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WIMU Instrumentation of Assassin Trainer & Skeleton Sled – Initial Data Capture

Mark Gaffney[1], Steffi Coyler[2], Dr. Michael Walsh[1], Scott Drawer[3], Dr. Aki Salo[2], Brendan O'Flynn[1], Dr. Cian O'Mathuna[1]

Motivation

Skeleton
Winter Olympic Sled Sport
1km+ Downhill Ice Course
High Speeds (140km/h)
Large Accelerations (5g)
Fractions of Second Crucial!

Pushing

Start period
20-30m Pushing & Loading
Complex Explosive Movements
Believed Critical to Performance
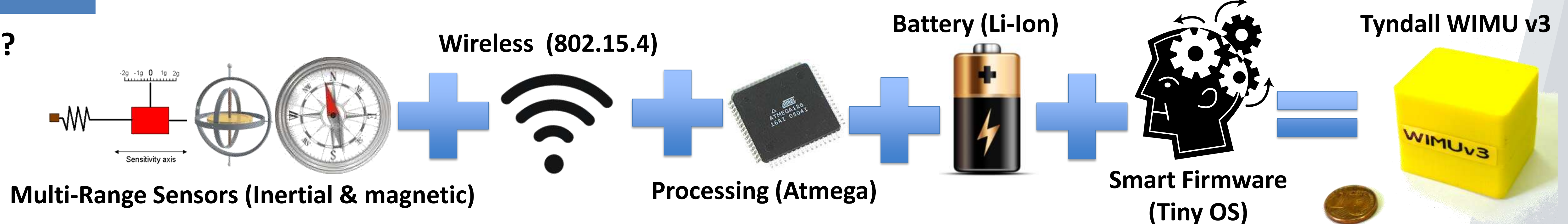Not Well Understood or Studied
Room for Improvement?

Loading

Collaborative Project
University of Bath & UK Sport
Tyndall's Sensor Expertise
Instrument Athletes & Equipment
Investigate Start Period & Training
Improve Athlete Performance?

Implementation

What's a WIMU?
Wireless
Inertial
Measurement
Unit

Multi-Range Sensors (Inertial & magnetic) + Wireless (802.15.4) + Processing (Atmega) + Battery (Li-Ion) + Smart Firmware (Tiny OS) = Tyndall WIMU v3

Assassin Start Trainer
Training System for Sled Starts
Rolling Sled on Adjustable Incline
Mounts for Resistance Bands & Weights
Attach WIMUs to Sled Metal Spars
Basic Timing Data - 2 Portable Light-Gates
Multiple Runs - Different Weights & Inclines

WIMU on Assassin

Instrumented Assassin Run

Sample Raw (top) and Filtered (bottom) Accelerometer Data from Assassin Run
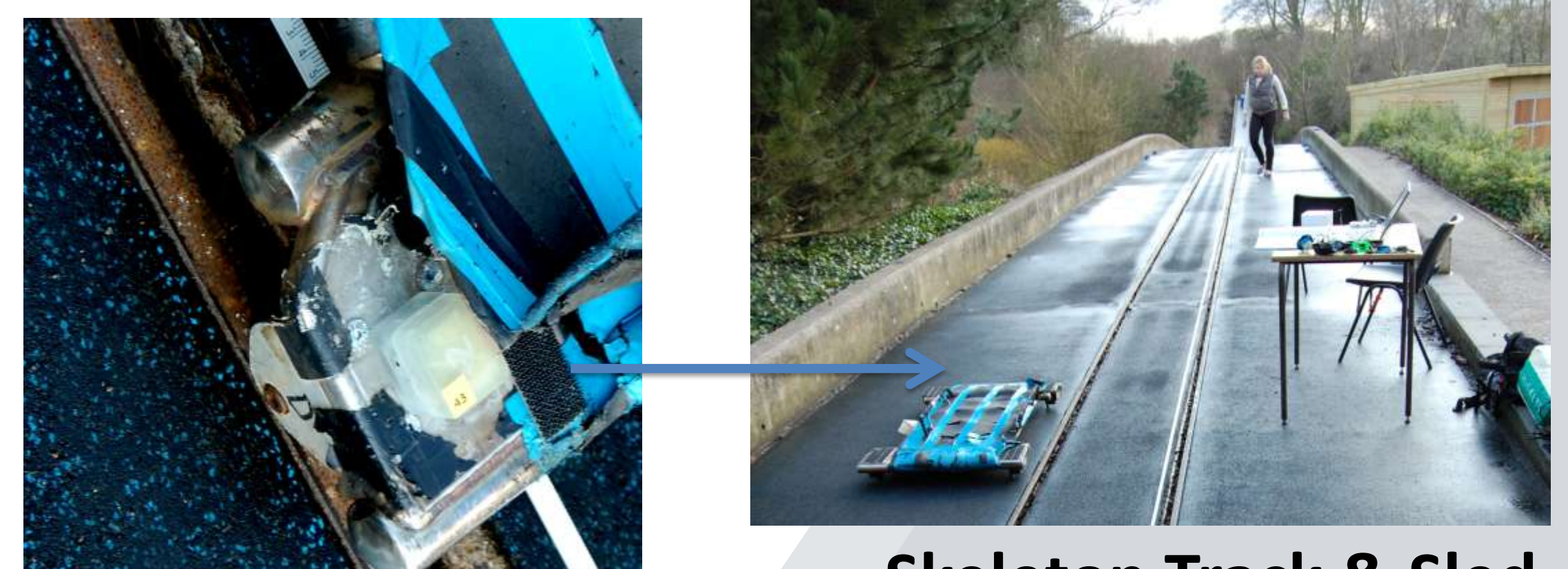
Skeleton Test Track
Practice Track for Sled Start
Concrete with Wheeled Sled on Metal Rails
Attach WIMUs to Plates on Sled Corners
Base-station Near Loading Point
Detailed Timing Data -13 Embedded Light-Gates
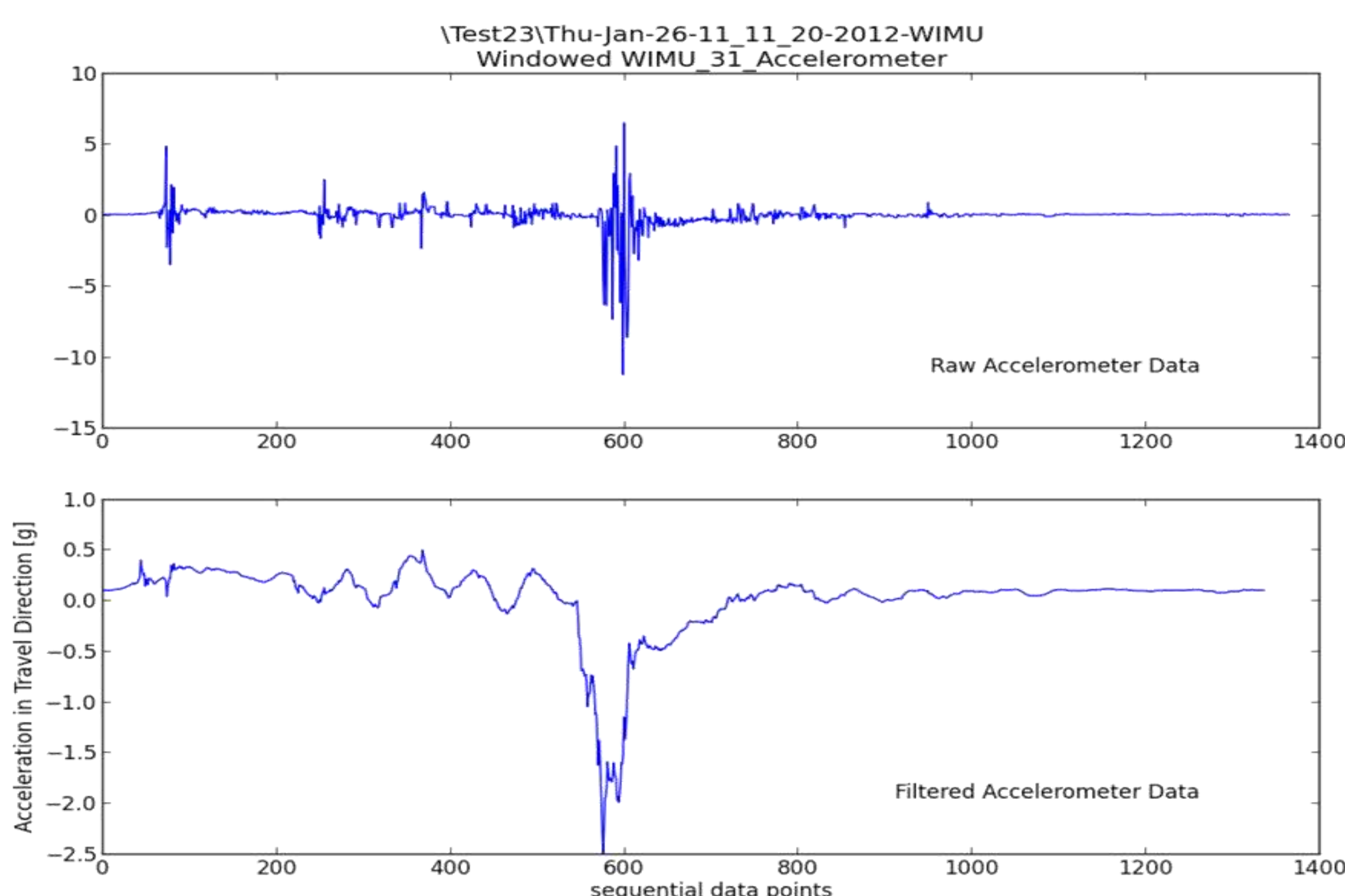Multiple Runs - Different Step Count & Push Style

WIMU on Skeleton

Skeleton Track & Sled
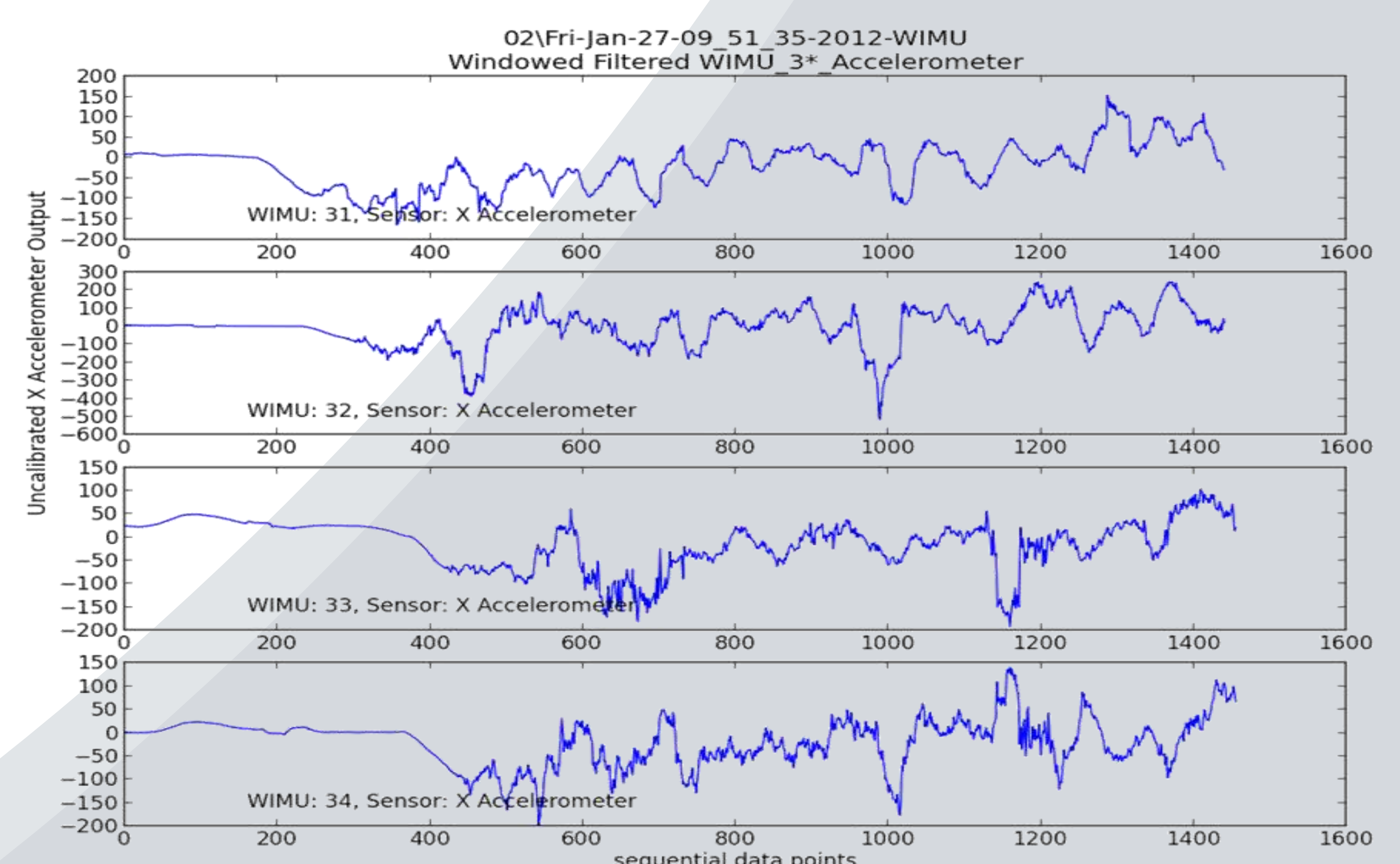
Sample Filtered Accelerometer Data from 4 WIMUs (31-34 top to bottom) on a Skeleton Run

Outcome

WIMU Data was successfully recorded for 35 Assassin and 11 Skeleton runs with average sensor sampling rates in the 100's of Hz per WIMU. Such WIMU based systems show great potential for skeleton performance analysis and possibly becoming part of elite athlete's strength and fitness training. Future work will involve getting more data, instrumenting the athlete and focusing on the stages of the skeleton run beyond the initial pushing and loading period

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