# Bachelor Thesis

« An embedded system with accelerometer for analysing human running styles »

Background

A recent trend for embedded system is the use of accelerometers for detecting vibration in systems and for recognizing gestures (e.g. for controlling computers or games). If attached to a human accelerometers can also be applied for monitoring human behaviour, e.g. for analysing the style in which a human runs or walks. An example is the integrated circuit ADXL334 from Analog Devices. Requiring only $350\mu A$ it measures acceleration in three dimensions returning it as three voltages to be evaluated by a micro controller's AD converter.
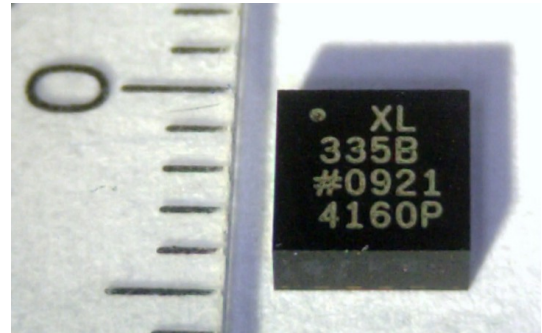
Goals of the thesis

The goal of this thesis is to analyse how a small embedded system can be developed in hardware and software that analyses the style in which a human runs. The battery powered system shall be small and lightweight. It shall contain an accelerometer as sensor, a microcontroller and few other components. It will be attached to the human's leg to measure the occurring acceleration. The student needs to investigate how measurements can be evaluated to recognize and rate the style of running. A concept is needed how measurements or evaluated data is transferred from the embedded system to a PC, PDA, or mobile phone (e.g. by radio or wired connection).

To prove developed concepts the embedded system shall be engineered as prototype. A small board is required with battery, accelerometer ADXL334, micro controller (ATmega1281), and other required components. Software needs to be developed for capturing data on the embedded system, for analysing data, and for displaying results on PC, PDA or mobile phone.

Requirements

- Ability to develop hardware systems, e.g. cicuit design, board design
- Knowledge of programming controllers
- Before starting the thesis, the student is expected to
  - ◆ be able to roughly explain which circuits are needed and how these are interconnected, and
  - ◆ have written a program for Atmel ATmega1281 that reads values from the AD converter and writes it on the UART.

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