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Development of a toolbox suite to analyse the kinematics of horse limbs during swimming

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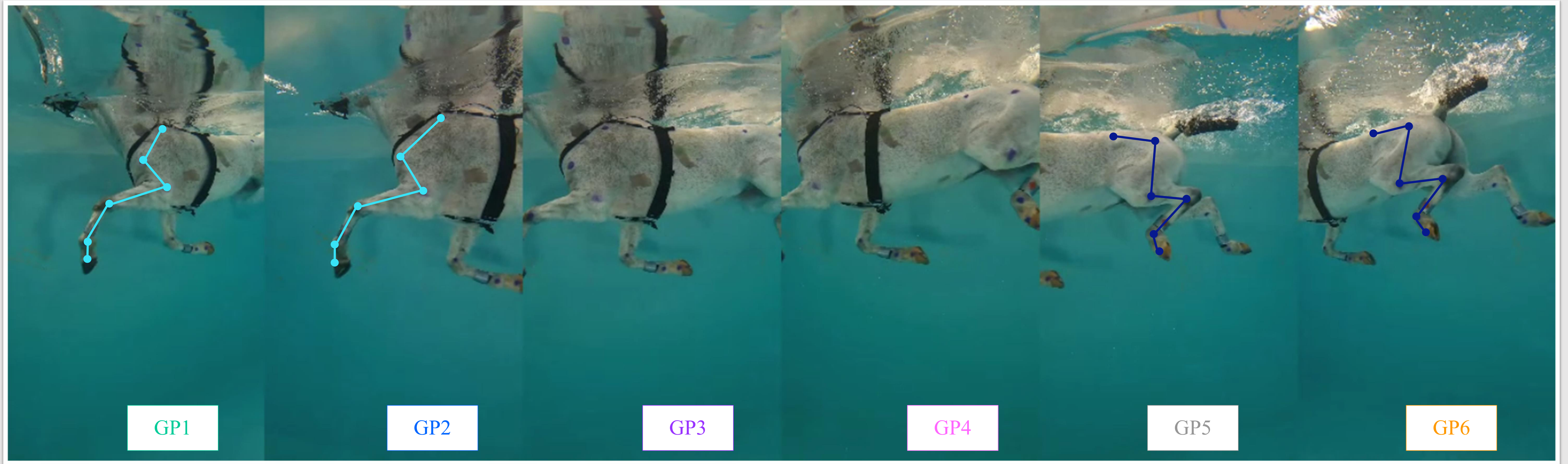
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Background

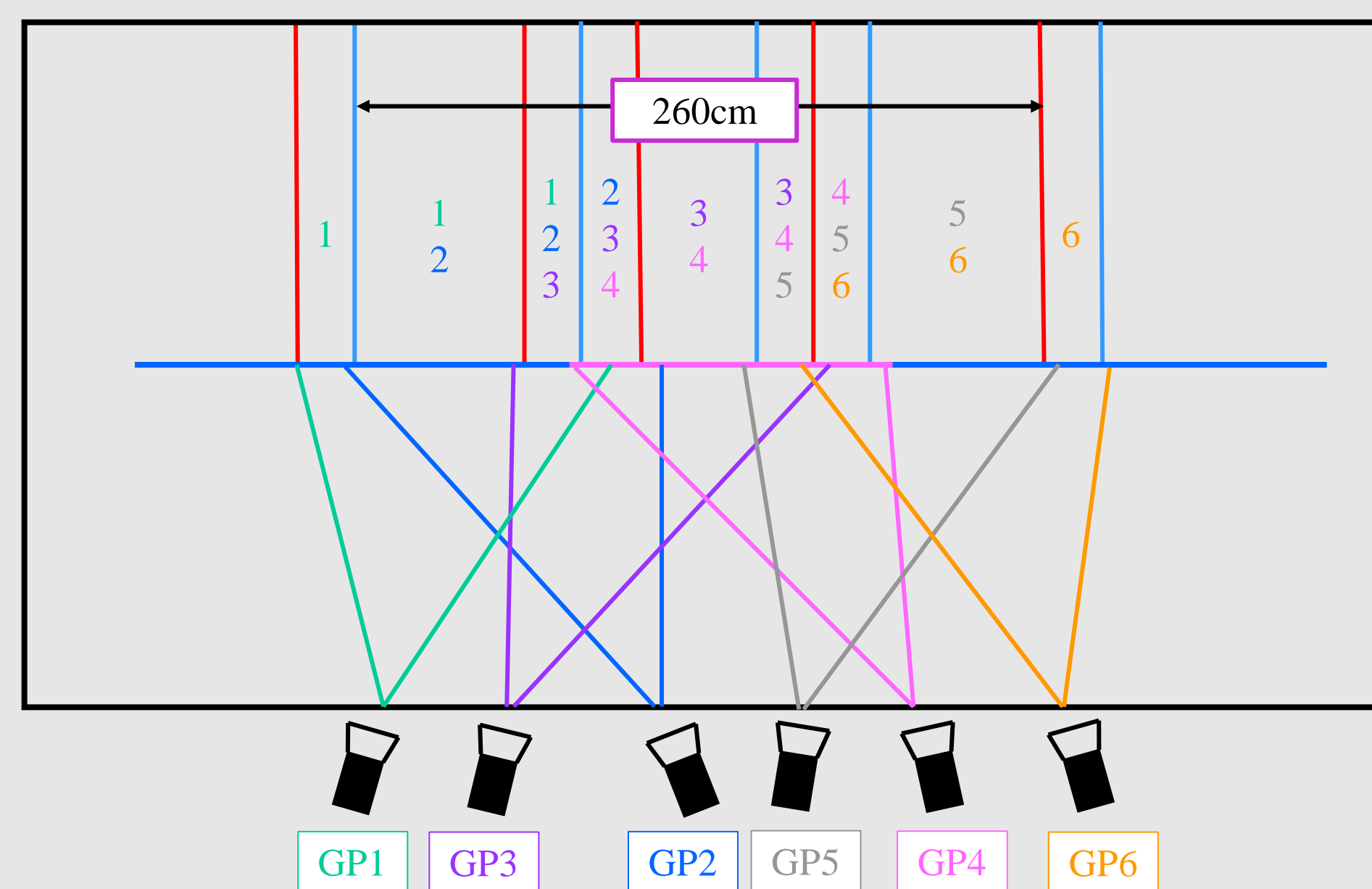
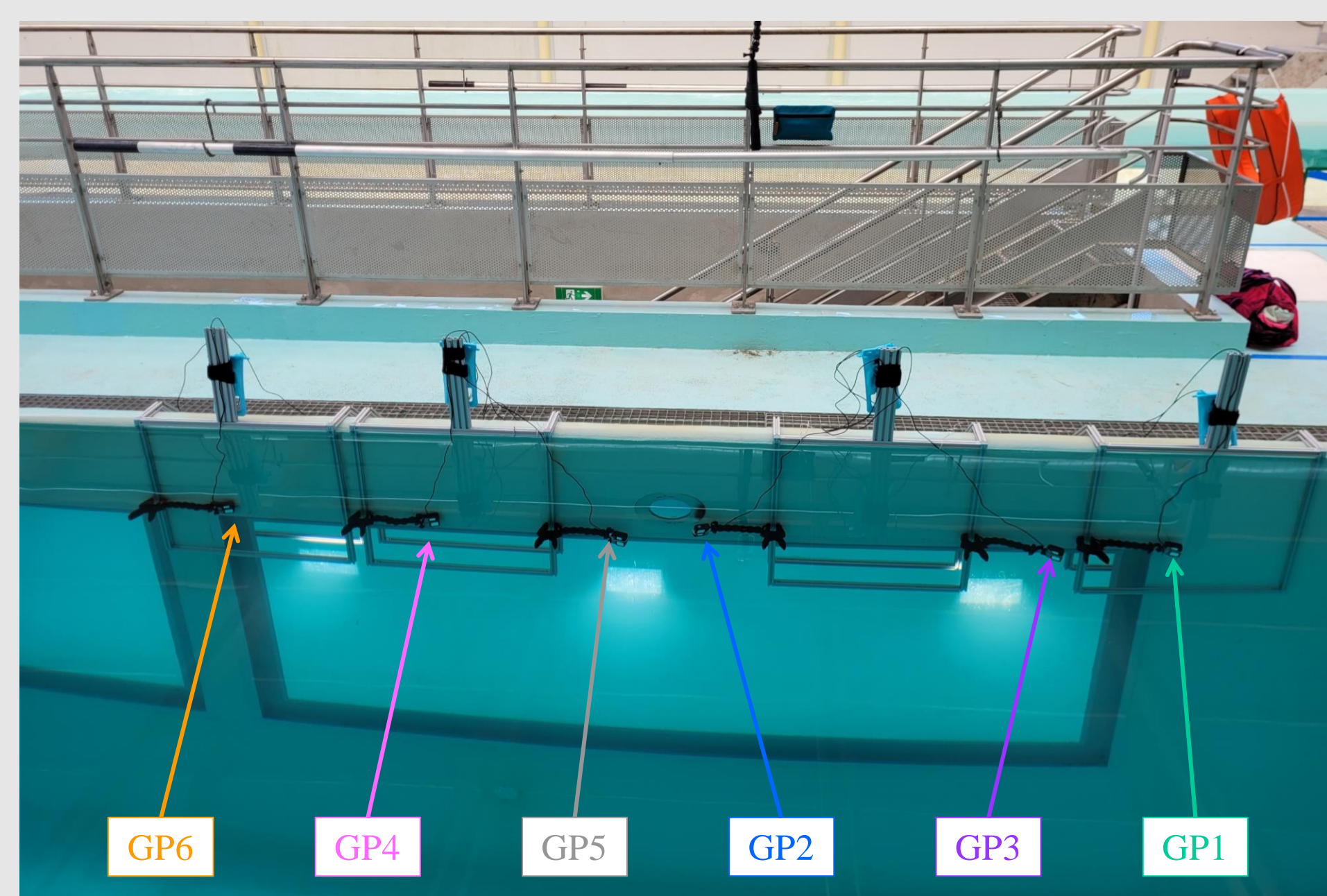
- Use of the swimming pool for **training & rehabilitation**
- Only one study of the **2D movement** of the swimming of the horse [1-2]
- Study of **limbs independently**
- No precision of the **accuracy**

Questions ?

- Describing **quantitatively** the **swimming cycle** of a horse?
- Building a **non-invasive, accurate** and **versatile** system and its associated post-processing to analyse the **3D movement**?

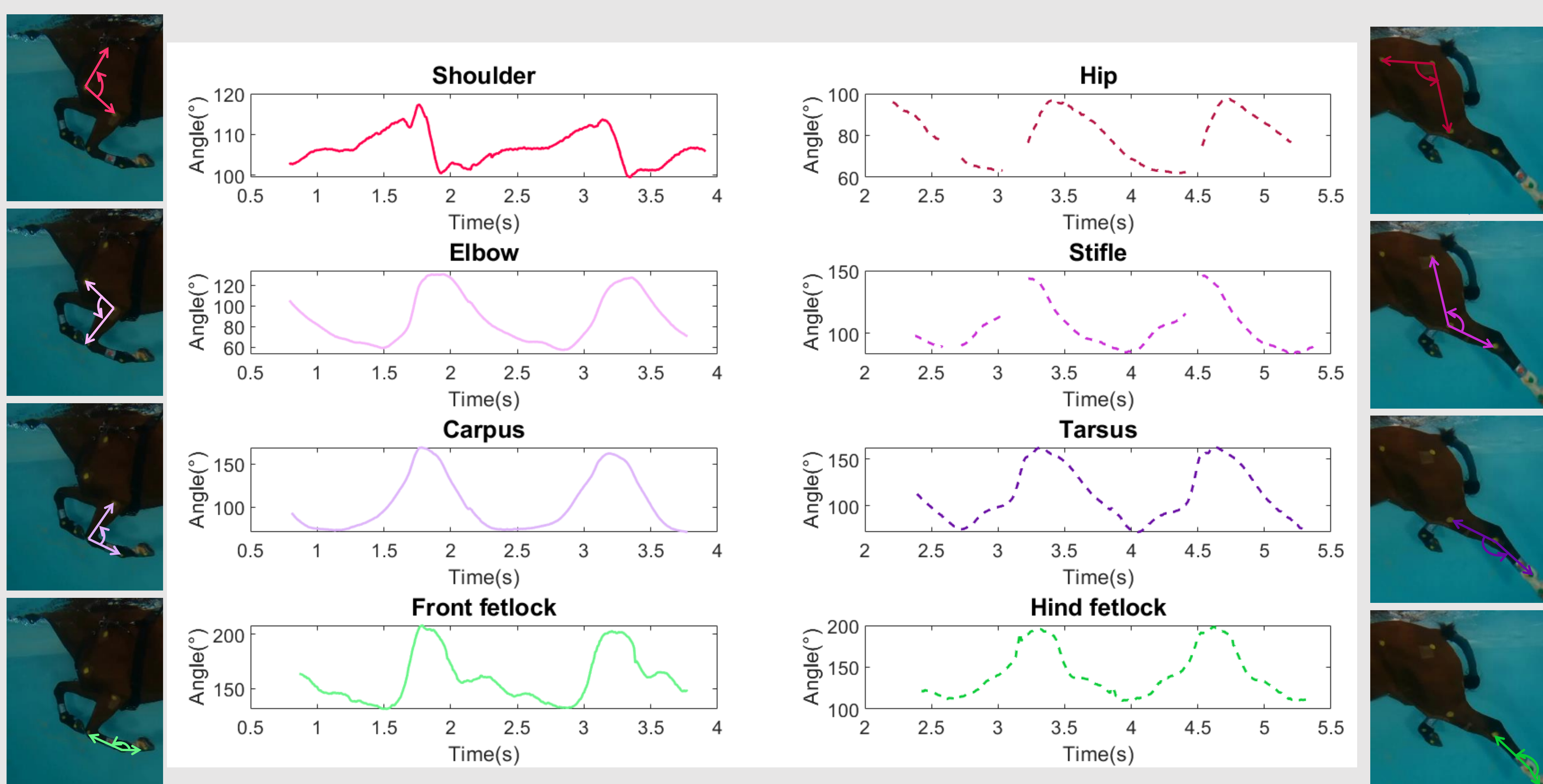
Materials & Methods

- 6 horses
- 24 anatomical markers (12 on both sides)



- 6 underwater cameras →
Field of view: 2,60m
- 12 recordings analysed
- Synchronization +
Calibration + Tracking +
DLT Algorithm → **3D reconstruction**

Main results



- 3D movement: **2 cycles** of swimming for each visible limb
- 1 full cycle of swimming ~1,5s
- ROM : larger than on land for all joints excepts for fetlocks, due mostly to larger maximal flexion (smaller minimum angle), with a precision of 1°

Conclusion & Perspectives

- 1 full cycle of swimming → **antero-posterior coordination**
- Detection of protraction & retraction → **temporal quantitative description** of the swimming cycle
- ROM : analysis for **rehabilitation process**

References

- [1] Santosuosso et al., Analysis During Straight Line Free Swimming in Horses: Part 1 - Forelimbs. Front. Vet. Sci., Vol. 8 – 2021, 752375
[2] Santosuosso et al., Analysis During Straight Line Free Swimming in Horses: Part 2 - Hindlimbs. Front. Vet. Sci., Vol. 8 – 2021, 761500

Acknowledgments

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