PFI Research Project

Self-lacing Shoe

The engineering department of PFI is currently developing a self-lacing and self-powered shoe in a research project. Such a shoe should help to enhance the independence and safety of older and physically challenged people.

Germany's demographic situation is currently undergoing radical changes: The birth rate is falling; fewer and fewer people are living in Germany. The proportion of the total population in employment in is steadily decreasing. At the same time, the number of older persons no longer in employment is also increasing. As early as 2035 more than half the population of Germany will be over fifty years old, and every third person will be over 60. By 2050 Germany will have some 17 million fewer inhabitants than today, according to calculations by the Federal German Office of Statistics. Every third person will then be over 65. Every seventh – i.e. about 10 million people – will even be over 80.

It is imperative that science, economy, and politics should already be prepared to face the problems posed by these population shifts. The past decade's advances in the area of "Ambient Assisted Living" have brought forth a wealth of possibilities for enhancing the quality of life of older and physically challenged people.

In this context, PFI is developing a self-lacing shoe which the wearer can do up or undo unaided. Such a shoe means independence in a hitherto hard-to-manage everyday situation for people with restricted movement: Putting on shoes, lacing them up securely, and taking them off again.

One of the goals of the project is to design the shoe in such as way as to make it maintenance-free and self-powered. Application of energy-harvesting technologies permits environmental energy to be harnessed as a power supply for this shoe.

Development and Integration of novel power generation concepts in footwear opens the way for new applications in the field of "intelligent footwear". In cooperation with the project partner HSG-IMIT, PFI is investigating the maximum available power which energy-harvesting systems could generate for functions in a shoe, as well as the durability and robustness of such systems incorporated into footwear. Energy recovery from the motion of walking and the possibility of additional charging mechanisms are also being analysed. The results will also give rise to new approaches and recommendations for the construction of such combinations.

PFI contact persons:
Dipl.-Ing. Peter Schultheis, Phone: +49-(0)6331/249040, E-Mail: peter.schultheis@pfi-germany.de or
Ronny Weis M. Eng., Phone: +49-(0)6331/249047, E-Mail: ronny.weis@pfi-germany.de