

Development of Software Modules for Sensors and Subsystems Under NSTL-DRDO CARS Project

Title of the CARS Project: Simulation of ‘data & Communication’ from ‘Sensors & Subsystems’ for bench testing of AUV mission computer

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Sanctioned Amount: Rs.14,72,970

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Project Duration: 9 months

The main aim of the project is to develop a simulator in a laboratory computer for the data interchange between the Mission Computer (MC) and the sensors & subsystems of an Autonomous Underwater Vehicle (AUV).

The objectives are

- a) **To study sensor and sub-system characteristics and consolidation of Interface Control Documents (ICDs)**
- b) **To develop individual software modules for sensors and sub-systems**
- c) **To develop software modules for Mission Computer (MC) functionality**
- d) **To develop AUV mission scenario generation with GUI provision**

The current autonomous underwater vehicle (AUV) can operate continuously in the ocean for several days, thanks to advancements in propulsion battery technology. As a result, the mission computer and electronic payloads must function reliably throughout the entire duration without manual intervention. This necessitates comprehensive testing of the mission computer in a laboratory setting, under simulated mission conditions, to identify and resolve any potential issues before deploying the AUV at sea.

The primary goal of this project is to simulate, on a laboratory computer, the data exchange between the mission computer (MC) and the AUV's sensors and subsystems, replicating the interactions that occur during an actual sea trial. The developed software will emulate sensor and subsystem data while also creating an ocean environment scenario through which the AUV navigates for extended missions. Additionally, as endurance increases, so do mission functionalities, leading to the inclusion of more sensors and subsystems on the MC bus. The simulator will evaluate the mission computer's performance, detect errors and failure conditions, and assess its capability for further expansion.

In this project, various sensor modules—including the Temperature Sensor Unit (TSU), Pressure Sensor Unit (PSU), Level Sensor Unit (LSU), Conductivity Temperature and Depth Probe (CTD), and Inertial Measurement Unit (IMU)—are designed and developed using MATLAB. Each sensor module is created based on different underwater environmental scenarios and an instruction manual. These modules are then integrated and tested over a specified time, ensuring seamless data exchange by sharing parameters such as temperature, depth, and time. A graphical user interface (GUI) is developed to facilitate interaction with the software modules, enabling sensor data transmission to the Mission Computer System via a Virtual Serial Port Driver or Ethernet.