Master-Thesis

Exploration of Agile Smart Footwear

Vorgelegt von: Marco Gabrecht

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Erstprüfer/in: Prof. Dr. Matthies

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(Professor Dr. Andreas Hanemann)
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Aufgabenstellung:

Currently, shoes are a passive tool, which do not respond to a user's context such as to provide optimal workout performance or to warn when dangerous situations are to occur. In future, intelligent footwear should be able to; 1) understand the user and its needs by sensing the user's activity and respond to the environment, 2) by adjusting its properties, such as changing the rigidity, profile, and cushioning of the mid-sole or other parts of the shoe. There are different technologies explored already, such as using a shoe-placed inertial measurement unit (IMU) or relying on a capacitive insole. Shoe-placed actuators are yet to be broadly explored. This thesis can go in two different directions. On the one hand it can explore the recognition capabilities of different terrains, posture, gait, etc. Hereby a machine learning approach should be driven by relying on the state-of-the-art techniques, including a neuronal network approach. On the other hand, the thesis could have a look at the actuation side; how to the dynamically adjust a sole or other part of the shoe. It could be investigated to apply novel technologies, such as shape-changing polymers or other techniques and technologies, such as pneumatic air pressure chambers. Exploring smart materials, such as shape memory alloys and solenoids for an energy efficient actuation could be interesting to look at. Either way, the thesis will have a strong focus on the implementation part following a Do-It-Yourself (DIY) approach building a small series of footwear prototypes. As usual, the thesis kicks-off with a thorough literature review, that will reveal possible directions worth for exploration. The thesis will deploy a series of footwear prototypes, which closes with a short user evaluation.

Prof. Dr. Matthies