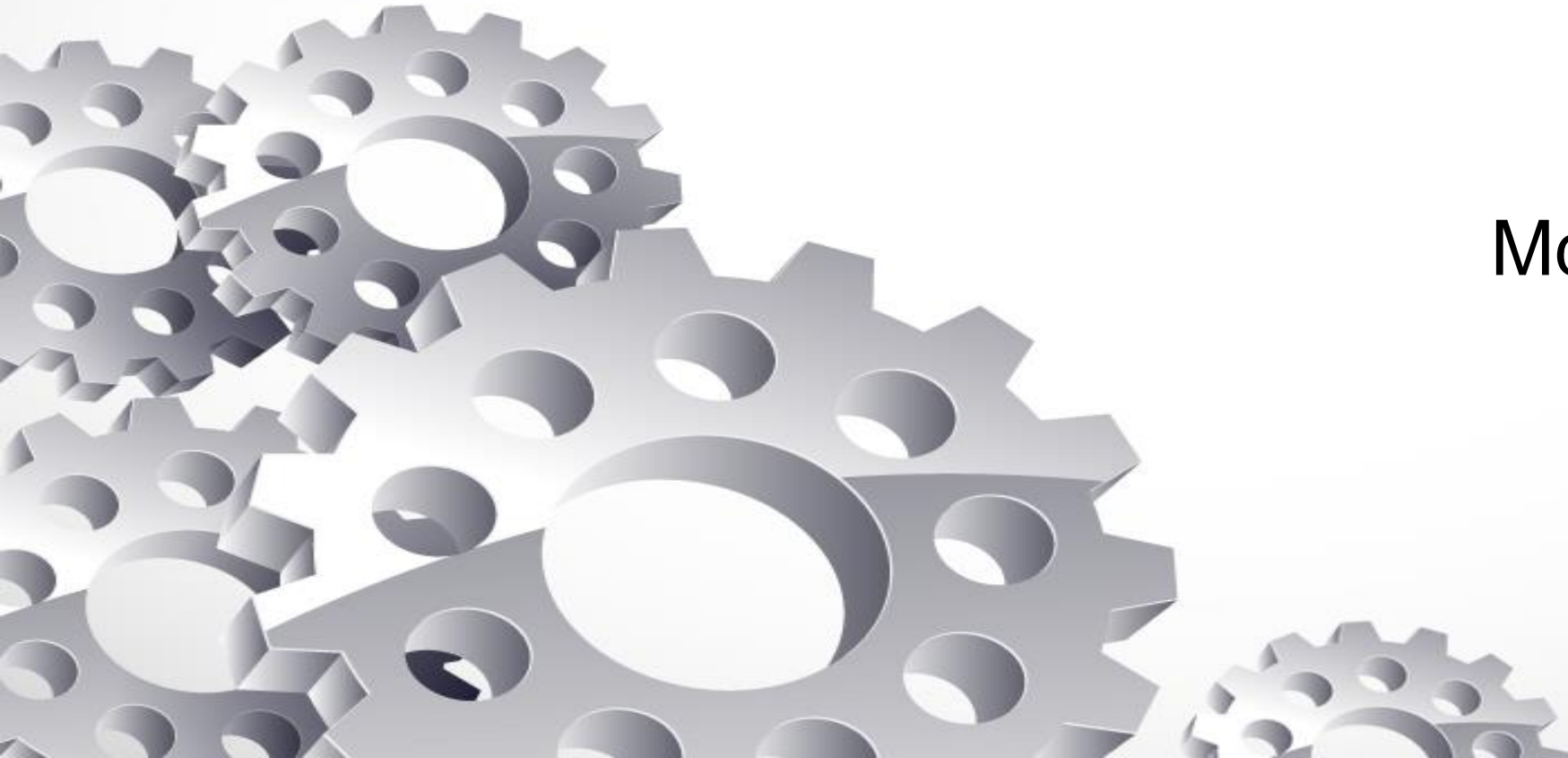




Rapid quadrupedal locomotion: A study of greyhound galloping mechanics

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Introduction (greyhound kinematics)

- Second fastest land animal (exceeding 70 km/h)
- High chase acceleration ($>6 \text{ m/s}^2$)
- Ability to sprint long distance (720 meters in just under 41 seconds)
- High turning ability (change heading at 23 degrees per second)



A greyhound in the race track



Usain Bolt, one of the fastest 100 m sprinter

Greyhound locomotion biomechanics



- Rotatory gallop gait for faster motion
- High stride frequency (>3 strides/s)
- Long stride (>5.5 m)
- 37% of the time airborne in the stride

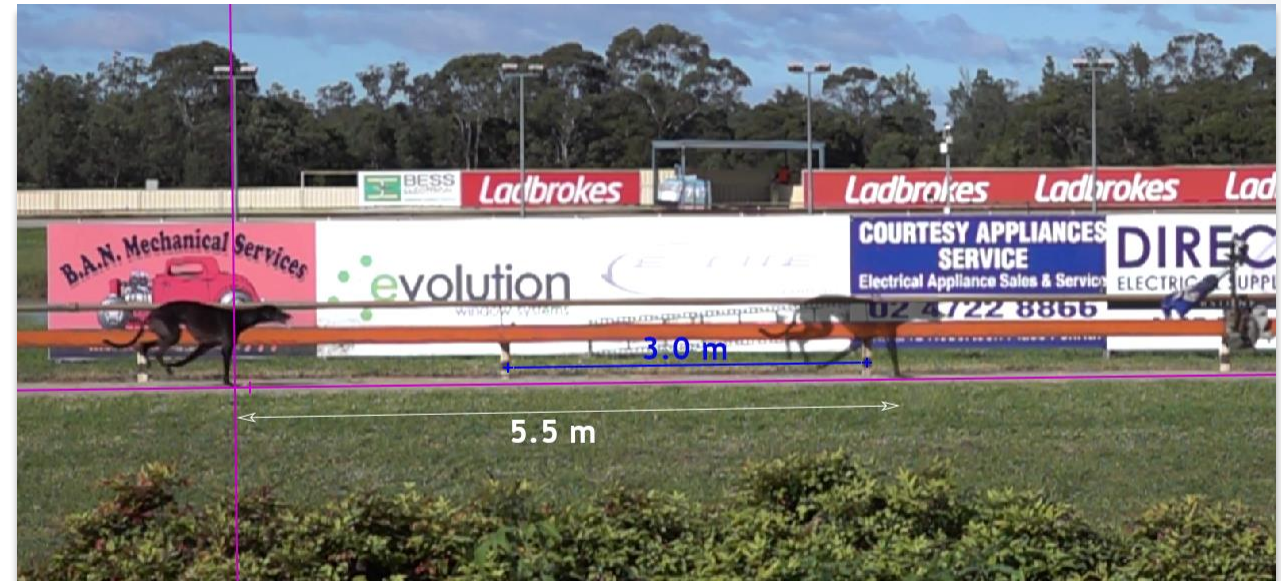


A greyhound rotatory gallop in slow motion

Understanding greyhound galloping mechanics by tracing greyhound body parts in motion



- Setup a HFR camera
- Find reference points in the background
- Process HFR video
- Analyse motion in video analysis software
- Generate object tracing results



The shadow greyhound showing greyhound run distance in one stride 5.5m in length

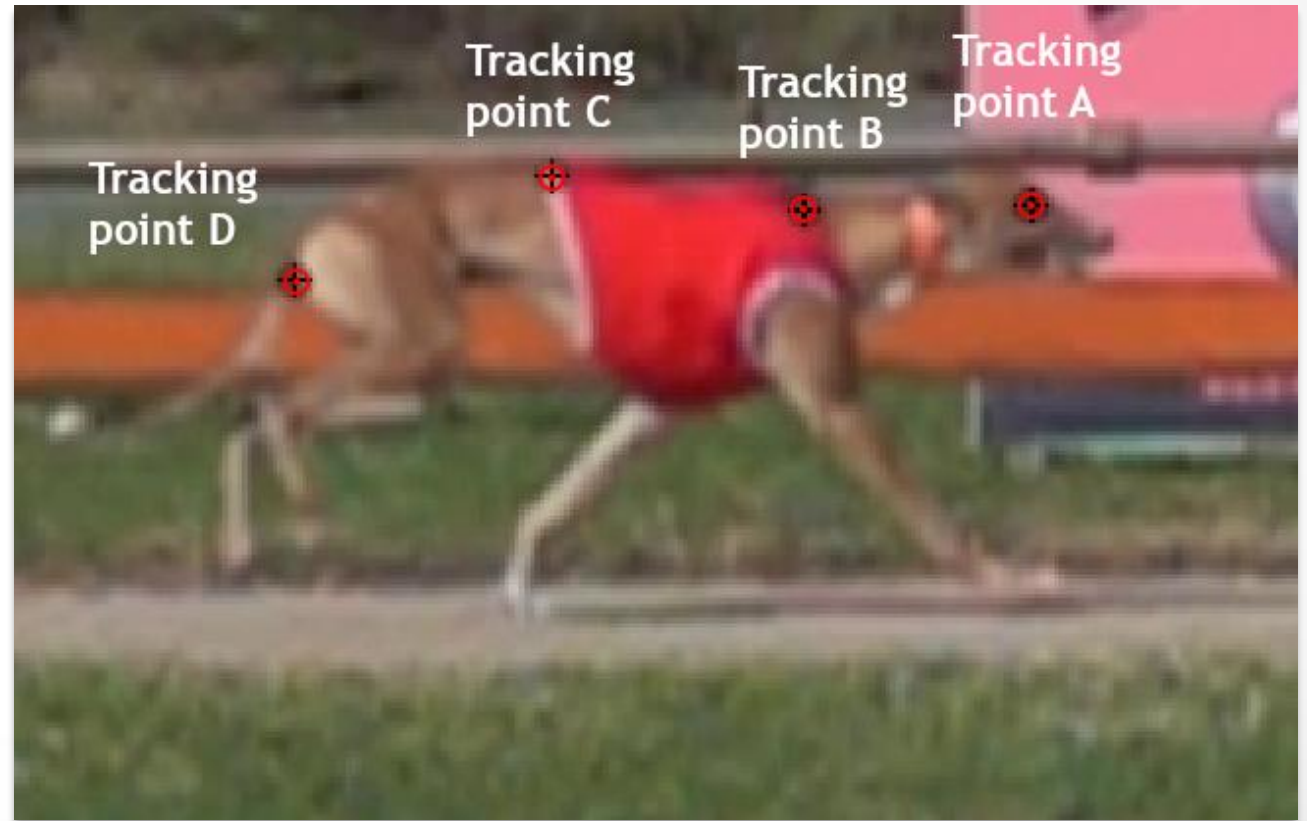
Extract frames of reference for motion analysis

- Feedback speed information
- Move greyhound frame



Locate points of interest

- Find 'hard' points
- Track these points

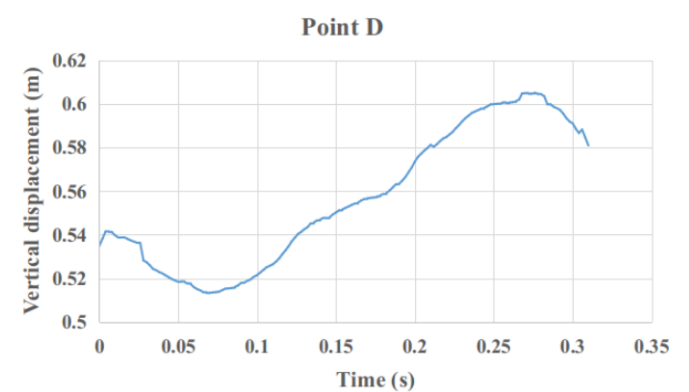
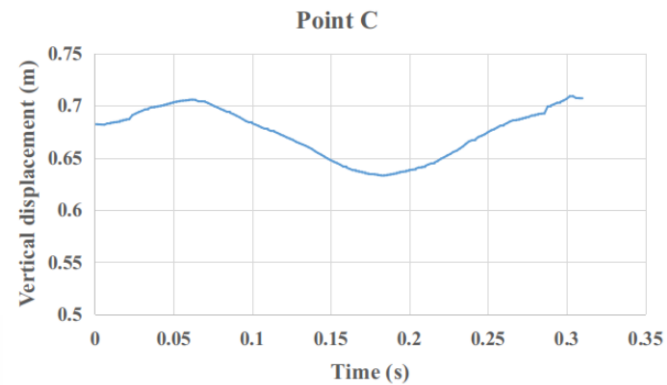
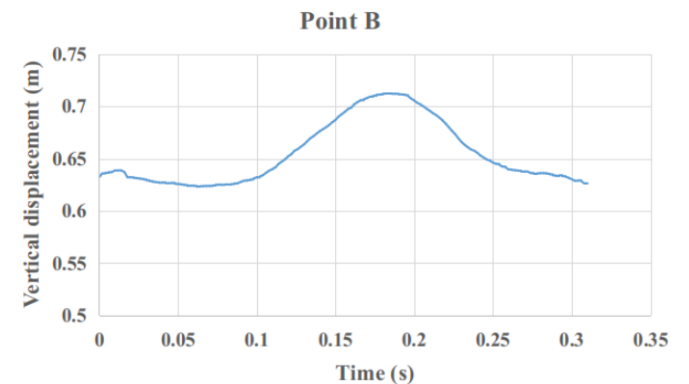
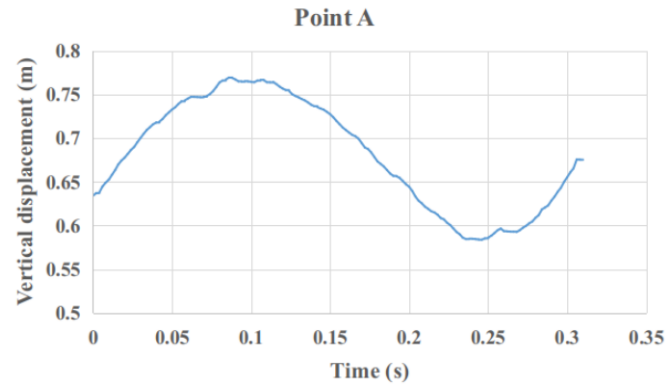


Pose analysis (vertical displacements)

- Musculoskeletal system performance

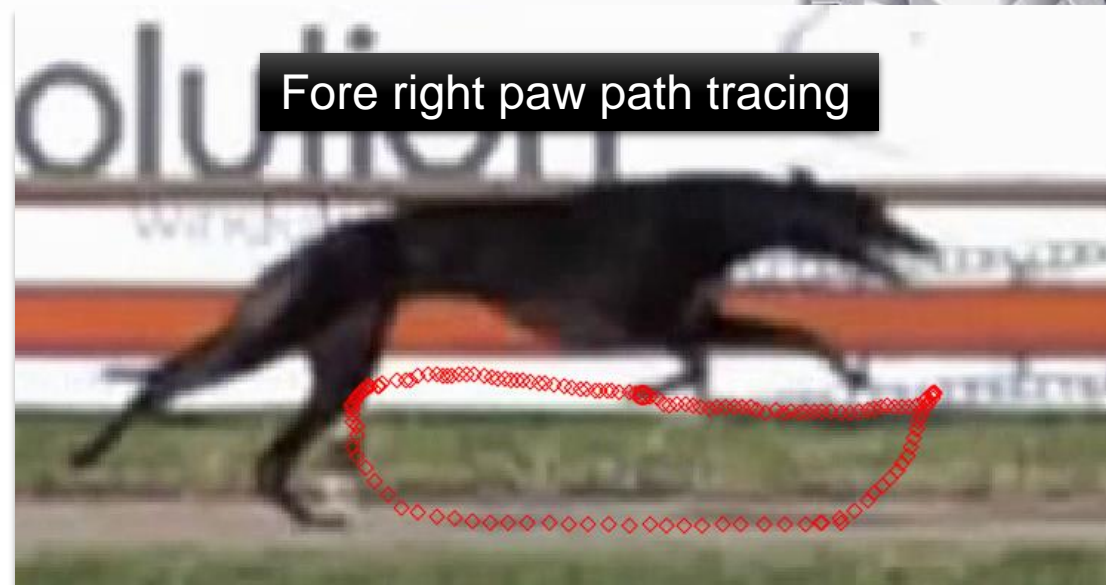


Hard point	mm
A	186
B	89
C	76
D	92



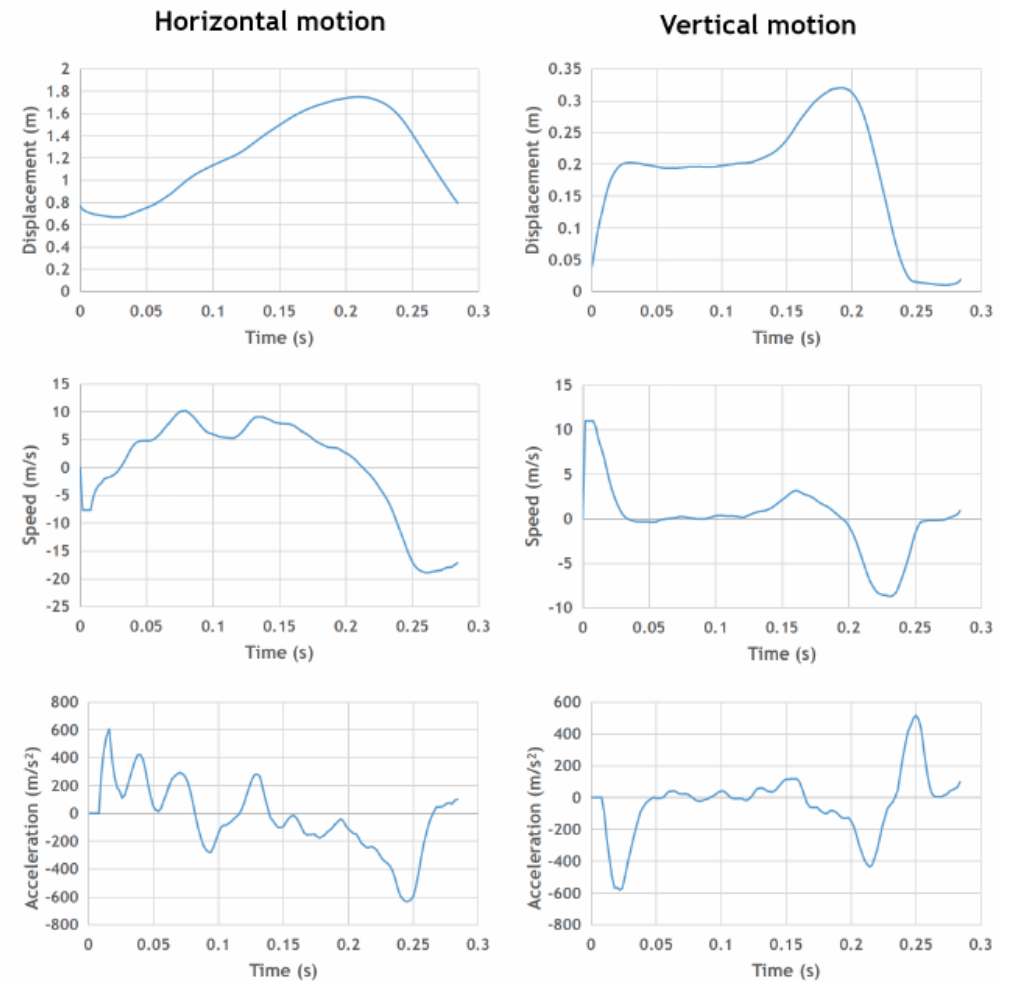
Displacements of tracking points

Limb kinematics analysis by paw tracing



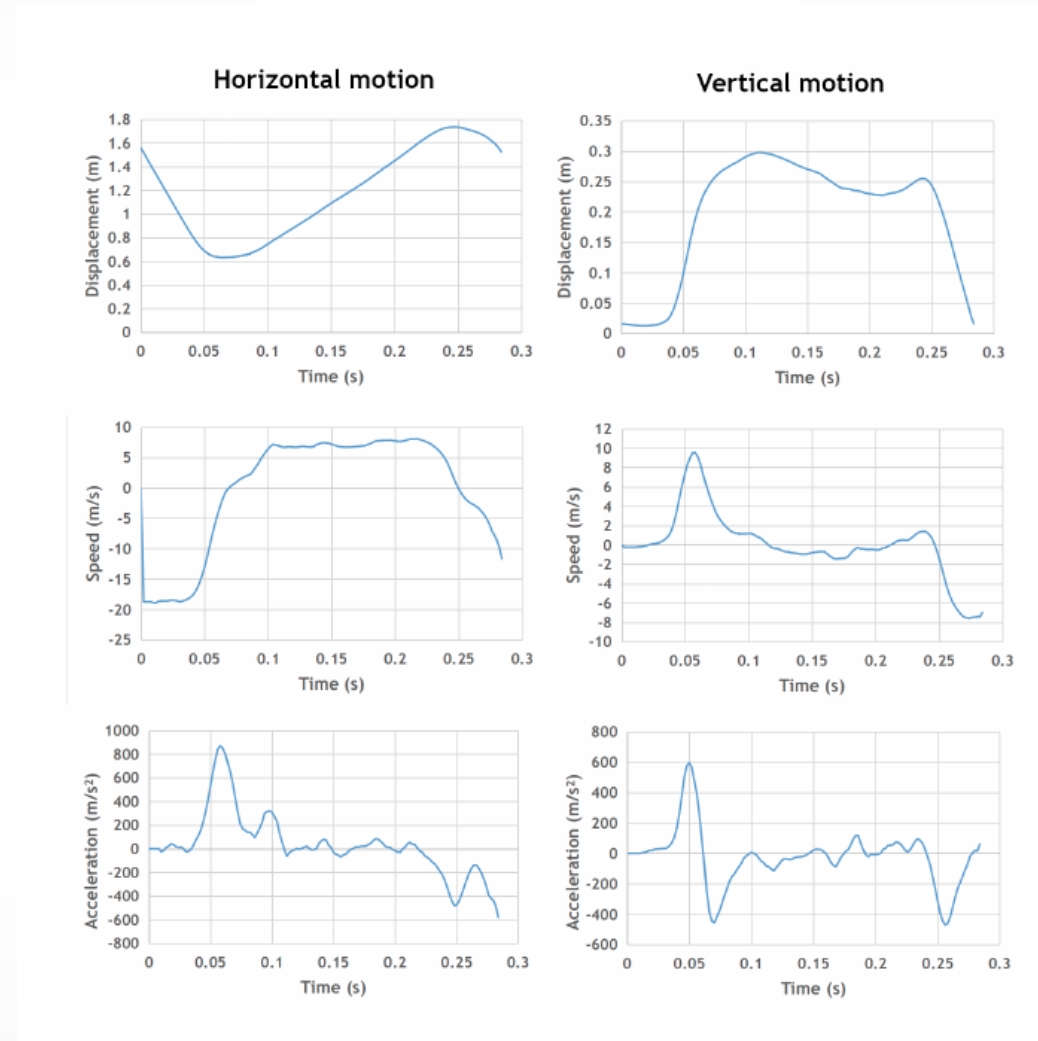
Paw kinematics analysis

- Paw relative displacement, speed and acceleration
- Find work done by the paw
- Find the kinetic energy of each paw
- Find force experienced by each paw



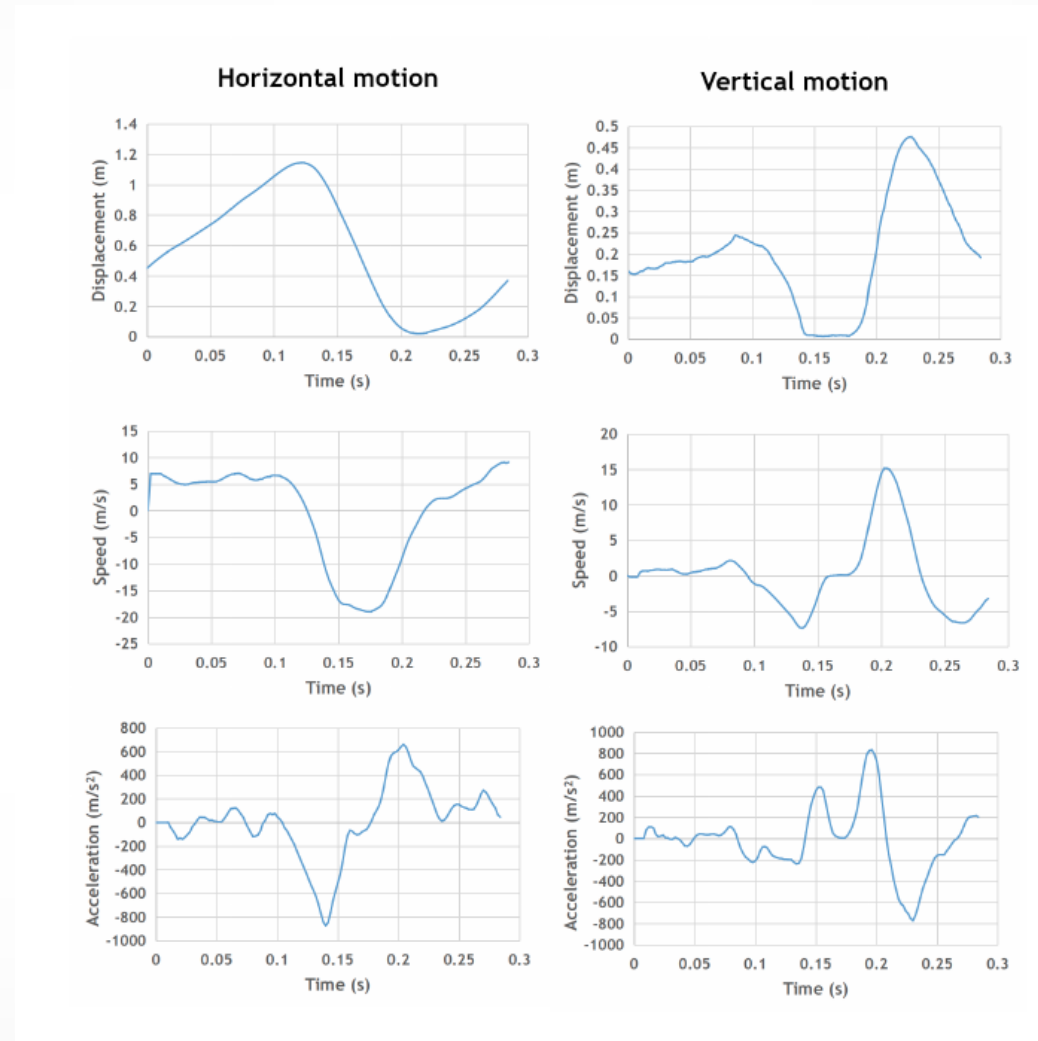
Relative motion of the front left paw in a stride

Paw kinematics analysis (right paw)



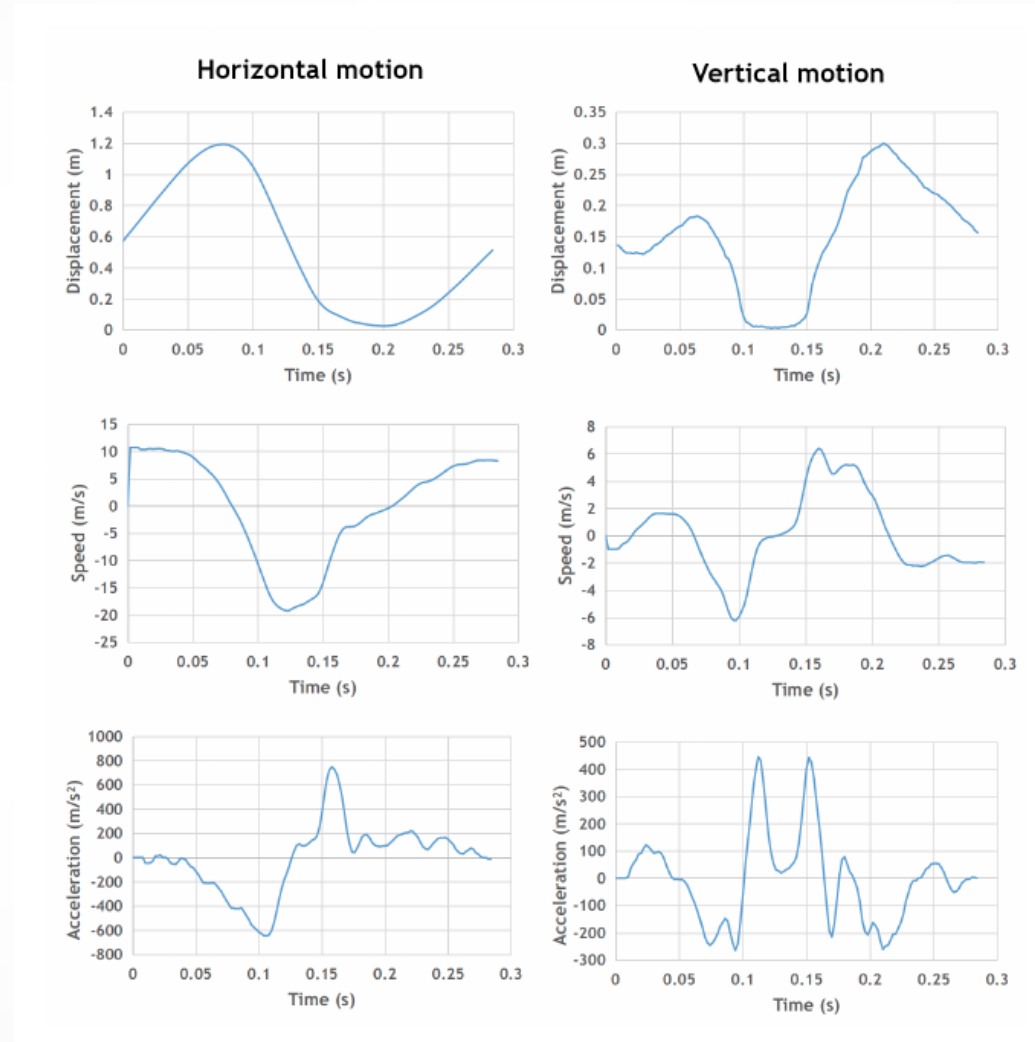
Relative motion of the front right paw in a stride

Paw kinematics analysis (hind left paw)



Relative motion of the hind left paw in a stride

Paw kinematics analysis (hind right paw)



Relative motion of the hind right paw in a stride

Paw kinematics analysis



	Front left paw	Front right paw	Hind left paw	Hind right paw
Maximum horizontal speed (m/s)	18.93	18.91	18.95	19.22
Maximum vertical speed (m/s)	10.94	9.55	15.14	6.39
Maximum horizontal acceleration (m/s ²)	633.10	870.14	873.14	746.84
Maximum vertical acceleration (m/s ²)	581.65	595.26	831.25	444.99



THANK YOU
Q/A