

Protocol for the detection of skin lesions with a multispectral camera

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1-Aim and domain of application

The aim is to detect and quantify skin lesions with fresh or coagulated blood in pigs. If successful, this objective technique will replace on-farm detection by an observer as described in scientific papers (e.g. in (Turner et al., 2006)) or in the Welfare Quality® protocol. Therefore, it could be used for welfare assessment in scientific experiments, for welfare certification, for genetic selection against aggressiveness or for farmers to have an objective evaluation of behavioural problems occurring in their farms.

2-Principle

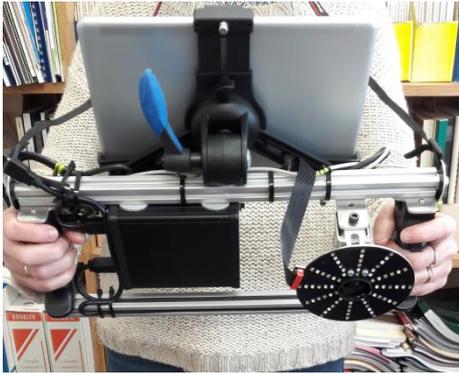
The detection method of skin lesions is based on a method described by (Goel et al., 2015). Six images are acquired by an active camera with projection of light characterized by 6 different wavelengths. These wavelengths were chosen so that haemoglobin could be specifically absorbed, and hence detected, at least by one length. The images are taken successively in a very short interval of time (30 ms) so that they are well superposed. These images are analysed by a software which allowed, in a first step, to produce 2 images: a well-defined image of the pig (left image below), a white and black image (right image below) where pixels in black corresponds to skin lesions with blood and pixels in grey to the skin without blood. An area of the body with skin lesions is depicted inside the white circle in both images.



In a second step, the percentage of the skin covered by blood can be calculated as the ratio between black pixels and (black + grey) pixels.

3- Material

A camera (IDS UI-3070CP) and red led lamps (6 different wavelengths) are linked to a tablet PC (Samsung Galaxy Book). The whole system is fixed on bars so that it can be easily carried and used by the observer (see image below). A board with two faces, one painted in black and one painted in white is also available for regular calibration.



4- Image collection

Animals should be shot at a relatively short distance (1 to 2 meters) in a location not too much exposed to light. Immediately before taking the picture, a test is done which indicates whether the picture will be overexposed or not. As a consequence picture cannot be taken outside in a sunny environment. As far as possible, animals should be immobile. As far as possible, 3 pictures of the same animal should be take, one from each side and one from above.

Before leaving the farm or the slaughterhouse, the camera should be clean from dust using a dust blower (EBM1003 de FERM) and clean with a disinfectant wipe (DASR Stericid).

5- Analysis

The software will calculate the percentage of the body covered by blood as the ratio between the black pixels and the (grey + black) pixels.

References

- Goel, M. et al. 2015. HyperCam: hyperspectral imaging for ubiquitous computing applications Proceedings of the 2015 ACM International Joint Conference on Pervasive and Ubiquitous Computing. p 145-156. ACM, Osaka, Japan.
- Turner, S. P. et al. 2006. The accumulation of skin lesions and their use as a predictor of individual aggressiveness in pigs. Applied Animal Behaviour Science 96: 245-259.