

Lameness detection using force plates and artificial intelligence

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Lameness scoring is a routine procedure in dairy industry for screening the herd for new lameness cases. Subjective lameness scoring which is the most popular lameness detection and screening method in dairy herds has some limitations such as low intra-observer and between-observer repeatability and the discrete nature of scores that limits its usage in monitoring the treatment protocol. The aim of this study is to develop an automated lameness scoring system comparable to conventional subjective lameness scoring using artificial neural networks. The system is composed of 4 balanced force plates installed in a hoof trimming box. A group of 105 dairy cows used for the study. Twenty three features extracted from ground reaction force (GRF) data are used in computer training process which is performed on 60% of the data. The remaining 40% of data is used to test the trained system. Repeatability of the lameness scoring system was determined by GRF samples of 25 cows which were captured in 2 different times in the same cow. The mean standard deviation was 0.31 and the mean coefficient of variation was 14.55% which represents a high repeatability in comparison with subjective vision based scoring methods. Although highest sensitivity and specificity values were seen in score 1 and score 4 the automatic lameness system is both sensitive and specific in all groups. The sensitivity and specificity is more than 72% in score 1 to 4.

Evaluation of sole ulcer cure rate

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Sole Ulcer is a noninfectious disease that causes severe cow lameness and milk reduction. Because this lesion is heel horn erosion, the treatment time is long. This current study was done during a 9 month period in a dairy cow with 2000 milking cows. Data of sole ulcers were recorded at first visit and each month after the first visit and the ulcer revealed treated when a layer of horny tissue covered the hole of the ulcer. Treatment

was done by removing the horny tissue around the ulcer, using a wooden block on its contra sound digit. Also locomotion of the cows scored on a five point scale monthly. Total of 69 ulcers recorded, as 57 (82.6%) cases were in rear feet. Total of treated lesions in three consequent month and also the number of culled cows were recorded in table 1.

Follow up month	Number of treated Percent	Number of culled Percent	Days to final treatment	Untreated ulcers
First	29 (42.02)	-	25.03 ± 3.8	
Second	23 (33.33)	7 (10.14)	68.67 ± 14.69	
Third	5 (7.24)	1 (1.44)	106.57 ± 28.15	4 (5.79)

The average treatment time for sole ulcers recorded as 50.13 ± 28.94 days that ranged from 20 to 164 days, 5.79% of the cows that still got uncovered ulcers remained in the herd three month after treatment and total of 11.59% of the cows were culled during this period. Locomotion scores of the cows increased from three month before (2.68 ± 1.04), reach to the highest amount one month before (3.64 ± 1.37), and decrease again till three month after recording the lesion (2.76 ± 1.23)(P<0.05). The average days in milk in affected cows was 250 days and treatments were more successful in cows with days in milk 300 and higher (P<0.05). Long course of locomotion scores (around 6 month) showed that locomotion scores were increased before clinically start of the condition and continue after its clinically treatment of it.

Evaluation of white line disease cure rate

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White line disease (WLD) is one of the most important diseases among cow's lameness causes. This current study was done during a nine month period in a dairy herd with 2000 milking cows. Hoof trimming and inspections were done in a regular basis by expert trained hoof trimmers. Gait of the cows scored by a five point scoring system on a monthly basis. When a WLD were recorded, each month after recording the lesion visited by a veterinarian and the lesion revealed treated when a layer of new horny tissue covered the white line area. Treatment was done by removing the horny tissue around the lesion and elevating affected digit by using a wooden block on its contra sound digit. Total of 38 WLD were recorded, as 19 (50%) in front feet and 19 (50%) in rear feet. The average treatment time was recorded as 33.54 ± 18.86 days that ranged from 20 to 106 days. Seventy three (73.68) percent of cows detected as treated at the first month after treatment.

15.79% at the second and 2.64% at the third month after treatment. Seven (7.89) percent of cows remained untreated. Locomotion scores of the cows were increased from three month before recording (2.23 ± 1.23), reach to the highest amount at the month of lesion (3.5 ± 1.45) detection, and decrease till three month afterward ($2 \pm .03$) ($p < 0.05$). The average days in milk in affected cows was 221 and treatment was more successful in cows with days in milk 300 and higher ($p < 0.05$). Sixty five (65) percent of affected cow were pregnant which 38.5% of them cured at the first month after treatment and 35% of affected cows were nonpregnant which 57% of them cured at the first month after treatment. No significant changes were recorded in milk production three months before to three months after detection of the lesion. Results show possible earlier detection of the lesion by locomotion scoring and negative effect of the pregnancy on cure rate of the lesions. Recorded duration of the treatment is less than other claw horn lesions like sole ulcer.

to live longer than any other animals, therefore vascular changes can occur similar to human. Vascular changes recorded in this study is somehow similar to the findings in human, but it is not clear whether these changes have any impact on the camel health or walking ability of the camel. Therefore further study is required to justify these findings with the camel health.

The pattern of vascular changes in the camel limbs

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In this study, angiography of young and adult camel limbs has been accomplished, and the vessels of the limb and its distribution and variations have been evaluated and compared. The thoracic and pelvic limb of 28 (5 young and 23 adult) camels were collected following slaughter. The palmar and plantar arteries isolated and catheterized then were perfuse by iodinated compound injected into each vessel. Angiograms were obtained using Palmar, plantaro and lateral projections. In the young camel in the adult camels there were a lot of variations such as: Varicose vein at the level of posterior part of P1 in the interdigital aspect in 5 (21.7%) camel. Angiogenesis or increase in the number of hoof branches at the level of common digital artery branching into axial and abxial in 6 (26%) camel. Increase in the diameter of the common digital artery by three to four time in 5 (21.7%) camel. Increase in number as well as diameter of the Common digital aretery in 7 (30.4%) camel. Presence of extra common digital artery in 1 (4.3%) camel. Each limb had three anatomically and functionally distinguishable sets of vein as: Subcutaneous, deep, and perforating. There are four general ways in which veins functions as: 1) conduits, 2) in thermal regulation, 3) as capacity vessels, 4) as musculovenous pumps. Among the domestic animals the camel has the chance