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TECNOLOGIAS QUE ALIMENTAM O MUNDO

3D DATA ACQUISITION ON NELORE CATTLE

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Resumo: Técnicas baseadas na captura intensiva de dados podem promover a melhora do bem-estar animal, bem como sua produtividade. Tendo-se isso em vista, o presente trabalho objetivou avaliar a viabilidade de aquisição de dados 3D em bovinos Nelore fêmeas em ecótono savana-amazônia. Um sistema baseado em uma câmera de profundidade Intel RealSense d435i foi utilizado para imagens em profundidade de 105 animais nelores em área experimental da Embrapa Agrossilvipastoril. Algoritmos de processamento de imagem, como erosão, dilatação e extração de contorno foram aplicados para aquisição da área de projeção. As imagens processadas apresentaram detalhes morfométricos úteis para os próximos passos desta pesquisa.

Palavras-chave: Sistemas computacionais, Processamento de dados, Processamento de imagens, RealSense

1. Introduction

The growth of society awareness related to animal production can impact directly on herds´ handling, nutrition, transportation, and sanity. Consumers are not only concern about public health, but also on animal welfare. European and Asian markets demand quality standards that have a direct impact on traditional production systems and environmental issues. For this reason, Brazilian policies have been established aiming to improve animal welfare, such as the recommendations for Good Practices on Livestock Welfare and Economic Interests – REBEM, from the Ministry of Agriculture, Livestock and Supply - MAPA (Pinto et al., 2013). However, welfare management also implies systematic animal data acquisition in order to provide competitiveness to the farmers.

The adoption of cutting-edge technologies to collect, analyze, and take a decision is the pillar of precision animal production. According to Laca (2009), precision livestock production is an effective opportunity to create safe and environmental-friendly livestock products. This can be performed on a large scale through the intensive use of multiple sensors and automatic systems.

Several management practices can be simultaneously performed when the animals go to corral, like weight acquisition, vaccination, and deworming. However, these practices traditionally demand high human resources and are time-consuming. In order to avoid suffering, stress, and injuries, they can be automated. Among other initiatives, Condotta et al. (2018) proposed a low-cost depth sensor to estimate pig´s mass which obtained high efficiency compared to analogic systems.

The objective of this study was to evaluate the feasibility of acquiring 3D data on female Nellore cattle on a Savanna-Amazon ecotone.

2. Material e Methods

The data acquisition was performed in a cattle corral surrounded by experimental plots at Embrapa Agrosilvopastoral in Sinop, Mato Grosso State, Brazil.

In this facility, Nellore animals were distributed in different treatments of crop-livestock-forestry integration. An Intel RealSense d435i camera was used to acquire depth and RGB color images from 105 individual Nellore animals and were deployed to a laptop. The camera was fixed to a metallic structure just before the squeeze chute, 2.5 m above the floor, on horizontal position to guarantee the capture of the whole dorsal region of the animals. Configurations of the sensor remained in automatic mode, so predefinitions of depth were adjusted to a median density. Sampling rate was defined to 15 FPS (frames per second) after experimental tests. On average, 150 frames were captured for each animal.

Data analysis was conducted in SIGEO Lab, also at Embrapa Agrosilvopastoral. The depth images were stored in *rostbag* format and its respective file names were associated to the animal´s electronic ear tag. After that, depth frames were extracted in a *png* (portable network graphic) format and associated to a *.csv* file, containing the depth image in metric units. This process was performed using *rs-convert* scripts available at Intel through its SDK (software development kit). The *png* images were kept only for visually selecting the best frames and, consequently, the best depth data. Later, the *.csv* files were imported and processed as grayscale images. For that, the Open Source Computer Vision Library (OpenCV) was used. The algorithm used for processing the images was followed the steps: (1) segmentation to remove the background , (2) opening and closing morphological filter to remove noises from filling holes, and (3) contour extraction.

3. Results and discussion

Some images presented holes and black spots, occurred when the point´s density was too high or too low (Figure 1b). To fix that, morphological operations were applied (erosion and dilation), followed by a Gaussian filter (Figure 1c). During the image acquisition, it was necessary to conduct the animals more than once

through the pathway to guarantee that at least one good image (i.e. containing the whole dorsal area of the animal) per animal was acquired. This procedure did not affect the weighting process.

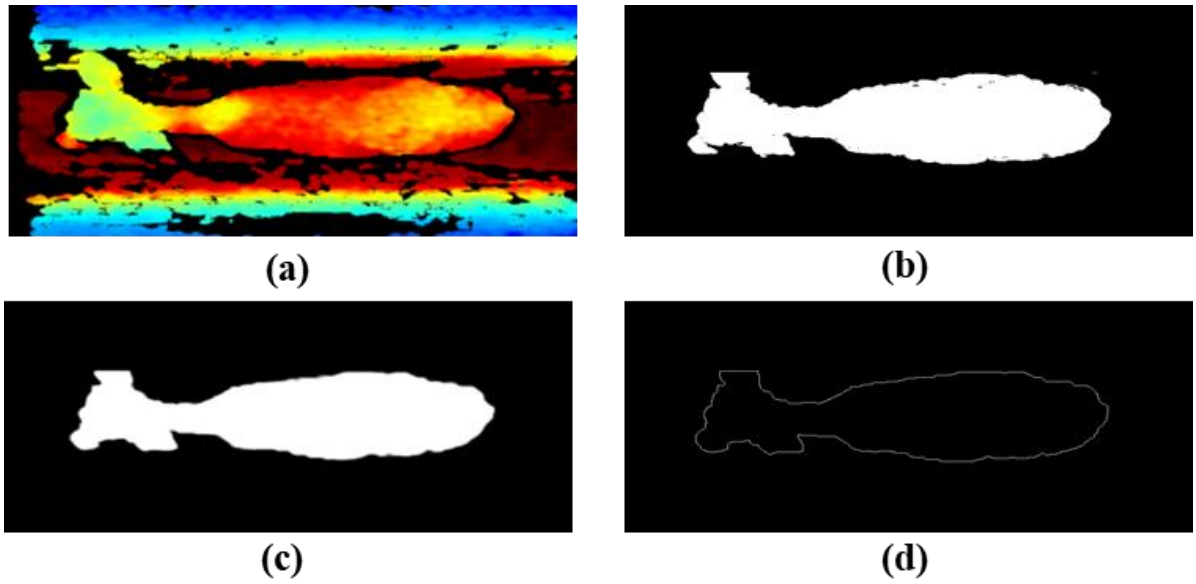

Figure 1 – (a) Original *.png* depth image acquired with Intel RealSense d435i depth camera. (b) Original *.csv* depth image. (c) Processed image. (d) contour extraction.

The mean area in pixels of the animals was 70,234.4 pixels showing a standard deviation of 13,619.1pixels.

These results indicate the possibility of correlating other variables such as, for example, projection volume, length and thoracic perimeter with the actual weight of Nellore cattle.

4. Conclusion

The need to provide welfare to animals is critical considering ethics and productivity. For this reason, the use of new technologies to avoid suffering and optimize daily farm routines is needed. Thus, a system based on depth cameras was

tested. The system was able to capture and record Nellore animals' depth images. These data will be correlated in future steps of this research with animal mass, aiming to develop an automated, non-invasive system for mass estimation of cattle.

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References

Condotta, I. C.F.S.; Brown-Brandl, T. M.; Silva-Miranda, K. O., Stinn, J. P. 2018 Evaluatin of depth sensor for mass estimation of growing and finishing pigs. Biosystems Enginnering v. 173. p. 11-18.

De Moura, D. J.; Bueno, L. G. de F.; de Lima, K. A. O; de Carvalho, T. M. R.; Maia, A. P. de A. M. 2010. Strategies and facilities in order to improve animal wefare. Revista Brasileira de Zootecnia, v. 39, p. 311-316

Laca, E. A 2009. Precision livestock production: toos and cocepts. Revista Brasileira de Zootecnia**,** v. 38, p.123-132.

Pinto, A. L. M; Vieira, F. V. R.; Garcia, P. R.; da Silva, I. J. 2013. O Manual of good practices for wefare: a proposal for dairy cattle on pasture in Brazil. Journal of Anim Behav Biometeorol**,** v. 1, p. 44-51