Project Description Summary - The Dolphin

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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. As of right now, the current gear that is available for divers are scuba masks, wetsuits, air tanks, depth gauges, fins, diver's watches, and buoyancy compensators. Although the current gear available is sufficient for diving, it can be improved upon. We have designed a product hoping to revolutionize the diving industry by providing divers with additional safety features. We have designed a product that condenses some of the components that are currently used and improved the manner of usage to be more intuitive.

Our product will have a heads up display that will provide the diver with vital information such as dive time elapsed, dive time remaining, dive depth, and an image of the surrounding area created via sonar. In the present, divers require a depth gauge, pressure gauge on the air tank, and dive watch to calculate the amount of dive time remaining. The diver has to mentally calculate the amount of time they have left underwater based on the amount of air remaining in the tank. This can be very dangerous as they can easily make a mistake during high pressure situations and calculate the incorrect dive time resulting in an insufficient amount of air left in the tank. With our product, the microprocessor in the mask will automate this process reducing human errors.

A main function our system has is displaying diving time elapsed, dive time remaining, and dive depth. The system will be using a combination of personal apps and pressure sensor to calculate this data. The app will be able to determine the depth from the depth gauge built into the system rather than a separate entity like it is right now. Furthermore, in order to get the dive time remaining, the system will use an app that will have to learn about how much oxygen the diver uses during the dive using the pressure gauge on the air tank to estimate the amount of oxygen being consumed. In addition, in order to determine the diving time elapsed, the system will be using a clock app to keep realtime update of the amount of time the dive has last starting from when the diver entered the water. Finally, these functions will be all displayed on the mask via projection to help the diver by having vital information readily available to them at all times. The system will allow the diver to pay more attention to the dive and less time checking the status of their gear.

The key feature of our product is the sonar map. Often times divers are not able to keep track of everything in their surroundings. We as humans have binocular vision, this limits the range of our vision to mostly forward with peripherals giving us a total of 190 degrees field of view. Since we have limited field of view it helps when there is additional support for checking the surrounding. 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.

The sonar would generate a frequency and creates a sonar map the the frequency returns. The map will be processed by the microprocessor and then displayed via projection onto the mask. The sonar map will help divers keep check of their surrounding in a 100 meters radius. The use for this in open waters is for detections of large objects traveling at high speed towards the diver giving ample time to react to the situation. The sonar system would be very useful in structural diving as well, due to high clutter and dim lighting. Divers would be able to see things on the sonar map that they possibly cannot see with just their naked eyes. The system will help in informing the diver of objects and passageways that the diver does not see by using the rotational sonar which can detect objects that that are to hard for the human eye to catch. This will allow the diver to navigate through dark and complex areas that many times current divers struggle.

There are only two similar products that available right now. They are the Oceanic Data Mask HUD and the Aeris Compu Mask HUD. Both of these mask are roughly the same in appearances and their capabilities. The masks uses a microprocessor to calculate the dive time remaining, dive time elapse, and current depth. The information is then displayed on a small LCD at the bottom of the mask. These mask have similar functionality to our product, however our product goes beyond these capabilities. First, while the Oceanic and Aeris mask uses regular goggles and a small LCD, our product uses a full face mask with information projected directly onto the screen of the mask. Second, our product uses sonar to project a map of the surroundings, something that neither of the other masks offer.

Unfortunately, the sonar required for this system is currently not available and would require research and development to create one that is usable for our design. Another constraint is that the system requires an application that is capable of combining in real time the images of what the sonar picked up, and correct the image when the diver moves. At this moment, correcting an image requires using a computer after a dive, which is inconvenient and time consuming. Users are required to rearrange and combine images manually to recreate a clear image due to the lack of software currently available for this purpose.

Our product produces less user error and increases efficiency for the all experienced-level divers. It achieves this by lessening the amount of responsibility held by the diver themselves. The diver will no longer be required to manually keep track of their depth, nor will they have to calculate their own airtime. This will all be done by our product, allowing the the consumer to focus on other life-threatening factors that happen in such environments. Our concern is safety. This is our motivation behind designing this particular system. There are high risks involved in modern diving and the technology can evolve along with those risks to help protect our users in these hazardous environments. We will achieve this with measurements displayed to the user such as air levels, as well as depth and surroundings.