IPAM: Parametric Equations of Human Gait

Geometric Modeling of Human Walking for Medical Rehabilitation

H2020 SOCIETAL CHALLENGES: Health, demographic change and wellbeing

PRODUCTIVE SECTOR: Biomedicine and Health Care

PROBLEM DESCRIPTION

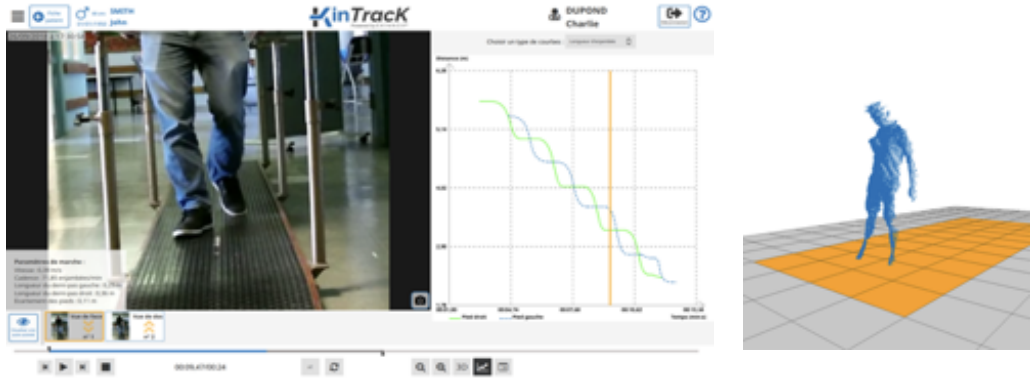
An accurate and robust estimation of the trajectory of the foot is a crucial step in order to provide a reliable diagnosis assistance and a relevant monitoring of medical treatments.

CHALLENGES AND GOALS

Accurate and robust human gait parameters computation based on a single 3D camera within the context of physical rehabilitation. The goal is to provide an accessible and easy-to-use tool for caregivers to better evaluate, follow-up and improve patient performances.

MATHEMATICAL AND COMPUTATIONAL METHODS

A parametric continuous model of walking, based on Bézier curves, has been designed for representing the foot trajectory during walking. A challenge was to find the right balance between the variability of the patients and the robustness to measurement uncertainties. In a second step, we devised from this new parametric model an approximation/interpolation method in order to adjust its control parameters to datasets obtained from 3D camera acquisitions. Finally, our accurate and robust method for estimating the locomotive walking parameters is used by physiotherapists from an instance of the model.



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Results and Benefits

We have developed a novel accurate and robust method for estimating important locomotive parameters of human gait from a single 3D camera.

The underlying mathematical novelty was to design a continuous parametric model to model the trajectory of the foot during walking.

A patented method implemented in a software used by physiotherapists.

A novel robust and accurate method for gait analysis to help caregivers in their diagnosis and treatments in physical rehabilitation.

Université Côte d'Azur & Inria

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