The Equine Lameness Locator ® (ELL) is a newly developed system that provides a robust and objective method to detect and evaluate equine lameness. To achieve objective lameness evaluation, the system analyzes a horse’s head and pelvis vertical movement signals during trotting. Two uniaxial accelerometers are placed on the horse’s torso, one each on the horse’s head and pelvis to record vertical accelerations. Vertical position signals are obtained by numerical double integration of the acceleration signals. However, these integrated position signals contain very large moving averages and require advance methods of signal processing for correction. In this thesis, a combination of the Hilbert Huang transform and a conjugate-pair decomposition method is proposed and tested against the current ELL’s signal processing method, a sliding-window curve-fitting method. Numerical simulations and experimental results show that the proposed new method involves more intense computation but does not provide better results for lameness evaluation of horses. Hence, the original sliding-window curve-fitting method is recommended for future use.

Clinical and experimental observations reveal that a horse’s head and pelvis also rotate during trotting. These rotations may cause inaccurate measurements of the true vertical accelerations. Hence, this work also numerically and experimentally examines the influences of rotations on the measured vertical accelerations. Numerical techniques, unique experimental devices and setups, and an algorithm for correcting accelerometer outputs to obtain true vertical accelerations have been developed and experimentally validated.