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A MEASUREMENT SYSTEM TO EVALUATE THE DOG'S MOTION FUNCTIONS USING IMU SENSORS

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The work concerns the prototype of a measurement system that will objectively support the diagnosis of a dog's musculoskeletal system, and the biomechanical parameters obtained will be used to assess the locomotor functions of the animal being tested. The concept of a measurement system for recording and analyzing dog movement developed in this work, works on the basis of inertial measurement units IMUs. These sensors have been widely used for many years in many fields, such as biomechanics, aerospace and transport. IMU sensors are relatively inexpensive, can be used both in the short and long term, and are lightweight. These features make them seem ideal for dog testing, their light weight being a definite advantage here, as the sensors will not be a nuisance to the animal during testing. The measurement system developed in this work consists of two IMU sensors, an Arduino MEGA board, an SD memory card reader and a power source in the form of an alkaline battery, which provides mobility and enables measurements in the field. The fabrication of a prototype measurement system, made it possible to perform test measurements on an animal. The measurements were made on a mixed-breed dog, aged 7 years, of medium size and weighing 13 kg. The signals were recorded while the dog was moving at a tarsus.

The IMU sensors, which are part of the measurement system, were placed along the spine in the canine withers and pelvic region. The rest of the system's components were housed in a specially designed and printed enclosure. The dog was dressed in a suitably prepared harness, which made it possible to mount all the components on the animal's body. The data recorded during the dog's test runs were analyzed using an application developed in the MATLAB environment. The algorithm made it possible to load and visualize the kinematic quantities associated with the dog's movement, as well as to determine the stepping frequency and angular waveforms of individual segments of the dog's movement system. The paper presents examples of experimental results recorded during the dog's slow and fast gait, that is, when moving at a tarsier.

The result of the work is a custom application to assess the locomotor functions of pets. The application will be able to be used by veterinarians to select the appropriate equipment for canine orthopedic supplies. In addition, data from the app can be used in the future by veterinarians and zoophysiotherapists to diagnose a dog's musculoskeletal system and monitor the progress of rehabilitation.