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Prototype design of a wireless system for the equine industry

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Abstract

Wireless sensor technology is ubiquitous in our daily living, yet the application has hardly been implemented in the equine industry. Training in equestrian sports is commonly based on historic and anecdotal observation or practices, since most of the training data acquisition systems are mostly cumbersome and invasive. On the other hand wireless technology can provide useful information on the parameters such as speed, stride and gait information, breathing pattern and heart rate which can help trainers to improve the performance of horses and also to prevent injury. **The purpose of this study was to implement the use of wireless technology to measure the horse's parameters during training on a race track.** A custom designed instrumented horse shoe (IHS) with an embedded 3D 70-G accelerometer, two 6000 °/sec gyroscopes and a strain gauge, was used. The IHS enabled examining the interaction between the hoof and track surfaces. Low power wireless microcontrollers (Jennic JN-5148) were used with a high-gain antenna (11 and 12 dB) for long transmission range. Four wireless modules were used (one each to transmit IHS and GPS data, one to route them to a receiving station). On the receiving station, one more module was installed. In an experiment, data from the IHS was transmitted at 100 Hz with six active channels (3 axis acceleration, 2 axis rotations and strain) and GPS at 1 Hz for the horse at three different strides(walk, trot and gallop). No significant data loss (maximum of 10%) was observed within a maximum distance of 300m, while maintaining devices synchronization with minimum deviation of approximately 10 µs. In addition, there was a separate maximum performance test; the system was able to transmit 2000 Hz of one channel IHS data and 1 Hz GPS data. The modular structure of the system ensures that in addition to IHS and GPS, parameters such as heart rate, breathing pattern analysis can be transmitted with all of the data synchronised with the IHS data. This design therefore has great benefit for the equine industry.

Lay Persons Message: This study illustrates the feasibility of implementing a wireless transmission of a horse's parameters during training. A better wireless capacity and protocol may solve some constraints in transmitting higher sampling rates while maintaining similar distance.

Biography

Dr. Tharshan Vaithianathan completed his BE and MEngSc (1991, 1995) from Monash University, BAppSc from Swinburne University and his PhD (2001) from University of New South Wales. He spent 5 years at the University College London as a Researcher and before returning to Australia in 2004. He is currently the leader of biomedical devices and signal processing at National Information Communication Technologies Australia which is Australia's leading centre of excellence for ICT. His other interests include monitoring the oxygenation of the brain in babies non-invasively using near-infrared technology, using wireless technology to monitor equine health and mainly interested in developing low cost biomedical instrumentation for medical application.

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