

# CADDY – your future diving buddy

For all of you, recreational or professional divers, the concept of CADDY might be new. However, in several years time, CADDY might become your most trustworthy diving companion. CADDY stands for Cognitive Autonomous Diving budDY and it is a project that is set up this January 2014 to create a set of robots that will accompany divers in their underwater adventure. The project is a close collaboration between diving experts from different backgrounds, various European Universities, the European Union and of course... DAN Europe.

## **Where did the idea come from?**

Experts from underwater archaeology, marine biology and marine safety encounter many problems and obstacles when working underwater. For example, when searching a specified underwater area, they have to set up the transect rope and for site referencing, several frames have to be put in place. This involves a lot of measuring, sketching and taking photos and it is a rather time-consuming process. The diver sometimes has to recover several objects and is often buried in material.

Therefore diving experts from these different backgrounds put their heads together and came up with the idea of having robots and divers collaborate to produce optimal results while guaranteeing maximum diving safety. The idea is to build an autonomous underwater and surface robot that will not only understand the diver but will interact with him and respond to the diver's wishes. When the project was presented, it was embraced enthusiastically by the European Union who decided to provide a funding of over three million Euros. Several European universities, institutes and research councils decided to collaborate to bring the project to a good end. When DAN was contacted with the request to join in on the project, DAN was more than happy to contribute to the development of CADDY and especially to make sure it would guarantee diver safety. How could DAN refuse to work on a project which consists of building a guardian angel for divers?

## **What does CADDY do?**

CADDY consists of two autonomous robots: a surface and an underwater robot. The underwater robot will remain in the vicinity of the diver, although always at a safe distance, and interacts with him, responding to the behaviour and gestures of the diver. The surface robot serves as a communication link between the diver and the underwater robot. It communicates with the command centre and it navigates the underwater robot. Together, these two robots will make sure that the diver has not to think about anything else, except enjoying the deep blue ocean.

Your diving buddy has three main functions to ensure a safe and carefree diving experience, which is to observe, to assist and to guide. First of all, the diving buddy as an observer, will remain close to the diver so it can interpret his behaviour. It will monitor the "body language" of the diver, interpret his gestures and detect anomalies. When the diver shows signs of being in trouble, the surface robot will immediately report to the command centre. The second main function of the robots is to assist the diver in his work and give a helping hand. In practice, this means that the diving buddy will examine the environment by using a laser beam. It will take photos and create a mosaic, it illuminates the site from any angle requested and will carry the requested equipment. This allows the diver to work more freely as he will not have to carry a payload of tools and interrupt his work to make light or take pictures. Finally, the diving buddy will guide the diver from one spot to another on a predefined path. In case of emergency, CADDY will steer the diver to an appropriate point at the surface while always respecting diving safety rules. In case the diver loses the surface vessel, the diving buddy as a guide, will serve as an intelligent communication router, bringing

the diver safely back to the vessel. Statistics show that 50% of the diving accidents occur when the diver is unaccompanied, CADDY will be a trustworthy companion, that will detect the diver's every move and act when needed.

### **What is DAN's involvement?**

DAN Europe was very enthusiastic to join a project that would change the future of diving. Therefore the focus of DAN will be on ensuring that diving safety regulations are respected at all times during the project and that diver safety will continue to be guaranteed after the project lifetime. Diver safety is an essential component of the CADDY project and to make sure safety is maximised, DAN steps in.

The robots are developed relying on safe technology and are evaluated accordingly. DAN will participate in testing the vehicles on their manoeuvring capabilities to decide whether or not it is safe for them to interact with the divers. In case of dissatisfaction of the product, the robots will continue to be adapted until the examinations show that the interaction between the diver and CADDY runs smoothly. When CADDY is proven to be a reliable diving companion, DAN Europe will provide the necessary professional and regulatory inputs to allow the project to be brought to the scientific, technical, and leisure-and sports-oriented diver community. Discussions will be organised with the targeted public to understand the pros and cons of CADDY. Finally DAN Europe is working on the Automatic diver status report generation system. As a major contribution to the research on diving physiology, the robots will measure the body parameters and relay them to the surface using sophisticated acoustical communication technologies. DAN Europe will be there from the beginning till the end of the project, and beyond as a representative of the diver community and to help build future technologies that will take the diving experience to the next level.

DAN Europe is proud to be actively participating in the CADDY project, so that your future diving companion will ensure your safety at all times and will truly become your guardian angel underwater. If you would like to learn more on the project, check out the web page <http://www.caddy-fp7.eu/>