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<b>Title</b>	WIMU instrumentation of assassin trainer & skeleton sled WIMU instrumentation of skeleton "ASSASSIN" trainer & sled
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University College Cork, Ireland  
Coláiste na hOllscoile Corcaigh

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## SKELETON

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



Pushing

## THE "START"

20-30m Pushing & Loading  
Complex Explosive Motion  
Critical to Performance  
Not Well Studied  
Room for Improvement?



Loading

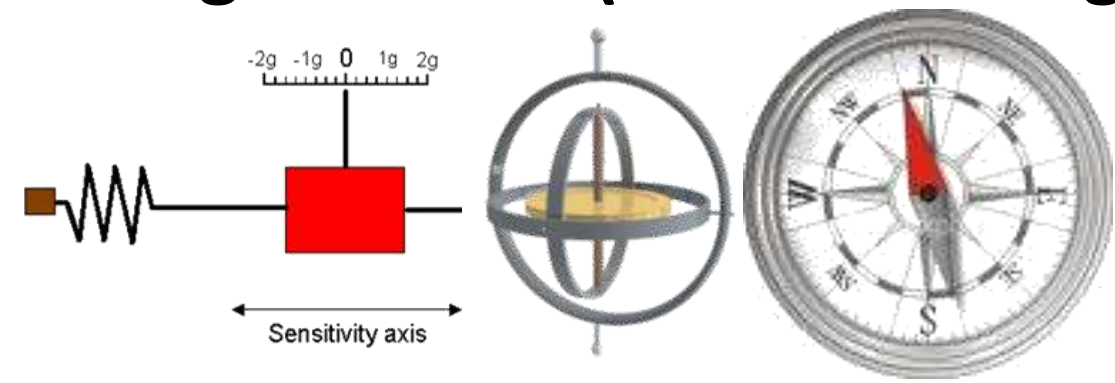
## COLLABORATION

Tyndall's Sensor Expertise  
University of Bath Facilities  
UK Sport Access to Athletes  
Olympic Athletes & Trainers  
Investigate Start Period & Training  
Improve Athlete Performance?



## WHAT IS A WIMU?

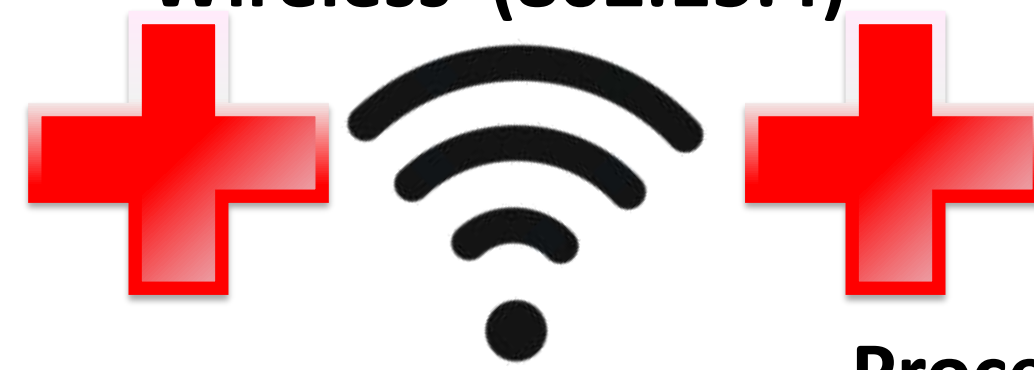
Multi-Range Sensors (Inertial & magnetic)



Tyndall WIMU v3



Wireless (802.15.4)



Processing (Atmega)

WIRELESS

Battery (Li-Ion)



Smart Firmware (Tiny OS)

INERTIAL

MEASUREMENT

UNIT

## ASSASSIN START TRAINER

Training System for Sled Starts  
Rolling Sled on Adjustable Incline  
2-3 WIMUs on Sled Spars  
Resistance Bands & Weights  
2 Light-Gates for Basic Timing  
37 Runs - Different Weights & Inclines



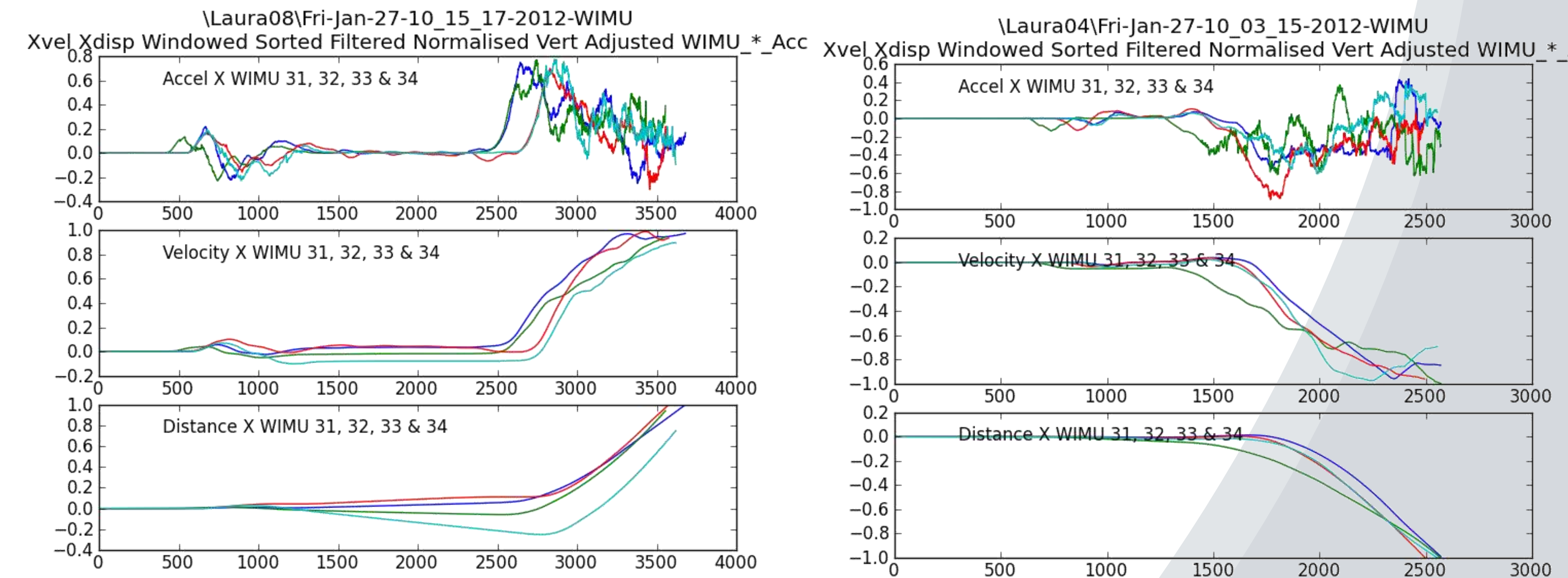
WIMU on Assassin

## SKELETON TEST TRACK

Practice Track for Sled Start  
Wheeled Sled on Metal Rails  
4 WIMUs on Sled Corner Plates  
Base-station Near Brow of Hill  
13 Light-Gates for Accurate Timing  
12 Runs - Different Step# & Push Type



WIMU on Skeleton



Skeleton Acceleration Data with Estimated Velocity & Displacement:  
Left and Right Handed Pushing can be Distinguished

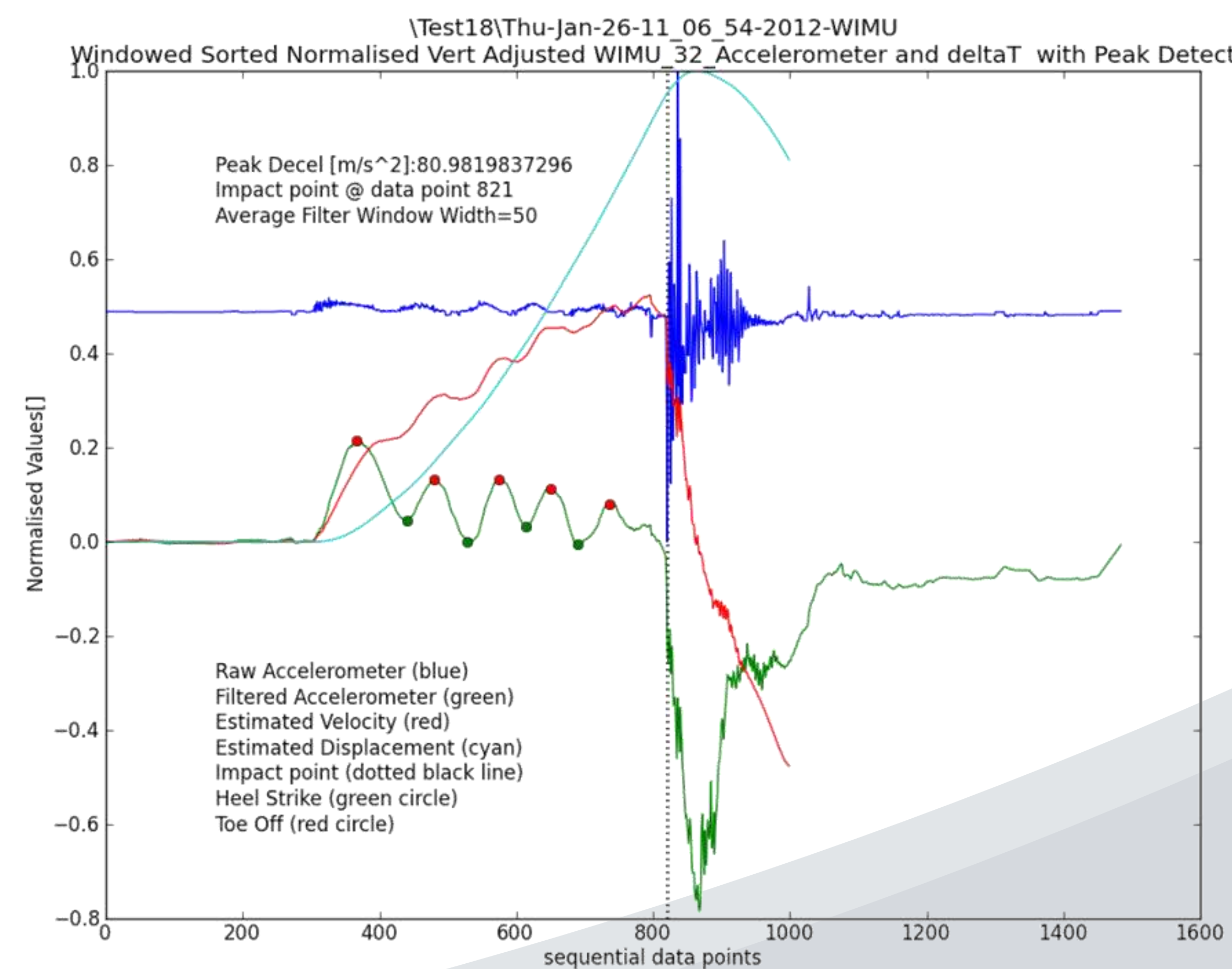
Sensor Type	Sensor Part	Range	Target	Assassin	Skeleton
Accelerometer	ADXL345	±16g	256Hz	257Hz/Axis	216Hz/Axis
Gyroscope	IDG/ISZ-650	±2000°/s	256Hz	263Hz/Axis	214Hz/Axis
Magnetometer	HM5843	±0.7Ga	50Hz	55Hz/Axis	42Hz/Axis
Combined Sensing Rate				3450Hz	5660Hz

## OUTCOME

WIMU Data was successfully recorded for 34 Assassin & 11 Skeleton runs with average device sampling rates close to the target. System wide sensing rates were in 1000's of Hz. Slight decreases in performance were seen for the Skeleton track due to a more challenging RF environment. Additional light-gate based timing and video data are also available for many of these runs and are being used to validate the initial results. Algorithmic identification of individual step candidates & initial calculations of sled direction, velocity and distance look promising.

## FUTURE

WIMU based systems hold great potential to aid & automate skeleton performance analysis and become part of training and coaching regimes for elite athletes. Future work will involve additional data recording, further instrumenting the athlete, analysing technique and focusing on post loading features. This will allow the Olympic level athletes involved to bring their training from the Lab to the track.



Assassin Data with Estimated Velocity & Displacement:  
Step and Impact Events can be Identified