

SMaRC – A NATIONAL RESEARCH CENTER WITH GLOBAL INDUSTRIAL FOCUS

Historically, Sweden holds a **strong position in the area of underwater technology**, with world-class manned submarines as well as unmanned systems and solutions, **unique for a country of its size**.

SMaRC research ensures that Sweden maintains its position of strength and will **continue to lead in the transition to unmanned systems**. This provides good opportunities for Swedish industry to both expand in existing markets and establish a presence in new ones – in interaction and collaboration with international players.

The main task of SMaRC is to engage in a **balanced mix of academic and industry-related research** embracing a variety of relevant fields such as robotics, artificial intelligence, electrochemistry, vehicle design, electronics, oceanography and software.

SMaRC's collaboration between academy and industry will be the driving force **putting us at the international forefront of underwater robotics**.

PARTICIPANTS

SMaRC constitutes a **unique node** for underwater robotics research, with strong connections to industry and various applications in, amongst others, natural science and polar research.

Partners within academy, industry and government collaborate in a **triple-helix setup ensuring synergies and consensus**.

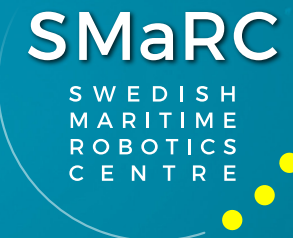


Academy
Industry
Government

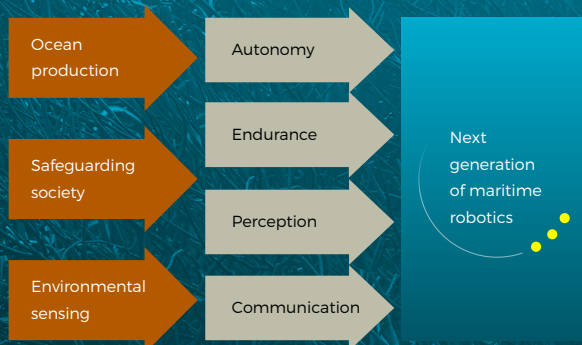
Partners within academy: KTH Royal Institute of Technology, Stockholm University, University of Gothenburg.

Partners within industry and government: Saab, MMT Sweden, FMV (the Swedish Defense Materiel Administration), and FOI (the Swedish Defense Research Agency).

The center is **financed through the SSF** (Swedish Foundation for Strategic Research) **and the partners**.



Taking aim at **three societal benefits** using **four research disciplines** to **change the future**.



WHAT IS SMaRC?

The Swedish Maritime Robotics Centre, SMaRC, is the **national cross-disciplinary industrial research center for maritime robotics** dedicated to the development of techniques for next-generation robots which will benefit society.

These robots will **be smarter, provide longer range, have greater endurance and cost less than today's systems.**

SMaRC contributes to global societal benefits in three important areas pertaining to the oceans:

- **Ocean production** – for example, using the oceans' potential for food, energy and raw materials such as cultivation of marine plants in large farms and mining of the ocean floor.
- **Safeguarding society** – for example, to create awareness of what is happening on and in our waters. This requires a wide range of monitoring with sensors and vehicles in harbors, oceans and coastal waters.
- **Environmental sensing** – measuring physical, biological and chemical parameters to assess the state of the ocean and to detect both man-made and natural variations in e.g. concentrations of pollutants, organic material and ice.

Future maritime robotics will contribute to doing for these global societal benefits **what orbiting satellites did for space exploration**. Increased presence in the oceans – with decreased human interaction – is the key. However, to accomplish this, **underwater systems need to develop further to:**

- be of simpler and more robust design
- demand less (costly) assistance from divers and vessels
- facilitate more complex missions with increased endurance and range in unknown waters.

THE SMaRC APPROACH

SMaRC's primary objective is to **raise the total system performance** of unmanned maritime robots. This requires a **holistic approach** where close collaboration between several engineering disciplines is of critical importance. Thus, to achieve **strong collaborations and synergies**, SMaRC research is organized around the following areas rather than around traditional research groups:

- **Autonomy:** the ability to adapt actions based on sensed data.
- **Endurance:** the ability to stay on mission for a prolonged period of time, typically months/years.
- **Perception:** the "eyes and ears" of the maritime robotics, not only for mission-related tasks but also for navigation.
- **Communication:** the notion of sending and receiving data, typically in extremely challenging underwater environments.

To further increase interdisciplinary work, a wide range of algorithms, methods, sensors and total systems are **developed and tested in a SMaRC demonstration lab as well as in real research environments**, in

direct collaboration between engineering and non-engineering disciplines such as **oceanography, marine biologics, and polar research** and with both academy and industry involvement.

In this way, **SMaRC constitutes a unique and vital academic environment** where the technology-developing **engineering disciplines converge and co-operate with the natural scientists** in those fields of oceanography and polar research representing the end-user of the technologies. This span in academic disciplines will ensure that SMaRC will be vigorous and progressive in achieving a **good balance of innovation and user focus**.

The SMaRC experimental activities center mainly on **two types of underwater robots:**

- long-range/long-endurance AUV for large operational areas
- small-size and affordable robots for wider markets.

