CHAPTER 1

INTRODUCTION

1.1 ROVs

Deep water industry or task is constantly evolving, and provides greater challenge as its depth of operation increase. This sort of activities requires not only accuracy, but ability to work in harsh condition that is dangerous and risky to be performed by human diver. To overcome this, researches has came up with the idea of underwater vehicle (UV), either remotely operated or autonomous, to replace divers in performing those task. UV nowadays has been develop by many companies, and with the advancement of technology, implementation of sensors and other hardware as well as software has been introduced to increase the capability of the UV. This enables more input information to be analyze, thus provides the UV users with rich information on what is happening underneath the sea surface.

Autonomous underwater vehicle (AUV) is designed to be able to perform on its own, without the need of connected to any controllers on surface. The AUV is preprogrammed with specific instruction before release into the sea, and its ability to avoid obstacles making it suitable to be use commercially and in military application as well (Bui, 2006). AUV also capable of controlling its own motion and adapt to the change of external disturbances, and at the same time maintaining its accuracy and reliability during task performing (Leonard, 1995).
Remotely operated underwater vehicle or simply called as ROV is an unoccupied and maneuverable vehicle, controlled by some sort of remote control by a person and usually from onboard of a boat. Signals are transferred back and forth by umbilical cable that act as the life line for the ROV, controlling thrusters and enabling live time viewing to the user via onboard camera. Common umbilical cable usually consists of power supply and communication where it is essential to operate the ROV (Lygouras, 1995).

1.2 PROJECT BACKGROUND

Underwater vehicle had been around since the early 1950s where its application is widely use around the globe for various underwater operations. Under harsh and risky condition, sending divers to complete those tasks is extremely dangerous and risky, and it can cause lost of life. Underwater operations such as repairing underwater pipes or probably in military spying task consume a lot of working hours, thus implementation of UV in completing those task enables not just long working hours, but capable of doing continuous work without fatigue. Advancement of technology nowadays allows UV developers to design and fabricate according to customers demand, which mainly focus on its application.

Various types of sensors was introduced to enable a more sophisticated UV, such as the lateral-line sensors capable of detecting change on local water velocity caused by object at its surrounding (Martiny, et al., 2009). This enable the UV to detect any object on its surrounding even during milky water condition where other sensors might unable to detect, thus avoiding any collision from its surrounding object. Although with the capability of lateral-line sensors, most ROVs require vision based navigation such as an onboard camera not only for sending image to the pilot, but as well as to enable image processing to stabilize the vehicle (Amat, et al., 1999). Tethered UV enable pilot to control the direction of the vehicle, with the help of onboard camera to see where it is going. Various control technique has been introduce such as the use of proportional and derivative action that are proved to be working (Guo, et al., 2003).
1.3 PROBLEM STATEMENT

Underwater task proposed great challenge to researchers as the condition deep down inside the ocean can be dangerous. Sending divers to repair leakage on pipes or to collect some samples for biology research can be fatal to them as the deeper it gets, pressure is growing higher and at the right amount it can easily crush the human body. Although with the help of UV, there is still one major problem associated with it, which is the cost. Most underwater equipments is expensive and developing UV with limited cost is difficult. Especially to ensure its ability to go deeper without having to bottleneck the capability of its onboard equipments. Therefore, it is important to calculate the right amount of cost to be spend. It is highly related to what type of application and task the UV will go through.

Ability of existing ROV to be control using both remotely and autonomously control proposed a great challenge and every aspect in designing and allocating important electronics component need to be taken into consideration. Light source is also needed and important in order to produce enough light intensity while the ROV performing autonomous control, so that object can be easily recognized. Roborealm software will be used to process the image from webcam, which enable object to be track and sending the signals to respective electronics component to move the ROV.

1.4 PROJECT OBJECTIVE

The objectives of this project are :

a) To develop and maneuver existing underwater vehicle and perform basic movements
b) To develop control system of the vehicle
c) To test the control system of the vehicle and observe its behavior