SARAFun

Smart Assembly Robot with Advanced Functionalities

The ***SARAFun*** *project* has been formed to enable a ***non-expert user*** to integrate a new ***bi-manual assembly task*** on a robot in ***less than a day***. This will be accomplished by augmenting the robot with cutting edge ***sensory and cognitive abilities*** as well as ***reasoning abilities*** required to ***plan and execute an assembly task***.

Project Overview

SARAFun is a three-year project, starting March 2015, that develops technologies for teaching an industrial robot an assembly task with minimum knowledge and effort required from the user. The project consortium is built up by experts in the field of robotics, cognition, sensor integration and human movement analysis in order to investigate how a robot can be taught to perform an assembly operation in an intuitive way by a human instructor that is not a robot expert.

ABB Sweden

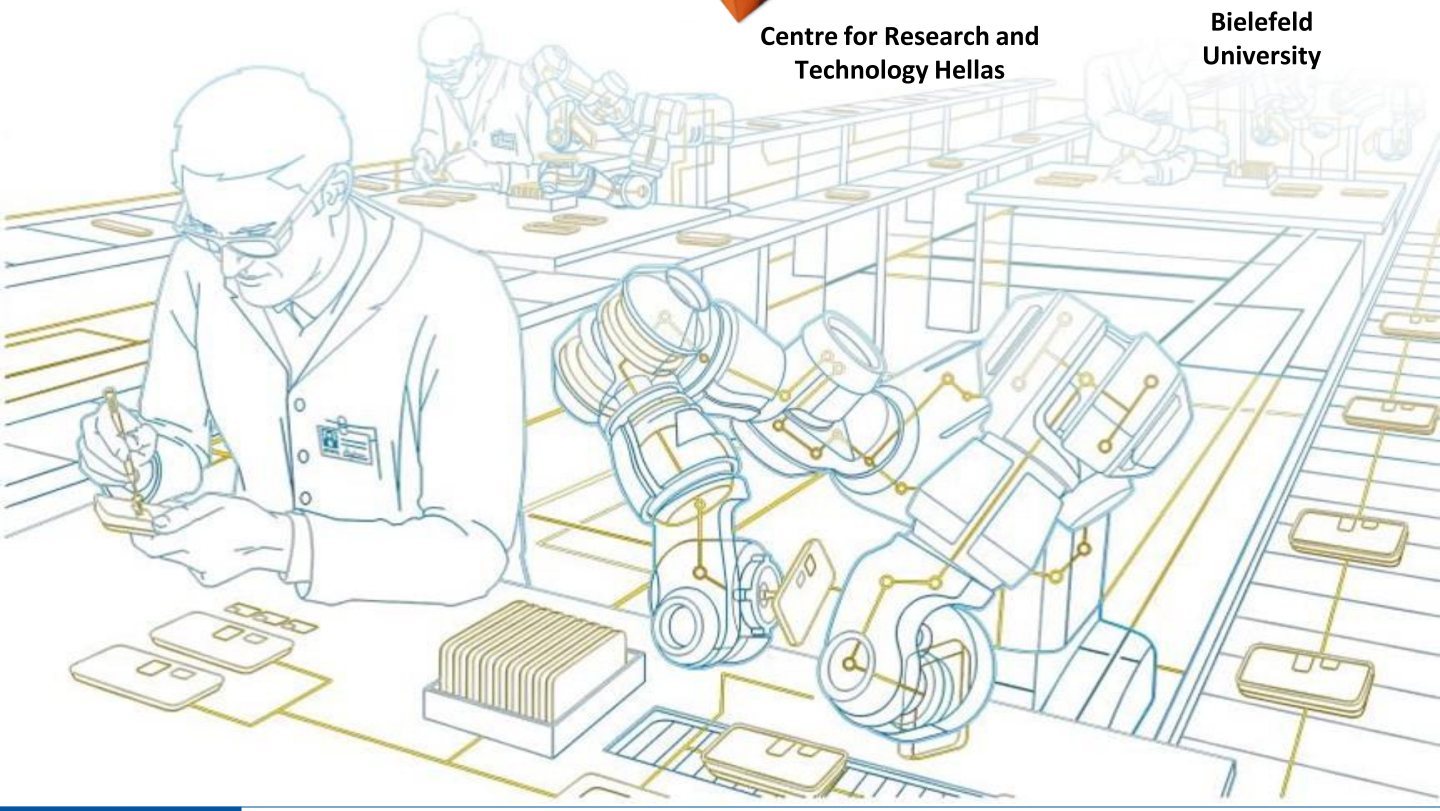
TECNALIA

Royal Institute of technology

Lund University

Centre for Research and Technology Hellas

Bielefeld University



The research leading to these results has received funding from the European Community's Framework Programme Horizon 2020 – under grant agreement No 644938 – SARAFun.

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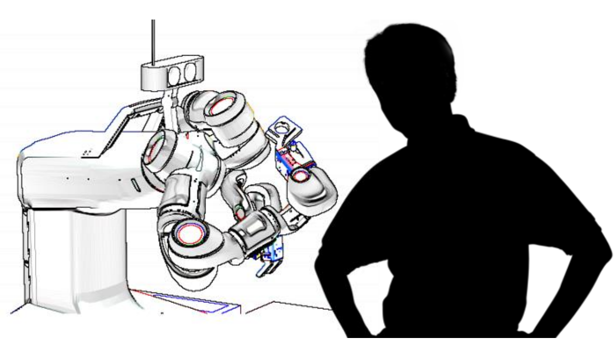
Project Approach

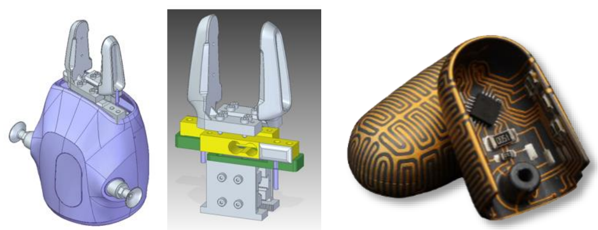
SARAfun's overall conceptual approach is that the robot should be capable of learning and executing assembly tasks by observing how a human performs the same task. Studies will be made to understand how human assembly workers learn and perform assembly tasks. The observed human performance will be modelled and transferred to the robot as assembly skills. The robot will use these models to generate control policies for assembly tasks, such as folding insertions or insertion with deformation, based on the observation of a human instructor. Said control policies will include the necessary assembly programs, exception handling, and the design 3D printable fingers tailored for gripping the parts at hand. With additional guidance from the human instructor, the robot will finally learn to perform the actual assembly task, relying on sensory feedback from machine vision, force and tactile sensing as well as physical human-robot interactions. The robot will gradually improve its understanding of the task until it is capable of performing the assembly in an efficient and robust manner.

For more information, publications, etc. visit: www.sarafun.eu

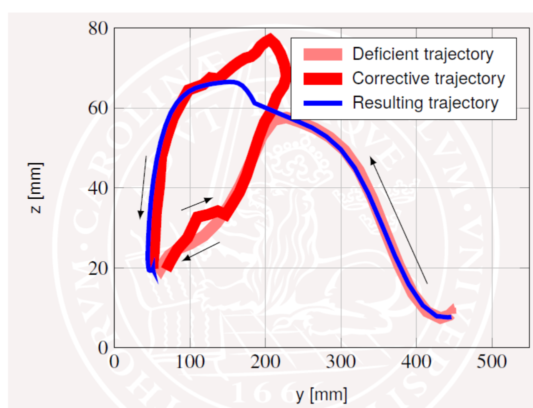


Example Results From The First Project Year

Tracking object and hand poses using a 3D camera. The 6 DOF position and orientation of the object is tracked while 42 DOFs of the hand are estimated.



Left: Industrial robot gripper, Centre: Strain-gauge sensor integrated in the finger base, Right: Tactile-sensor fingertips.



Dynamic motion primitives (DMPs) are used to model robot motion and allow the user to modify the trajectories for greater robustness or collision avoidance.

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