

Human Gait Analyses in the Field

Project Seminar (3 students)

Aging or diseases often lead to physical and functional losses, affecting daily mobility. Lower limb exoskeletons offer hope in mitigating these losses. In cooperation with the locomotion laboratory of the institute of sport science of the TU Darmstadt, our institute has explored various applications in the field of exoskeletons and active lower-limb prosthetics. One key part of study is to analyze human gait patterns to detect locomotion mode (e.g., level walking, ascent or descent of stairs) and gait phase (progress during a stride). This information is required in subordinate controllers of the assistive device.

This project seminar explores the analyses of the human gait using a thigh mounted IMU, building on our previous work [1], which used a shank mounted IMU to detect the gait mode and phase.

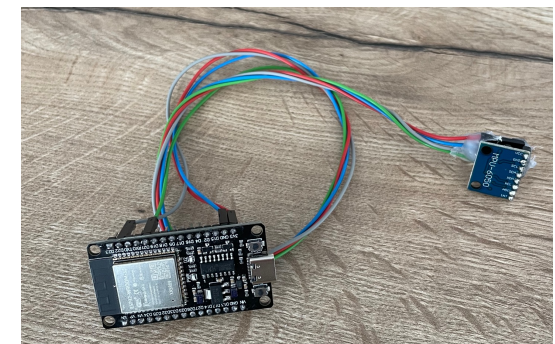
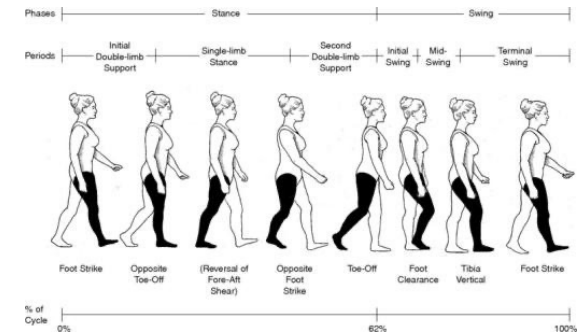
The task is split into a mandatory part and a creative part based on the student's interest. Within the mandatory part the following tasks are to be tackled:

1. Train a neural network to detect the gait mode and gait phase based on existing data.
2. Develop a hardware setup suitable for field tests.
3. Record field data and evaluate the neural network's performance.

The developments of this part can then be used to explore some creative application or analyses that the students can develop on their own. Examples could be:

- Step counter – count the number of steps for each gait mode.
- Wearer recognition – detect who or who is not wearing the device.
- Activity detection – transfer approach to other activities such as running or cycling.

Hands-on programming skills and interest in embedded systems and gait patterns are required.



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