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New 3D sensor developed for robots

The TACO (**T**hree dimensional **A**daptive **C**amera with **O**bject Detection and Foveation) project has developed a 3D sensing system with foveation properties endowing service robots with a higher level of motion and affordance perception and interaction capabilities to everyday objects and environments.

The project has focused on providing future service robots with a significantly better overview and understanding of their surroundings. This brings us a step closer to a new generation of robots which are able to perform a wide range of tasks in several different fields such as cleaning, construction, maintenance, security, and personal support.

Mission

The TACO project was conceived by a group of researchers active in the field of robotics. In particular, they had an interest in further developing service robots and their functionalities thereby allowing them to fulfill more sophisticated tasks. A novel 3D sensor was therefore custom-built for this purpose.

An enhanced sensing system with real 3D foveation properties can enable robots to interact with their everyday environment in a more natural and human-like manner. The ability of the human eye to seek out important objects or elements in our surroundings has served as inspiration to the TACO researchers in the development of a sensor that can produce better quality data without increasing the total amount of data the robot needs to process. They take an important step further by providing the sensor with the ability to process spatial and temporal information, thus helping robots to deal with our unstructured world.

The TACO sensor has been developed through two main technologies: flexible, and robust hardware based on laser scanning technology on the one hand, and software for rapid object detection and environmental understanding on the other hand.

Results

The TACO project has covered the whole value chain within 3D sensing systems with partners specializing in MEMS hardware components, time-of-flight sensors, 3D image analysis software algorithms, and robotic industry applications. The resulting sensor demonstrates various novel technologies as described below.

TACO has implemented for the first time an advanced scanning concept, based on an array of steerable micro-mirrors in combination with a pulse laser distance measurement in order to provide 3D imaging, thereby providing accurate data at unsurpassed point rate. Furthermore, a 3D sensing system based on minituarised silicon MEMS-based technology can be incorporated into small units mountable as payload on both service robots or on the arm of an industrial robot.

The new foveation software, in combination with the laser scanner, allows for better object detection and tracking through an optimized trade-off between resolution and frame-rate; detection of regions of interest; and increased sampling density in interesting regions.

The development of a 3D sensing system has contributed towards further research in the robotic fields of 3D attention awareness management and strategies for fast acquisition of images. Moreover, these reliable sensing systems are paving the way for a much broader deployment of robots for various applications. As a result, the market opportunities for sensor hardware and software producers in this field will also increase manyfold.

For more information about the TACO project please visit the project's website http://www.taco-project.eu or send an e-mail to the project coordinator.

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