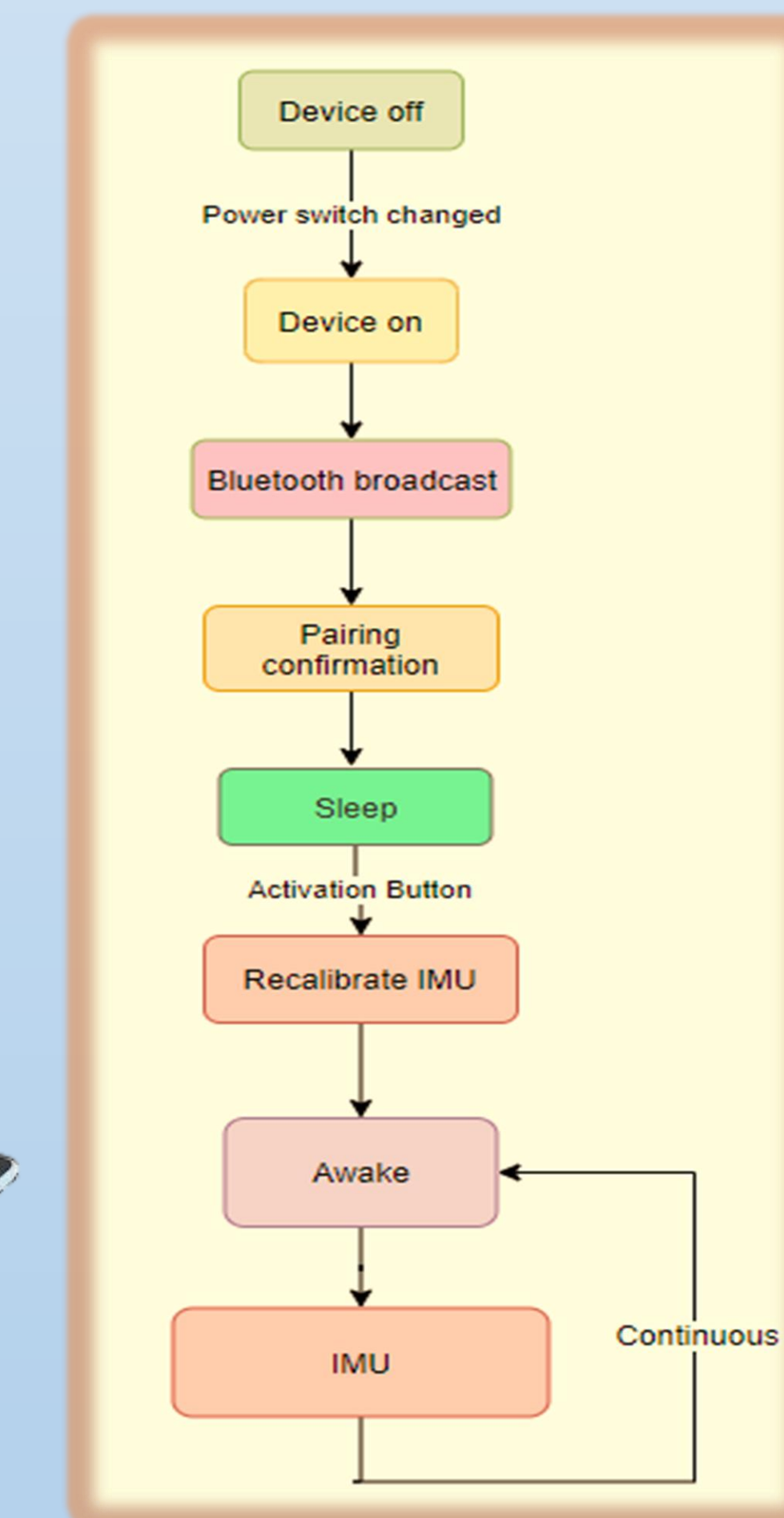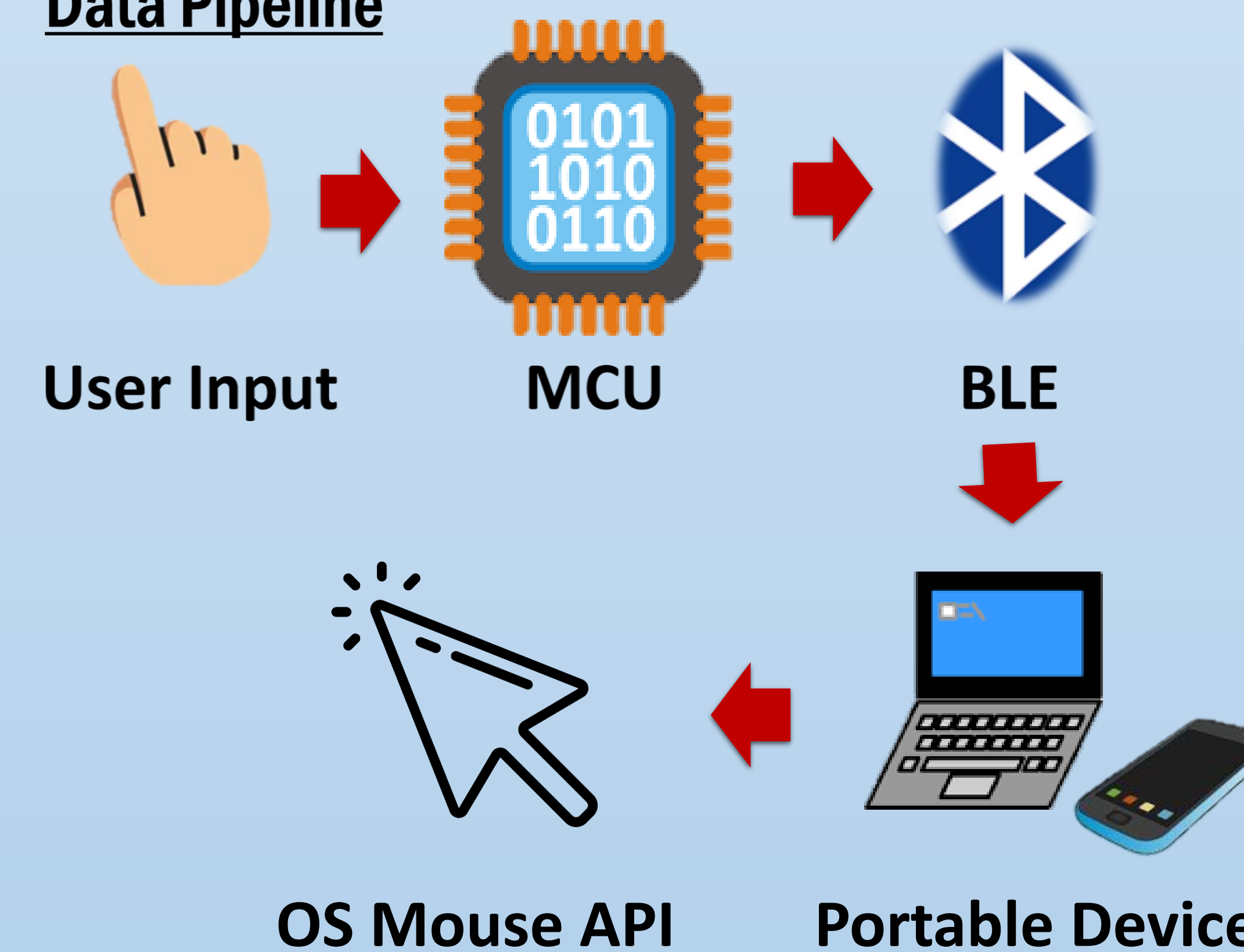
Next Steps

- Tweak the sensitivity of the controls
- Reduce lag for the cursor control
- 3D Object Manipulation
- Integrate gestures with common program control modes (rotate /scale/zoom)