

The Dolphin - Project Requirements Summary

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Diving is a dangerous activity to engage in. Divers are always faced with dangers such as water pressure and air consumption. A main function our system has is displaying diving time elapsed, dive time remaining, and dive depth. The body mounted sonar would be able to create an image of the surroundings giving divers an idea of their surroundings allowing them to be able to perceive possible hazards.

Functional Requirements:

- The product shall change the rotational sensor being used based on the diver's position. The system will use the head rotational sonar when the diver is swimming vertically in the water, and the back rotational sonar when the diver is swimming horizontally.

Speed and Latency Requirements:

- System retrieves data that the sonar picked every half a second for real time sonar map.
- System alerts diver 20 minutes before oxygen tank depletes to allow the diver time to surface.

Precision Requirements:

- The system shall calculate the remaining oxygen left in the tank with a precision of ± 1 minute, in order to avoid killing someone because of a miscalculation.

Safety-Critical Requirements:

- The HUD shall not block more than 25% of the mask since covering too much of the mask may lead to blocking the view of the diver, and causing the diver to get injured.

Operational and Environmental Requirements:

- The system will be used in areas with high water pressure, so it will have to withstand waters of up to 100 meters.

Features to be tested / not to be tested:

- Ability to withstand ~100+ meters depth.

Approach:

- Test mask functionality in approximate water pressure level at 100 meters depth

Suspensions and resumption:

- Suspension: When $\geq 70\%$ of device functionality begins to malfunction
- Resumption: When $< 40\%$ of device is malfunctioning

Test Cases:

- Device sonar shall produce accurate images up to ~100+ meters depth.

Design Goals:

- Sonar mapping should be computed and displayed as fast as possible.
- Vital calculations should be computed and displayed as fast as possible.

Software Architecture:

- multiple classes interacting and communicating with each other to create a proper task flow.

Subsystem Decomposition:

- Application
- User Interface
- Persistent Data Storage
- Peripherals

Object Design:

- Cost vs. Durability: high quality material used; costly.

Open Issues:

- Hardware Support: There is currently no hardware to support our product.
- Efficient software: The calculations that are required by the product is very intensive

Ready-Made Products:

- Full dive mask: Diving mask with a dive computer attached.
- Console diving computer: Handheld dive computer
- Wrist dive computer: A small dive computer that is wearable on the wrist.

Risks:

- Inaccurate metrics
- Slow computations
- High power consumption
- Inaccurate mapping

Costs:

Type	Cost
Requirements and use cases	\$16,200
Project Design	\$16,000
Project Development FP cost	\$648,000
Project Development man-hour	\$1,296,000
Hardware R&D	\$2,000,000
Total	\$3,976,200