MECHATRONICS BOOK SERIES

CONTROL AND INTELLIGENT SYSTEMS

Momoh Jimoh E. Salami
Abiodun Musa Aibinu
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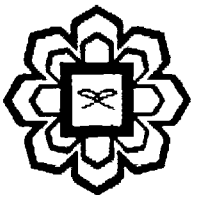

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Chapter 11
Control of Unmanned Underwater Vehicle

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11.1 Introduction

The UUV design is separated into parts which are the mechanical system part and the control system part. A literature review was done on similar projects on the UUV to grasp all the concepts needed to construct our UUV successfully. The UUV is usually constructed in developed countries like US, Europe and Japan [1]. Researchers from Kyushu Institute of Technology and Tokai in Japan have developed series of underwater robots called "AquaBox". Unlike typical underwater robots, these robots were designed to be handy, small and can be operated by just a few researchers [2]. The UUV of AquaBox series are small and handy so that it is able to complete missions faster, has a modular system that made changing of sensors and actuators according to different missions easy, and is able to be operated in two modes. AUV mode or ROV mode is selectable depending on the missions [3].

Another small UUV that has been developed is the Digitally-controlled Research Immersible Prototype (DRIP) which was designed as a small, cheap UUV for under ship inspection and salvage. The development of DRIP was motivated by the fact that UUVs have customarily being very expensive. The parts cost of DRIP are under $3000 where two-thirds of the cost is for the color-tracking system. The limitations of DRIP are it can only be operated under shallow calm water with currents less than 2 knots at depths less than 30m, and no real time commands and real time video are installed inside [4].

We have also referred to a UUV called the Kamikaze. Its purpose is to survey a volcano crater in American Samoa [5]. The torpedo shaped vehicle was built using glass sphere for instrumentation housings, a dive plane for control fins and a trolling motor for forward thrust. Its tasks included to characterize the data field along the coast and seamount using various traditional oceanographic tools and to optimize its data collection by making mission corrections on its own and can return home safely. Its development process was divided into 4 which were. 1) Hull design 2) Power design 3) Propulsion design and 4) Communication design. Its hydroplanes were designed using the NACA 0015 table which is usually used for aerofoil shapes [6]. This helped in the calculations of the dimensions of our hydroplanes [7]. One other special feature that it has been designed to have positive buoyancy so that it floats when any failure happen. This feature will also be implemented in our design.