Intelligent Force Plate Array

Measuring natural motion in 3D using an array or duo of force plates at a fraction of the cost.

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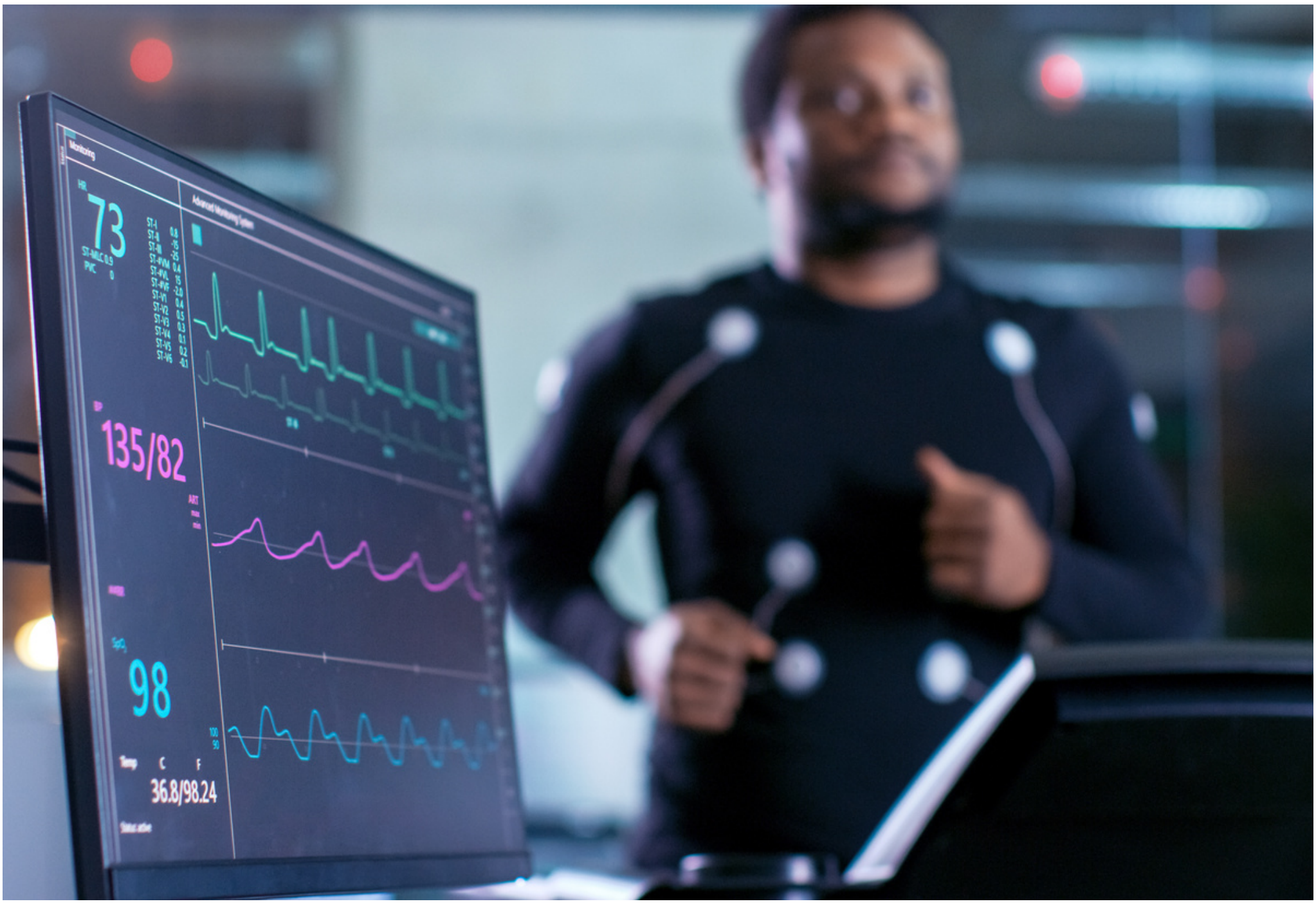

Gorodenkoff, stock.adobe.com

Background

Biomedical studies (e.g., prosthetic development and injury rehabilitation), sports science research, high performance optimization research and assessments, and bipedal or quadraped movement measurement often require accurate measurement of the forces exerted by the subject being studied (typically Ground Reaction Forces or GRFs). These forces are useful indicators of a person's balance, gait, and exercise performance .

3-dimensional (3D) force measurements can measure the force vector but are typically prohibitively expensive (>US$ 50,000). Low-cost force plates exist, but these plates have not been designed for robust sports biomechanics applications and are problematic because they measure only vertical (not horizontal) forces and typically cannot accurately measure force in 3D .

Furthermore, the use of existing force plates is constrained by the testing protocol and location. Subjects need to step exactly on the plate (usually 500mm x 500mm in area), which can cause unnatural motion if they are running or doing a dynamic movement. This constraint increases testing time as subjects need to adjust their gait for the test. This may in turn result in early fatigue, which further increases testing duration. Using more than two force plates simultaneously (i.e., an array) allows for more natural movement of the subject being studied, thus more accurate determination of GRFs, but in practice it is rare due to high cost.

Technology Overview

The UCT force plate is an instrument that measures GRFs while the person being measured is standing, performing exercises on or moving across the plate. The design and manufacture of the UCT force plates enable the accurate estimation of the full 3D GRF-vector with the aid of sophisticated Machine Learning models without the need for expensive, multi-axial load cells with strain gages.

The design and configuration of the force plates enable the user to use them as a dual plate or in an array. UCT inventors have also designed the force plates such that the array 4x4, 8x8 and 10x10 arrays could be a fraction of the cost of an equivalent dual or single plate arrays.

Benefits

The benefit of the array configuration is that it enables the test subject greater freedom-of-movement than achievable using a single force plate with limited testing surface area. This will improve the accuracy of measurements and outputs, enabling the user or researcher to build information-rich models of movement and assessment. The unique selling position for the force plate is to enable the measurement of more natural movement and using that to improve

performance and recovery at reasonable cost.

The combination of components, design, and software algorithms collectively contribute to the cost advantage that we will potentially have in the market relative to the competitors. The cost advantage will reciprocally be valuable to build arrays of the force plates to cover larger capture-surface areas, which will increase the fidelity of the data capture.

Furthermore, the force plates are mobile, will interface with mobile application and can be used in research and teaching and learning environments too.

Applications

The potential users of the force plate could include researchers involved in tracking locomotion for orthopedics and prosthetics, sport science, in aerospace and robotics. Other users could be biomechanics consultants, bio-kineticists and sports scientists focused on tracking athlete performance and athlete or patient recovery from injury. There is also the potential for the technology to be used in animal health and sports, such as performance testing of racing horses.

Another potential application is neuromuscular rehab for victims of strokes and spinal cord injuries and any other industry where having numerical metrics to describe a subject's movement is useful.

The force plates could be used with OptiTrack or Vicon motion capture systems.

Opportunity

The technology is currently being developed by a UCT spin-off company.

UCT is looking for companies who would like to partner with its spinoff company and/or purchase the dual or array system from them.

It will also be possible to use the force plates to validate new use cases in collaboration with the spin-off company.

Patents

- Granted Priority Founding Patent number GB2589138
- International Patent Application PCT/IB2020/060685
- Australian Patent Application No. 2020386666
- South African Patent Application No. 2022/05393
- United States of America Patent Application No. 17/756,230
- European Patent Convention Application No. 20811740.8

IP Status

- Patented
- Patent application submitted

Seeking

- Commercial partner
- Development partner
- Seeking investment