

Automated BCS Scoring System using Template Matching by Bayesian Sequential Hypothesis

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To monitor the health of dairy cows, the Body Condition Score (BCS) is a very useful tool. Body condition scoring is a useful, easy-to-use management tool to estimate the nutritional needs of a cow herd. Using a numeric scoring system from 1 to 9, cows in the field can be evaluated to estimate body energy reserves. Since body condition affects the reproductive performance as well as nutrition efficiency, monitoring body condition using BCS can have a driving influence on a dairy farm's bottom line. Measuring BCS and live weight physically in the field is both time consuming and disruptive.

We have designed an adaptive automated system that calculates the Body condition Score and Body weight within seconds using Template Matching by Bayesian Sequential Hypothesis method - an image processing technique. A network camera is used to capture the image of the cow, which are then processed and analysed by the Template Matching method to calculate the Body Condition Score and Body weight of cow. The Image processing kit, Network camera and a small LCD screen will all be embedded in a handheld kit, so that it is easy to handle and portable.

Template Matching by Bayesian Sequential Hypothesis method involves, finding a pattern similar to a template in an image. Members of the Hamming Distance family are robust to occlusion, small geometrical transforms, light changes and non-rigid deformations. We then use a novel Bayesian framework for sequential hypothesis testing on finite populations. Based on this framework, we design an optimal rejection/acceptance sampling algorithm. This algorithm quickly determines whether two images are similar with respect to a member of the Image Hamming Distance Family. Extensive experimental results show that the sequential sampling algorithm performance is excellent. Implemented on a common COTS Pentium 4 3GHz processor, detection of a pattern with large number of pixels, in 640x480 pixel frames, wherein each frame the pattern rotated and was highly occluded, proceeds at only 2-3 seconds per frame. The same algorithm works well for multiple templates and the result can be saved for further processing.

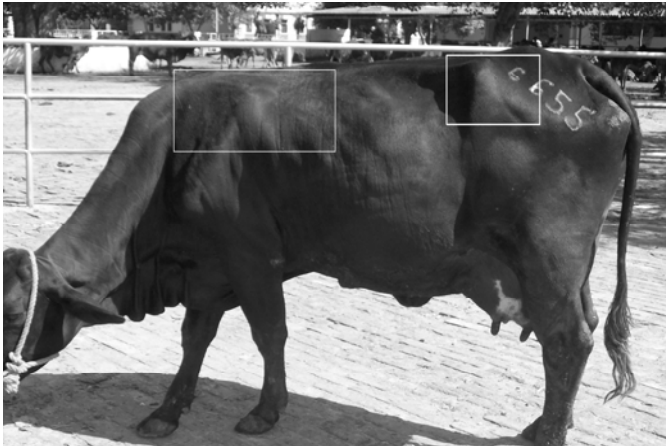


Figure1: Multiple Template

Matching Calculate distance between the two detected regions (Thurl and front bone) from the image and hence estimating weight after finding out the correlation coefficient based on analysis.

$$\text{(Body Weight) } Bw = f(D)$$

- Estimating the Live body weight of cow using the above equations.

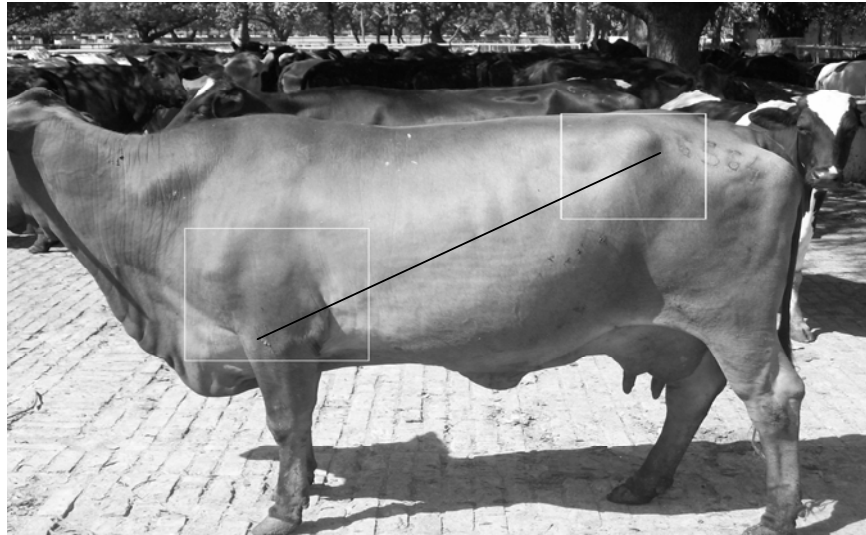


Fig 2: The distance between the detected feature will give weight of cow.

- Finding out Body condition score(BCS). That can be done after finding out the angle between hook and pin bone of cow from the detected region of rear view.