

ExpROVer - Milestone 1 - Vision and Scenarios |

Personas and Motivations



ExpROVer

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Version Control

Version	Date	Authors	Changes Log
V0.1	06/03/2019	António Santos (AS), Beatriz Borges (BB), Gonçalo Marques (GM), João Monteiro (JM), Sérgio Gasalho (SG), Tiago Almeida (TA)	First draft of the Introduction and Positioning sections.
V0.8	12/03/2019	AS, BB, GM, JM, SG, TA	Addition of Personas and Goals, Architecture and User Manual Draft sections. Revision and update of the Product Overview section.
V0.9	12/03/2019	AS, BB	Revision of Personas and Scenarios sections.
V1	16/03/2019	BB	Integration of project mentors' feedback.

Vision

1. Introduction

Remotely Operated Vehicles (ROVs) are underwater vehicles used across several sea- and ocean-related industries, for fish management, research purposes, dangerous maintenance operations and several other tasks.

The VideoRay Pro 4 (VRP4) is the world's most popular small underwater ROV. It incorporates the latest design and technology, making it stand out on the market as the most advanced, capable, and versatile small ROV.

With a maximum depth of 300m, the VRP4 is controlled through an umbilical cord which directly connects it to a computer, which is used by the ROV to send data to the computer and to receive commands from it.



Figure 1. VideoRay Pro 4.
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The VRP4 is controlled through the VideoRay Cockpit software, developed by VideoRay, executable only on Windows - and unfortunately known to be liable to problems and bugs.

Finally, this software requires training, being complex and demanding high levels of prolonged concentration from its users to ensure the proper maneuvering of the VRP4.

2. Positioning

In this section, the main problems and the project's locality are described.

2.1. Problem Statement

The problem of	operating a ROV or improving its functionality range
affects	all business and research institutions which require underwater monitoring or operations
the impact of which is	high labor costs, accidents' susceptibility and error-proneness during operations
a successful solution would be	the reduction of effort and inconvenience associated with operating a ROV, leading to lower expenses, higher efficiency and the enabling of new functionalities' creation.

2.2. Product Position Statement

For	owners of the VRP4
Who	want to control the VRP4 with either less specialized or more productive workers and have higher effectiveness in its operation
The ExpROVer	is a software solution
That	promotes a reduced workload and lower training requirements, offering several helper functionality and high accessibility to the ROV's systems.

Unlike	VideoRay's Cockpit software
Our product	will run on Linux, as well as Android, and will have several additional semi-autonomous features, such as object recognition and smart maneuvering.

3. Personas and Motivations

3.1. Ralph Schmidt

Name: Ralph Schmidt

Age: 23 years old

Profession: Programmer



History: Ralph is a college graduate with a degree in computer science working as professional programmer. Owning a VideoRay Pro 4, he also develops simple software for the VideoRay community as a hobby. He wants to implement new pre-programmed actions in his ROV, but he is faced with the herculean task of modifying VideoRay's proprietary Cockpit software. What he needs is an open source solution that provides him with both a control interface and the ability to add these new actions.

Motivations: He wants to add more functionalities to his ROV.

3.2. Michelle Kahoru

Name: Michelle Kahoru

Age: 26 years old

Profession: Special Rescue Underwater Worker



History: Michelle is part of a specialized emergency response team and sometimes goes on emergency missions to find survivors trapped in shipwrecks. She recently started using a ROV as the main tool to find survivors and help them out as fast as possible. Every day, Michelle is more interested in ROVs and their potential for additional capabilities, enabled by the integration of new sensors and actuators. She aims to leverage ROVs to be more efficient in her job.

As a result, she is looking for a solution that enables her to control the ROV in harsh conditions,

at anytime, from anywhere. It comes as a useful bonus that this software also allows her to add support for new functionalities and peripherals in a relatively simple manner.

Motivations: Michelle wants to save as many people as she possibly can, and rescue as many items as she can salvage. Her ROV facilitates her job, and makes it easier to recognize obstacles and survivors.

3.3. Peter Smith

Name: Peter Smith

Age: 56 years old

Occupation: Aquafarmer



History: Peter owns an aquaculture enterprise where he grows fish. He needs a way to control the health of his fish population, while also perform inspections on nets, pens, mooring points, and other elements of his farms.

This type of jobs present risky work conditions for divers, so he is inclined towards using a remotely operated solution. It would allow him to monitor his fishes' feeding habits and make periodical inspections. However, he is not very experienced neither with ROV handling nor ROV operations.

Motivations: He wants to find a simple way to operate ROVs, so that he can monitor his fishes' health and perform inspection work.

4. Scenarios

Below, 4 distinct scenarios are described. Out of them, only scenarios 1 and 3 will be selected for the system's first release.

4.1. Scenario 1 - Remote ROV control and monitoring via mobile devices

Peter wants to quickly visualize his aquafarm. However, he has gone on holiday with his family, and is not present at his office, where he could directly access the VRP4 through a computer connected to its umbilical cord.

Before he left on holiday, Peter installed and ran ExpROVer's back-end program, allowing him to now monitor his ROV anytime, from anywhere. On his tablet, which he has linked to the ROV via the ExpROVer's mobile app, he can now monitor and control his VRP4.

4.2. Scenario 2 - Lighter workload during harsh environmental conditions

Michelle is rudely awakened by a loud crash. As she was turning on the news, she gets a call informing her that a coastal building has just collapsed and that she is needed. After a long and exhausting trip to the area of the accident to meetup with the rest of the team, and on very little sleep, Michelle needs to work with the VideoRay Pro 4 to rescue what she can.

The ambient is muddy, dirty and clouded and details or static objects can easily escape the operator's eye. Not only is it crucial for Michelle's job that she notices these, since they can necessitate to be rescued, some of these objects can also harm the ROV. As such, with the help of the ExpROVer program, Michelle can easily both track objects with higher ease by using the Computer Vision functionalities, but also avoid obstacles due to the semi-autonomous maneuvers module.

4.3. Scenario 3 - Adding support for new peripherals

Ralph knows how to program, and nowadays works almost exclusively using the Linux OS.

VideoRay's Cockpit software forced him to work on Windows 7, since the Windows 10 version caused several bugs, requiring a factory reset to the VRP4. Not only that, but Ralph was also confined to the functionality provided out of the box by VideoRay's Cockpit software, since it was proprietary and therefore not open to modifications and expansions.

Unhappy about his situation, Ralph decided to instead adopt the ExpROVer software, and though he is not particularly interested in controlling his ROV with other devices, he is happy that the code is open source and easy to modify. He has developed and shared an extension to integrate control of a grappler arm, and even tweaked his own interface to better suit his use of the software.

4.4. Scenario 4 - Using community extensions

Michelle's rescue company recently decided to invest in a grappler arm for the VRP4, which was quickly revealing itself to be a major asset in their operations. Michelle read ExpROVer's user manual to check whether or not this peripheral was supported by the base software. She saw it was indeed not supported, but, undeterred and directed by the manual to check the community extensions, she found a popular extension, by Ralph Schmidt, adding just the functionality she needed. She downloaded and integrated his code, and after reading Ralph's documentation and doing a field test, Michelle now found herself capable of using the grappler arm as well, despite her short training period.

5. References

Several documents were consulted during the elaboration of this report:

1. Pro 4 Operator's Manual, VideoRay, March 2019, available at http://download.videoray.com/documentation/pro_4/html/index.html
2. Human-Automation Systems Lab general workspace, Georgia Tech ROS Group, March 2019, available at <https://github.com/gt-ros-pkg/humans>