**POPULAR SCIENCE SUMMARY OF THE PROJECT**

# RESEARCH ON THE USE OF INTELLIGENT MATERIALS IN THE CONSTRUCTION OF A NOVEL GRIPPER THAT ADAPTS TO THE SURFACE OF THE OBJECT BEING GRABBED

The aim of the project is to investigate the effect of using smart materials in the design of a robot gripper. The author intends to focus on the use of magnetorheological (MR) fluid, a substance consisting of oil and particles susceptible to changing magnetic fields, to create the effect of a human finger. The presence of a magnetic field causes the MR liquid to change its viscosity. The result is a hardening of its structure in a closed reservoir. The project will develop an innovative two-jaw gripper equipped with special MR liquid cushions, which are the equivalent of human fingertips. Structural elements will be made by machining and the nowadays highly developed 3D printing technology, including the use of flexible materials.

The designed MR fluid cushion model will be investigated in simulations using finite element methods for magnetic issues, in order to develop an optimal design in regard to the generated magnetic field. A novel gripper will be designed with different variants in terms of materials used and jaw pad solutions, in particuar with MR fluid cushions. Experimental tests will be compared with prototypes in terms of their ability to generate a magnetic field to activate the MR fluid. The gripping properties will then be evaluated, as well as the adaptability of the developed design solutions to the surface of the test objects. Comparative studies are also planned to verify the results in relation to other gripping solutions.

The ability of grippers to adapt to the surface of objects is currently a very popular and developed topic and aims to replicate the ability of the human equivalent. The hand, due to its structure, is capable of comprehensively adapting its structure and shape depending on the task given. However, despite being very difficult to replicate, the demand for an achievable part of its capabilities is being reproduced in widely used industrial robot grippers and precision manipulation devices used in industry. Another field of research in this area is prosthetic limbs, which share solutions in materials, design and kinematics with industrial grippers. The expected outcome of the project is the development of solutions to increase the adaptability, and thus the versatility of devices intended for gripping objects diverse in structure and construction. The research foreseen within this project may be useful in designing devices with extended properties, used in medical and industrial environments.