

# SMART CANE

## Enhancing Safety Without Changing Mobility

Group 43: Cody Schwenk<sup>2</sup>, Daniel Blank<sup>2</sup>, Khaled Fada<sup>2</sup>, Sayyed Zaidi<sup>1</sup>, and Advisor Bruce Eisenstein<sup>2</sup>

<sup>1</sup>Department of Mechanical Engineering and Mechanics

<sup>2</sup>Department of Electrical and Computer Engineering

### Real-time hazard detection with intuitive haptic feedback

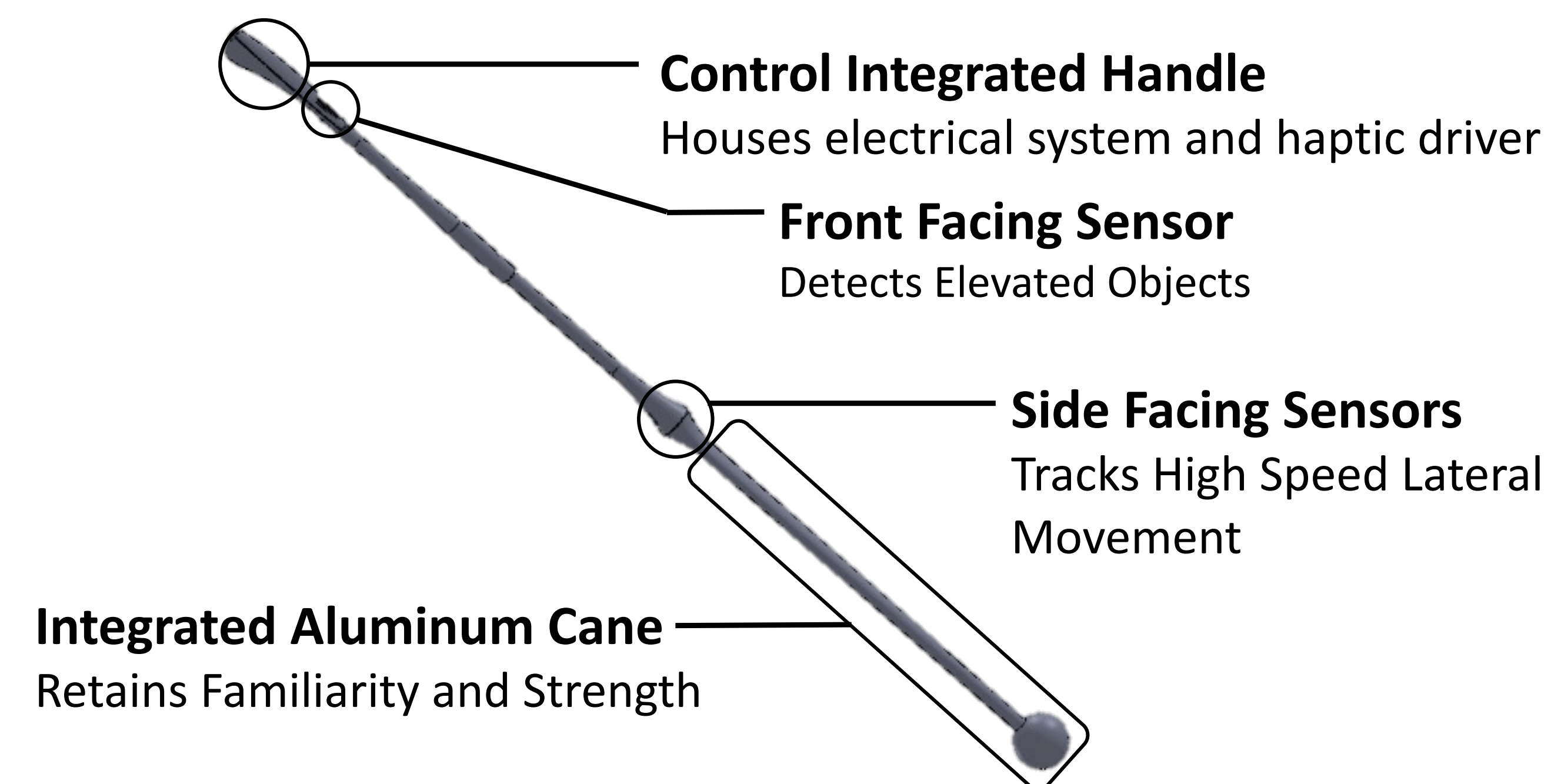
#### Challenges and Objectives

- Elevated objects remain undetected
- Fast-Moving vehicles approach unseen
- Urban Environments are only becoming more complex



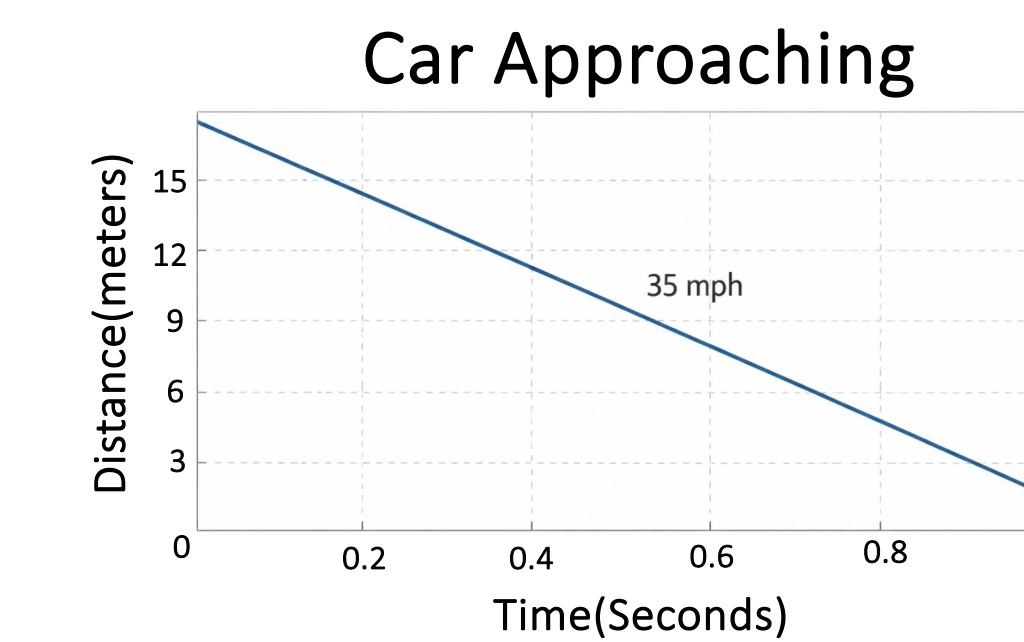
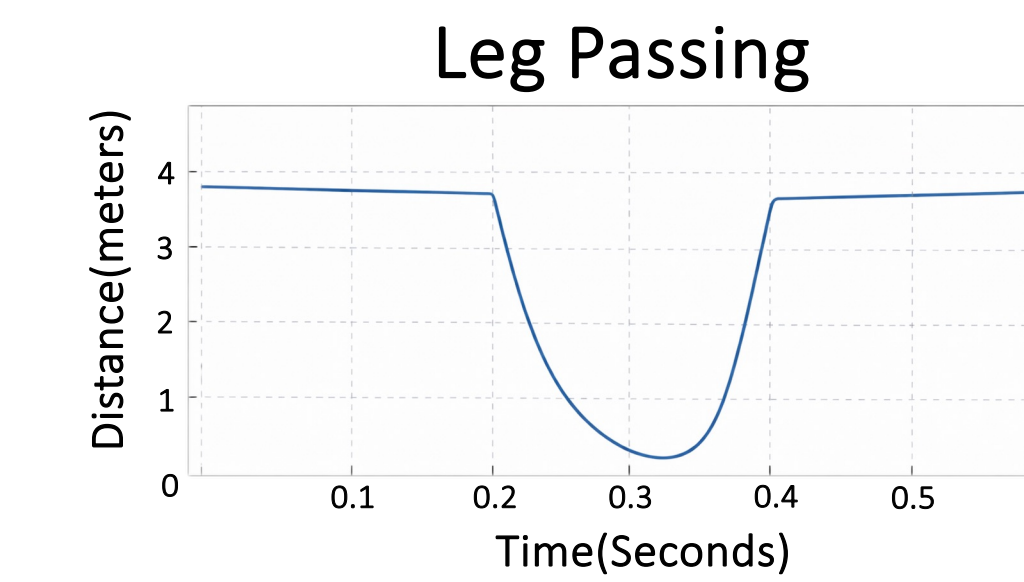
The Smart Cane adds directional hazard detection and intelligent filtering while preserving the trusted white cane design.

#### System Overview

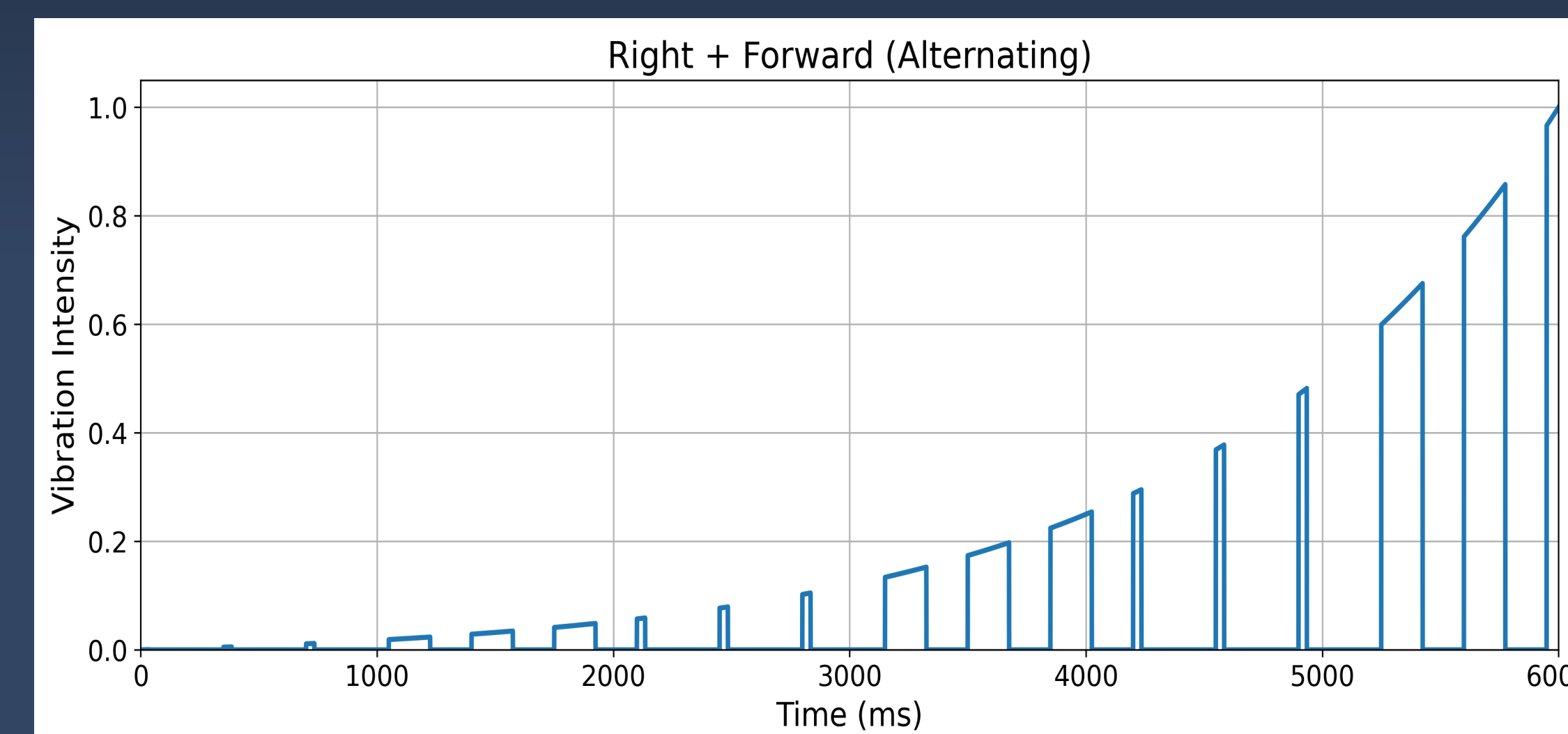
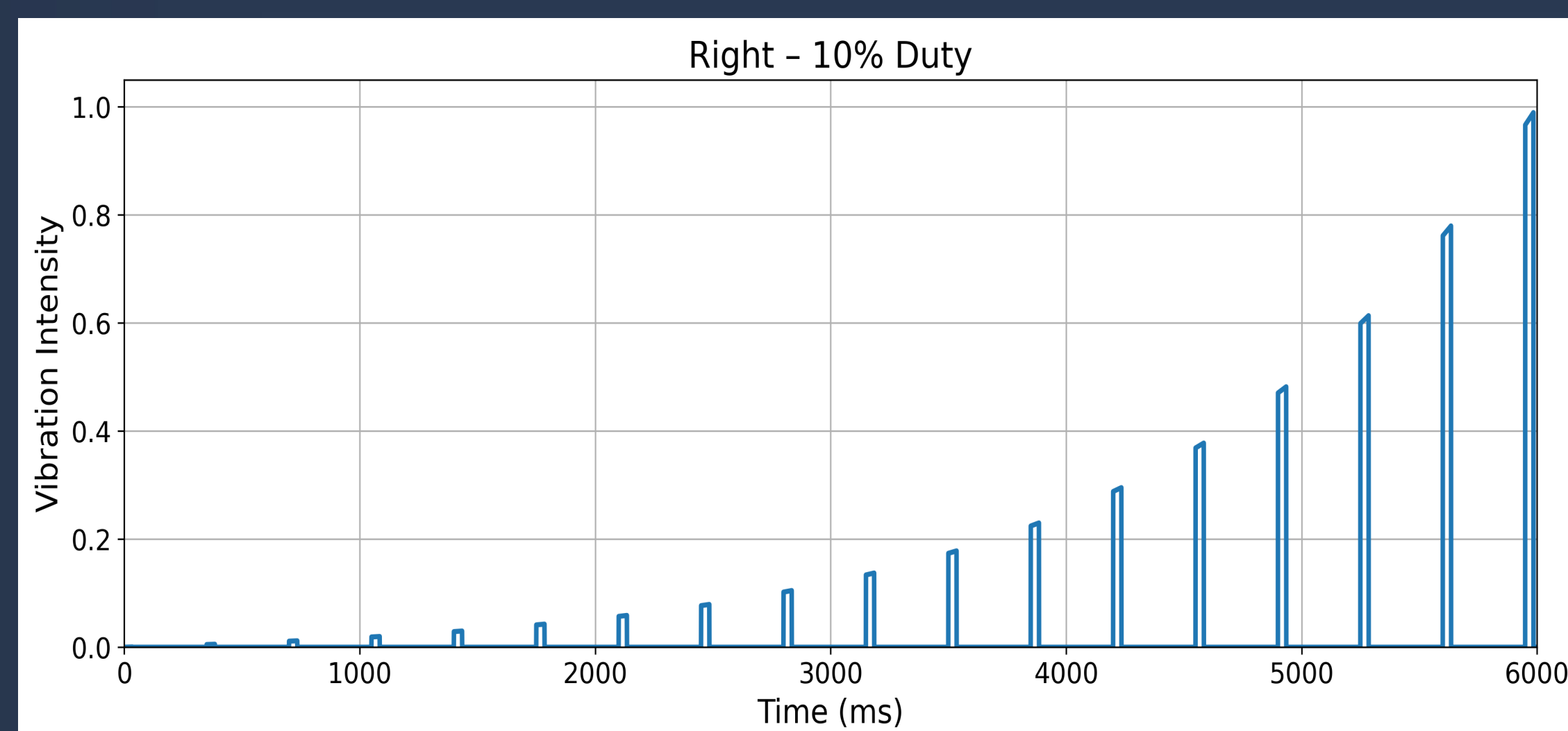


- Multi-part 3D printed housing to accommodate printer size constrains
- Sections mechanically joined using alignment holes and bolted fasteners
- Internal wire routing channels designed to protect sensors and power connections
- Accessible charging port and exposed sensors integrated into exterior housing

#### Smart Filtering



- Velocity calculated from sequential distance samples with rolling average
- Rejects outliers with statistical based threshold analysis
- Deceleration monitored to detect objects slowing down
- Minimum time window requirement to alert user



#### Haptic Feedback

- Direction is encoded by pulse pattern; distance is encoded by vibration amplitude
- Multiple detections produce alternating pulse groups for clear differentiation