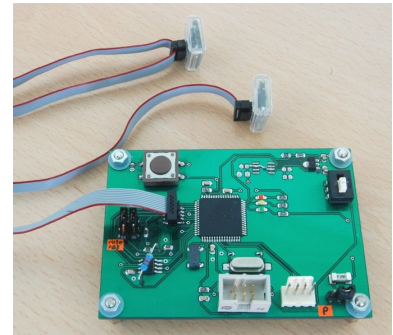# Bachelor Thesis

« Analysing human running styles with an embedded system containing accelerometers »

Background

Modern embedded systems containing a microcontroller and sensors can support the training of athletes. Using accelerometer sensors, acceleration forces can be measured. This allows calculating characteristic values describing the running style and the stress affecting the human body. From this hints to the athlete can be derived.

In a previous project a student has developed a system, suitable for this application, shown on the figure. It is a battery powered microcontroller system connected to two accelerometer chips measuring forces in 3 dimensions that can be mounted to a humans leg or foot. Data is recorded on a chip and can be downloaded to a PC for post-processing.

Goals of the thesis

The goal of the proposed bachelor thesis is to investigate algorithms to analyse how a human runs, based on the acceleration of their legs or feet measured with accelerometer chips. Different styles of running need to be detected reliably and distinguished from walking. It should be detected if a human runs uphill, downhill or on a flat path. In addition the stress to the body (e.g. on articulations, bones) has to be measured. The effect of shock absorbing running shoes should be analysed.

Along with the development of algorithms, measurements with different humans have to be conducted to prove the applicability of the algorithms. The embedded system developed in the previous student project should be applied for recording acceleration forces. This requires designing a suitable housing that can be fixed to the body. Recorded signals shall be evaluated on a PC, e.g. using Matlab.

The thesis can be written in German or English.

Requirements

- Basic knowledge in signal processing
- Experience in Matlab or a similar language allowing rapid testing of signal processing algorithms
- Good understanding of mechanics. Knowledge of the physics of running is an advantage
- Before starting the thesis, the student has to present a first idea of how to distinguish different styles of running based on the acceleration forces

Contact: Marcus Venzke

venzke@tu-harburg.de   Phone: +49 40 / 428 78 – 3378   Room: E 4.086