DALi - A Smart Walker That Looks Ahead

Interview with Josef Alois Birchbauer

What did you investigate as part of the DALi project?

Safe navigation in crowded and unstructured spaces for older adults is the key asset of DALi
From the research perspective Siemens support this aim in two directions.
Detecting anomalies in the surrounding of the c-walker is critical for safe navigation. Some examples of anomalies are a wet floor (recognizable by a dedicated floor sign), a physical object at a previously uncovered location, e.g. goods that did fall down from a shelf, or an unusual high density or aggregation of persons. A subset of those anomalies can be detected by means of real world OCR. The enabling key technology is online Optical Character Recognition (OCR) in real world scenes. In contrast to document OCR real world images bear a lot of challenges ranging from image quality, lighting conditions, perspective distortion, highly cluttered scene content as well as occlusions.

Navigation can not function without reliable localization. Indoor Positioning is different from outdoors since GPS is not working indoors. *We propose a localization system that solely relies on onboard sensors (in particular video sensors) and does not require proprietary installations in the environment like Wi-Fi fingerprinting and Bluetooth.* The Structure from Motion (SfM) method computes camera positions and orientations from point correspondences between images. 3D points are obtained from these correspondences implicitly. Camera images can be localized with respect to the 3D model with decimeter accuracy. Visual Odometry (VO) supplements the global localization.

Tell us about the challenges?

We wanted to keep the device as slim as possible and integrate functionality without altering its overall appearance too much, thus keeping the price for the additional hardware in modest range. We managed to make our algorithms run on COTS hardware (Microsoft Kinect/Asus Xtion, Intel NUC) that is highly integrated. While most algorithms in the context computer vision nowadays can heavily profit from GPU implementation, we specifically excluded of this option in favor of the hardware preference.

"We want to empower older adults to perform tasks of daily living outside their home."

Why is Siemens participating in this project?

For Siemens, global trends and drivers as well as megatrends like demographic change are of course of interest. And as a research department we are naturally trying to provide new ideas and new answers in this direction.

What benefits do you see from the outcomes of DALi?

Airports challenge even persons without any cognitive disabilities, since they are large and confusing sites, each airport is structured differently, and usually time is important when trying to get a connecting flight, thus putting stress on people. On airport sites people already make use of carts for moving their luggage in a convenient way. It seems rather logical to add some intelligence in those carts in the spirit of DALi, providing a positive effect for each traveller - in particular cognitive challenged ones. Siemens is delivering comprehensive airports solutions; an intelligent airport cart would extend the existing portfolio.

The technology that turns a basic walker into a digital mobility assistant shows potential in other environments as well. Integrated into data glasses, it could warn production plant employees of danger zones and show service technicians the fastest way through a factory. Or consider a forklift. With our technology, it could transport its load through an assembly hall autonomously. It would be able to react to obstacles and avoid people — or even interact with them. For Siemens these developments are a contribution on the path towards an intelligent industrial environment. Our vision is to develop so-called cognitive environments. Today, people have to watch out for machines. In the future, it could be the mechanical 'employee' that watches out for humans.

About Josef Alois Birchbauer

Josef A. Birchbauer is senior researcher at Siemens Corporate Technology Central and Eastern Europe. He holds a M.S. degree in Telematics from Graz University of Technology, Austria. In 2000 he joined Siemens and has been working in core fingerprint algorithm development for several years as well as other biometrics, surveillance and general computer vision projects with a special focus on detection and interpretation.

His research interests also includes the systematic generation of innovations - a hunting field on which he is working jointly with colleagues from another SIEMENS department that is dedicated to technology and innovation management.

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