A semi-autonomous subaquatic robot for surveillance navigated by stereovision and sonar

SARSTION

Final Year Project - Proposal

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# Abstract

The “SARSTION” is a semi-autonomous robot for underwater surveillance. Using propellers and ballast tank administered by an elaborate control system based on various positional feedback sensors, can provide 6 degrees of freedom. It uses the techniques of stereo-vision and sonar/laser scanning for analyzing its environment, creating a 3D map and henceforth communicating the processed visual information to the control room. It also uses the same processed information for its own navigation and locomotion.

The potential applications of SARSTION include, but are not limited to, oceanography, underwater construction and repairs, underwater oil field exploration, underwater imaging for submarines and ships. It can also be employed as coastline underwater monitoring unit against enemy attacks and other suspicious activities.

# Project Modules

This project can be divided into following major modules:

## Control Unit

A control system to manage the motion of robot based on data from inertial unit, stereo vision and sonar.

## Inertial Unit

A unit comprising to accelerometers, magnetometers and gyroscopes to act as feedback for controlling the motion of robot.

## Electronics

An electrical network to drive motors, ballast tanks, on-board controller, cameras and other sensors.

## Mechanical Structure

A hydrodynamic assembly which can house waterproof chamber for electronic equipment. It will also be equipped with motors and ballast tank. Assembly needs to be agile and robust. Also the assembly should be buoyant but should sink easily when desired.

## Stereo Vision Unit

Comprising of stereo camera and a computational device, this unit will generate 3D image of surroundings for surveillance as well as navigation.

## Sonar/Laser Sensing Unit

Sonar or laser is to be employed to calculate absolute distance form objects underwater as well as depth of robot underwater to navigate and control its motion.

# Block Diagram



# Timeline

|  |  |
| --- | --- |
| Objective | Time Duration |
| Feasibility Study | July 2014 |
| Mechanical Assembly | July 2014 – August 2014 |
| Motion Control | Sept 2014 – Nov 2014 |
| Stereo Imaging and Sonar/Lasing Sensing | Sept 2014 – Nov 2014 |
| Integration | Dec 2014 – Jan 2015 |
| Testing and Validation | Jan 2015 – April 2014 |

# Resource Requirement

Exact resources required to successfully complete the project shall be listed after feasibility study has been carried out. A tentative list has been provided below:

* Inertial Unit
* Stereo camera
* Sonar / Laser Range Finder
* Motors
* Mechanical Workshop
* Testing Facility (A water reservoir)