

Automatic detection of lameness in dairy cattle

Image features related to dairy cow lameness

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Lameness, an increasing animal welfare problem, has a negative impact on milk production, body condition and reproductive performance in dairy cows [1, 2 and 3]. The objective of this research is to develop and analyze image parameters correlated with expert gait scores that are applicable for continuous lameness detection. Experiments were done on ILVO farm in Ghent Belgium in August/September 2007. A camera recorded postures and movements of 10 lactating Holstein cows while passing the corridor to the pasture outside the barn. The gait of the cows was scored by experts on a scale of 1 to 3. Image features of track way overlap and spine arch were investigated by using labelled countour points. The trackway overlap can be described by the distance between the placement of the fore hoof on the floor and the placement of the hind hoof on the floor (see Figure 1). Within the spine arch 2 corresponding values can be calculated: the curvature of the back and the radius as a basis of the curvature (see Figure 2).

Results show that each calculated image feature has a relation to the expert scores on lameness. Regarding the parameter trackway overlap, The cows with walking problems have higher locomotion scores and greater positive trackway overlap values at least in one leg. The results of the parameter spine arch show that in between the 10 cows the curvature of the back becomes more convex with high gait score. The radius has a linear relation to the curvature and becomes smaller with an increasing convexity and a higher gait score.

It shows track way overlap and spine arch are useful image features for lameness detection. A further goal is the development of an automatic on-line lameness detection tool after analyzing more lame cows and more image features.

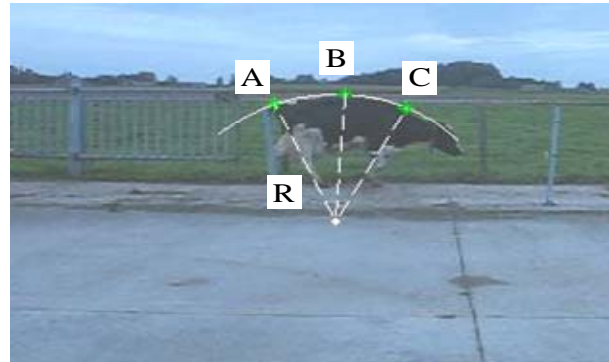


Figure 1. Feature of spine arch curvature (κ) in the horizontal side view. $\kappa = 1/R$

References.

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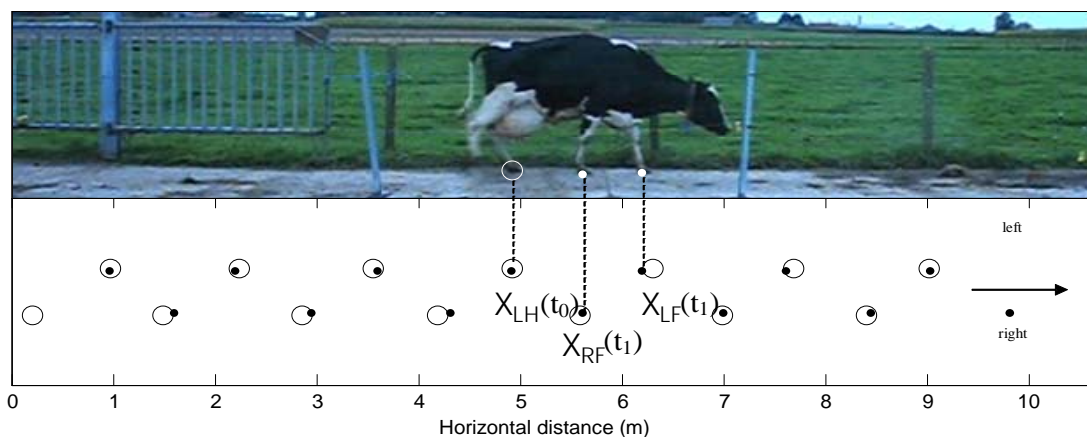


Figure 2. Feature of track way overlap (Δ) in the horizontal side view. $\Delta_i(t) = X_{LH}(t_1) - X_{LF}(t_0)$