Tytuł: Design and implementation of new robotic walker devices.

Autorzy: Bartłomiej Stanczyk, Instytucja: ACCREA Engineering, Lublin, Poland.

Streszczenie:

The MOBOT Project aims at developing intelligent walking assistant for people experiencing certain mobility problems. The two main target groups are i) users that have sufficient own gripping force in their hands ii) the users that do not have this force. Therefore it is necessary to develop two types of walking assistants; correspondingly the ‘rollator type’ and the ‘nurse type’ devices.

This talk addresses the essential methodological aspects of a collaborative development a robotic walker. Being a classical mechatronic system, created within a framework of a mixed research / engineering project, this device poses typical challenges on the developers, that need to tackled in a systematic way. Based on the lessons learned from similar projects, the author proposes an approach that might be generalisable. The overall concept of the work on project is based on the V-cycle paradigm, based on “methodology of development of mechatronic systems” as of VDI2206, adapted to an innovative project enabling feasibility studies and early evaluation of prototypes.

The user groups and their specific needs are captured by the clinical partners and comprise the specification of use cases, performance metrics and user evaluation studies relying on the expertise in gerontology and rehabilitation. The two main functionalities of the assistive walker are i) to offer active support during walking and ii) to support the user while standing up or sitting, the so called sit-to-stand (STS) transfer. In order to perform the necessary mechanical design, the geometry and the mass properties of the target user group were modeled based on human data and served as input to the biomechanical optimizations of the STS and walking.

The first version of the rollator was developed based on the measurements of the desired workspace and forces profiles performed with real patients, using a steel bar with dummy handles. The forces were measured using force sensors attached to the handles and the workspace and the kinematics of the patient was recorded using vision sensors. The resulting workspace has the size of approx. 30x30cm and the required lifting force is in the range of 224 N. The main components are the mobile platform, the STS mechanism and the perception and computing workstations. The mobile platform is driven by two active wheels further supported by two castor wheels. The STS mechanism contains two separately driven handles for independent control of the left and right arms. Each arm has two active degrees of freedom and 1 passive degree kept parallel to the ground by means of tendons.