The Dolphin - Project Requirements Summary

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The Dolphin is a scuba diving mask made to give divers a quality of life improvement as well as giving them addition functionality. The Dolphin provides divers with vital information such as dive depth and air time remaining as well as providing them with a real time sonar map.

Requirements:

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.
- The system will allow the diver to adjust the brightness of the screen, so that the HUD will be visible even in pitch black and completely illuminated areas.
- The product will be able to switch between imperial and metric units for the convenience of divers.
- The product will display vitals of user onto the HUD.

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.
- System completes calculations in <.5 seconds to always keep the diver aware of the current oxygen level, depth, and remaining time.
- The system shall combine and correct the images that the sonar produces in at most a half a second, in order to provide to the diver at all times an image of it surroundings.
- Maximum response time between user and system shall be at most 1.5 seconds
- Sonar will do a recalibration for proper transmission of frequency range and image creation without interruption to dependents (main system data retrieval) every 60 seconds.

Precision Requirements:

- The system shall calculate the remaining oxygen left in the tank with a precision of $\pm$ 1 minute, in order to avoid killing someone because of a miscalculation.
- Remaining time shall be updated with a precision of $\pm$ 1 seconds to work in tandem with oxygen remaining calculations. Possible solutions: synchronized time server.
- Synchronized time server will also assist with displaying current time to user
- Calculations for depth will be at the user's choice of unit system(ft, km,mi)

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.

- The content displayed shall be concise and clear as to prevent any distractions to the user. This differs from the first requirement as this does not care to consider blockage but other details, such as color, efficiency of the least amount of terminology,etc.
- The HUD shall also be offered in various size adjustments to individual users if necessary.
- The material used shall be not hazardous to the user in any way.

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.
- The system will have to be IP69k certified, in order to avoid water infiltrating inside the system.

Usability Requirements:

- The system shall be as simple to use that a beginner will understand what each of the data displayed on the screen mean.

Test Plans:

Features to be tested / not to be tested:

- HUD display
- Ability to withstand ~100+ meters depth.
- Sonar mapping

Pass/Fail Criteria:

- Projection displays correct data and Response <1.5 seconds with button interactions.
- Device has no malfunctions any less than 100 meters depth.
- Sonar maps surroundings correctly.

Approach:

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

Suspensions and resumption:

- Suspension: When >=70% of device functionality begins to malfunction
- Resumption: When <40% of device is malfunctioning

Testing Materials:

- Completed system
- Body of water >= 100 meters depth

Test Cases:

- Device sonar shall produce accurate images up to ~100+ meters depth.
- HUD shall be respond accordingly to button presses.
- Device shall accurately detect user's vitals up to ~100+ meters depth.

Testing Schedule:

- Once per week for test data as well as for durability results.