Separating the normal from abnormal variation caused by lameness in a detection model

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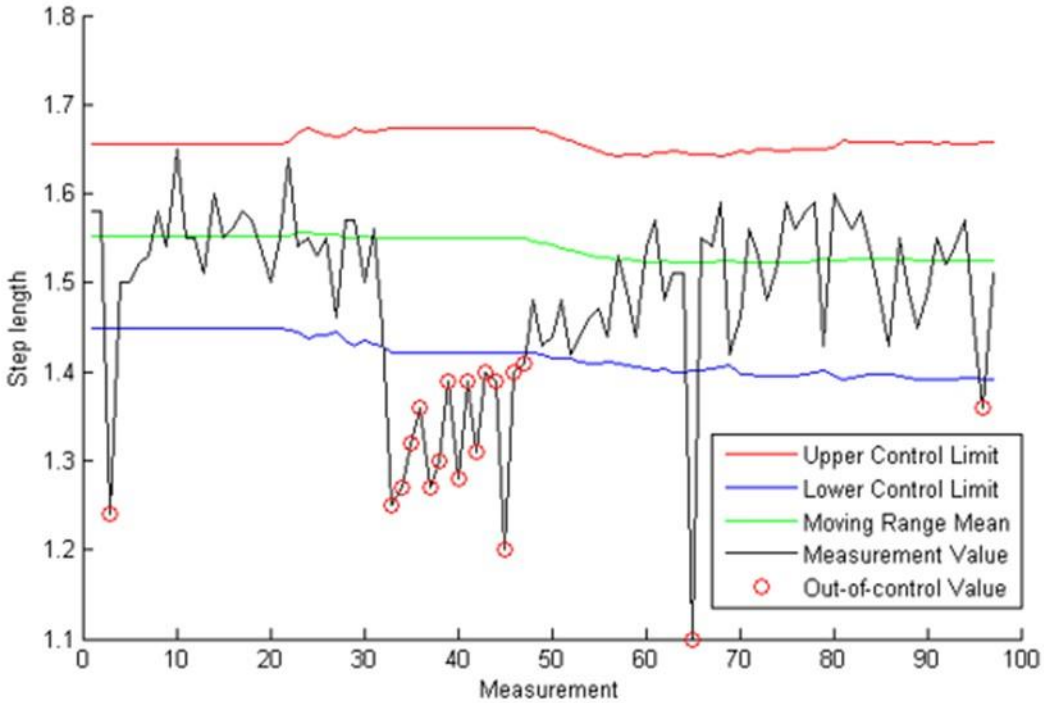
In a lameness detection system, lameness alerts should correspond to changing gait or behaviour related to lameness. However, alterations in the gait of cows can not only be caused by painful claw lesions but also by filling of the udders, age or slippery flooring, etc. To avoid that such 'normal' variation in gait variables causes misclassification and hence hamper the success rate of the detection system, the effect of environment and cow factors on the specific gait variables measured by the Gaitwise has been investigated in a pilot study using measurements of 30 non-lame, healthy cows during 5 months. A dark environment and wet surface provoked shorter and more asymmetrical strides. In general, older cows had a more asymmetrical gait, walking slower with more abduction. Towards the end of the gestation cows were found to walk slower, with less step overlap and more asymmetry. An automatic detection system for lameness (or for any other health problems) will only function accurately if it is able to distinguish the variation due to the disease from such normal variation due to non-disease related cow factors and environmental or management factors. Environmental factors could be avoided by changing the set-up of the measurement zone. Cow factors could be taken into account in the detection algorithm by using an individual cow model instead of models using group thresholds. Observing changes in gait variables related to lameness on an individual base can be performed by applying statistical process control (SPC). Before SPC can be applied, the observed data has to be stationary, normally distributed and not autocorrelated (Mertens, 2009). Such prerequisites however, are often violated in biological data. Therefore, the concept of synergistic control (SGC) was developed, which adds an extra step of engineering process control (EPC) before SPC is performed. SGC has successfully been applied on milk yield and pig feeding behavior (Huybrechts et al., 2012; 2014; Maselyne et al., 2013). The next step in further developing Gaitwise as a lameness detection tool is to apply the concept of SGC on cow gait variables measured by the Gaitwise walkway. Figure 1 shows preliminary results using SGC on the Gaitwise variable 'stride length', resulting in both alarms for lameness episodes (day 33 to 50) as for environmental factors causing shorter strides on day 3, 45, 65, 96. In addition, the added value of combining the Gaitwise data with data already available on farm (e.g. production) and data of other sensortechnologies (e.g. accelerometers) will be investigated in the future.



Acknowledgements

This article is based upon work from COST Action FA1308 DairyCare, supported by COST (European Cooperation in Science and Technology, www.cost.eu). COST is a funding agency for research and innovation networks. COST Actions help connect research initiatives across Europe and enable scientists to grow their ideas by sharing them with their peers. This boosts their research, career and innovation.