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Morpho 3D: a new device to register and analyze 3D shapes of animals

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General: Monitoring growth and body condition is essential in modern farms for optimal management. Because of difficulties of implementation and use in commercial farms, it is not very common.

Hypothesis: 3 dimensions image analysis is a solution: designing Morpho 3D tool.

Questions: does Morpho 3D device is suitable for precise morphological measurements ?

Material & Methods

On-animal manual measurements of Heart Girth (HG), Withers Height (WH) and Hip Width (HW):

- 6 different cows (4 successive measurements)
 - Reproducibility
- 1 model plastic cow (6 times):
 - Repeatability



Heart Girth (HG)

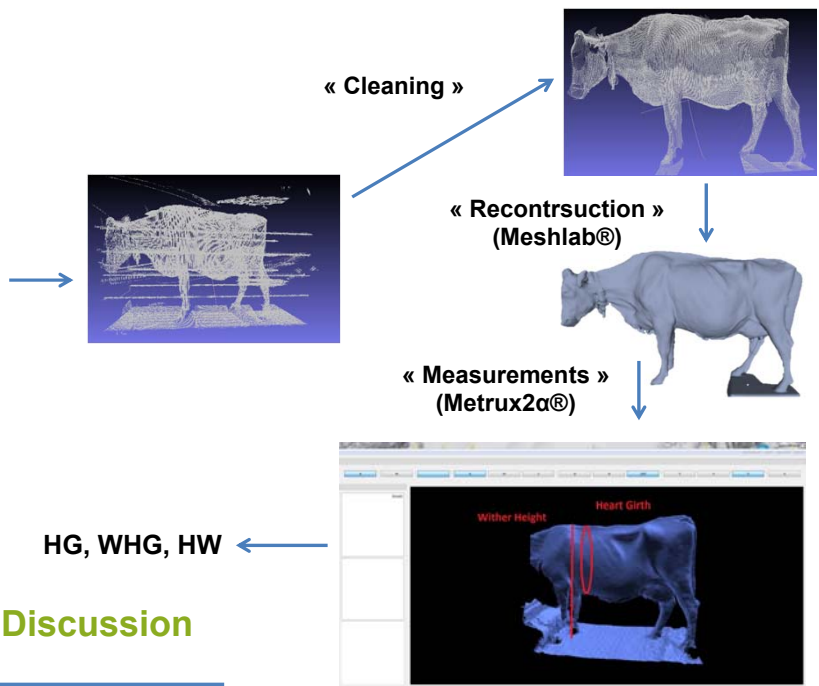
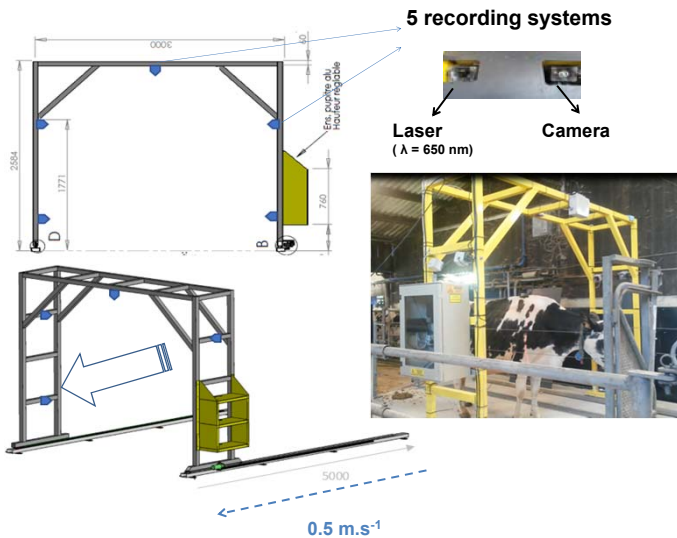


Withers Height (WHG)



Hip Width (HW)

Indirect measurements on 3D images from 3D device
(Video available at : <https://vimeo.com/219370900>)



Results / Discussion

		Repeatability			Reproducibility	
		μ_r (cm)	σ_r	CV_r (%)	σ_R	CV_R (%)
HG	Manual	129.1	1.04	0.80	1.07	0.72
	Morpho3D	131.1	0.34	0.26	2.12	1.42
WHG	Manual	39.8	0.35	0.88	1.01	1.82
	Morpho3D	39.9	0.67	1.68	0.55	0.94
HW	Manual	194.2	0.21	0.11	0.49	0.62
	Morpho3D	195.8	1.89	0.97	0.92	1.09

μ : average value; σ : standard deviation;
 $CV_r = \mu_r / \sigma_r * 100$; $CV_R = \mu_R / \sigma_R * 100$ (μ_R is the average value of the cow model, not presented)

- 2 min/cow to get an image
- High correlations between **Manual** and **Morpho3D** values
- CV_r & CV_R values < 3 %: repeatability and reproductibility are (very) good
- Reliable technology for on-farm uses

Conclusion / perspectives

- Needs for automation of measurements on 3D images (currently need 15 min for 5 items, only 3 presented here)
- Possibility to determine and use new indicators
- New opportunities for animal management and genetic evaluation, other than dairy cows, thanks to the possible determination of new indicators (surfaces, volumes...)

