Lightweight Knee Exoskeleton
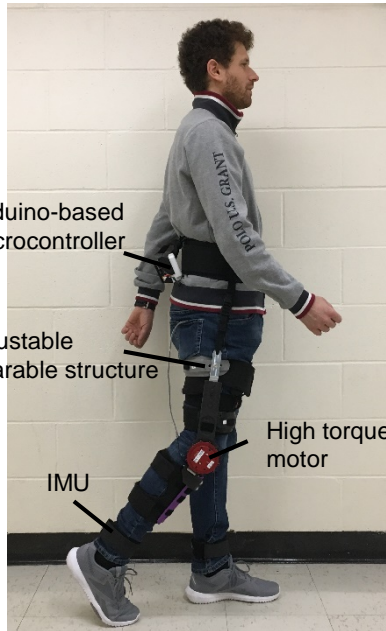

System Overview

Portable Exoskeleton Specifications	
Unilateral Mass	2.5 kg
Bilateral Mass	3.9 kg
Size	570x200x180mm
Motor Voltage	42V
Motor Continuous Torque	6.6 Nm
Motor Speed	250 RPM
Output Peak Torque	20 Nm
Output Speed	26.2 rad/s
Gear Ratio	6:1
Range of Motion	0-160°
Battery Life	2 hours
Wearable structure	Small, Middle, Large
Actuation type	Portable

Sensor and Control Description

Master Computer
Software GUI
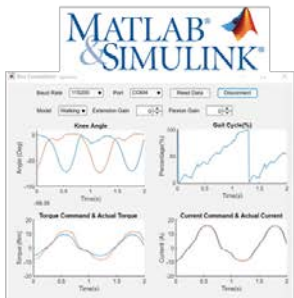
- Visualization interface
- Tune parameters

Bluetooth 64 Bytes or RS232

Microcontroller
High-level Exo control

Teensy 3.6 (180MHz)

- Torque generation
- Torque control

CAN UART ADC

Human & Robot
Low-level Motor Control

- Motor controller (CAN)
- Encoders (CAN)
- Wireless IMUs (UART)
- Torque Sensors (ADC)

Sensor and Control Specifications

Sensor	Motor Encoder, 9-axis IMU, Torque Sensor
Master Computer Communication	Bluetooth, USB (RS-232)
Microcontroller Communication	RS-232, CAN Bus, SPI, I²C
Control Platform	MATLAB Simulink Real-time, Arduino Teensy
API Support	MATLAB, C/C++, Python
Control Mode	Torque/Current/Position/Velocity Control

Portable Exoskeleton Architecture (Teensy 3.6)