**IOSR Journal of Engineering (IOSRJEN)** **www.iosrjen.org**
ISSN (e): 2250-3021, ISSN (p): 2278-8719
Volume 15, PP 32-37

# Underwater Pick and Place Arm

Rahul Sogam[1], Shubham Rane[2], Amruta Mhatre[3], Shubham Vengurlekar[4]
*Student of Computer Engineering, Universal College, Mumbai University, India*
*Student of Computer Engineering, Atharva College,Mumbai University, India*
*Assistant Professor of Atharva College of Engineering, Mumbai University, India*
*Student of Computer Engineering, Atharva College, Mumbai University,India*

***Abstract:*** *The design analysis of Underwater Remote Controlled "Pick and Place" Robotic Vehicle has been presented in this paper. This Remotely operated vehicles (ROV) help oceanographers study parts of the ocean that are too dark, too cold, or too deep for human divers. Build a real underwater ROV, and take a video showing how you control it while it's underneath water.*
*We are trying to make a mechanical arm with all its basic applications which can be also useful underwater that is we can search, locate, and pick or place it on another location underwater.*
*This arm will able to pick and place object which cannot handled or not accessible to human body which are beneath the water, as it is underwater the arm and its other parts will be fully waterproof.*
***Keyword:*** *ROV, Oceanographers*

## I Introduction

This Underwater Pick and Place arm is of type ROV, which will be controlled by two wired remote controllers from which one remote controller is for Robot body and another is for Robotic arm. Also the robot is divided in two main bodies, one is main body which is a framework which is moving robotic body from one place to another place and second one is robotic arm which is used to pick and place objects from one place to another place.

A certain problems associated with building a Underwater robotic vehicle with robotic arm. Firstly, the problem of integrating the units to form a working machine which can work fully submersed in water. Secondly, using the right actuator (pneumatic, stepper motor, RC servo etc). Thirdly, choice of right material (wood, plastic, acrylic) and last but not the least the balancing the weight of robotic body in water and making its framework resistant to jerks and waves of water.

In the work, a miniature Underwater robotic vehicle with four degree of freedom a robotic arm is designed.it is also intended that structure of the robot should be simple to facilitate easy adaptation and upgrading. The housing is designed to create three distinct layers within the RCRV to separate elements of the robot, thus leaving space to add more devices in future. The middle layer will contain the electronics and its connections.

## II Literature Review

***History***

Robots have their historical past though they came into existence only in 1962 when Unimation Inc. USA introduced the first servo controlled industrial robots. Early development during back to 500B.C. shows that the Egyptians, Indians, Chinese and Romans build many automatic puppets which imitate the movement of animals and birds.

***Existing System***

Now days there are already many pick and place arms available and developed by various industries and countries. These pick and place arms are used for various purposes like for industrials application, scientific research sector, medical field, for defence applications. The basics behind these pick and place arms is all the same just there is a difference between in components, material, soft wares, micro controllers or micro-processors used as per the requirement of task.

The basics are that, there is one or more robotic arms having special tool holder at its one end and another end resting on a surface if it is a moving then its base is resting on a mobile vehicle and if not moving then resting on a fixed surface.

## III Indentations And Equations

This section will describe the functions of various units of work and various algorithms/approaches during its development.

***Mode of operation***

When the operator issues a command from the remote control to the robotic vehicle all necessary tasks will be carried out by sending signals to its respective electrical channels. The electric motor response will depend on the type of command issued; and the direction, speed and motion of the motor is regulated.
The rotation of the powered motor moves the affected links connected to the motor and this in effect affects the movement of robotic arm.

***System Description***

The robotic arm has four degree of freedom. It is made up of various links forming an open chain. The arrangement of these links depends on the adopted design. The arm has rotating base which rests on upper region of vehicle. The arm terminates with the gripper or a specialized tool holder; it has four degrees of freedom. The first three links of the arm form the body and which helps to place the tool holder at desired position at the location inside the environment. The fourth link is used for the gripper's grab and drop operation. For the purpose of analysis, the robotic arm is made up of joints which are named as elbow, shoulder, and base. The preliminary sketch from which the detailed design was made is based on the sketch.

***End Effector***

This is gripper to whose operation is to grip and outgrip the objects to be lifted or moved. The connected to the horizontal rotating servo motor.

***Elbow***

This is joint between end effector and shoulder; it has one degree of freedom actuated by RC servo motor. It can rotate to about 180-degree (by design).

***Shoulder***

This is a joint between base and elbow, this joint has one degree of rotation which is actuated by servo motor. It can rotate about 180-degree horizontal axis.

***Base***

This is joint between robotic arm and vehicle; it has one degree of freedom which is actuated by a DC motor connected to gear in link. The DC motor is similar to that used in the shoulder but different gear arrangement. The base rotates about full 360 degrees. The base is platform on which the arm stands and carries the weight of the arm which in turns determine maximum load the robotic are can lift. the circuit board and wiring and other attachments are fixed to the base.

***Design Considerations***

The following were put into considerations in the design process.

i. Electrical actuators DC servo are chosen instead of hydraulic and pneumatic actuators because of the little power requirements and its light weight which is suitable for design.
ii. The material which are used for the design will be light in weight so as the reduce the weight concentration on the base and shoulder.
iii. Hollow acrylic pipes are used to design the framework of the vehicle body, this extremely reduced the weight of the body which is very useful for the vehicle while it is underwater.
iv. The silicon is used for sealing and waterproofing of the desired parts, circuits, joints and materials of the whole ROV.
v. The detachable floaters are used for robot's toggle operation which can be over the water or under the water.
vi. Materials used for the fabrication were locally sourced from available materials.

## IV. Figures And Tables

The circuits include components for supplying power to the system, controlling the electric power to the system, controlling electric motors.

There are two different connections of motors one for vehicle motors and another one for arm motors:
For vehicle body, there are 6 mini submersed water pumps which are paired in group of 2-2.
One pair is used to move vehicle body forward, second one is used for moving vehicle body backward, and third pair is used for rotating purpose.

For arm, there are 5 servo DC motors, from this each one motor is for gripper, elbow, base and 2 for shoulder respectively.

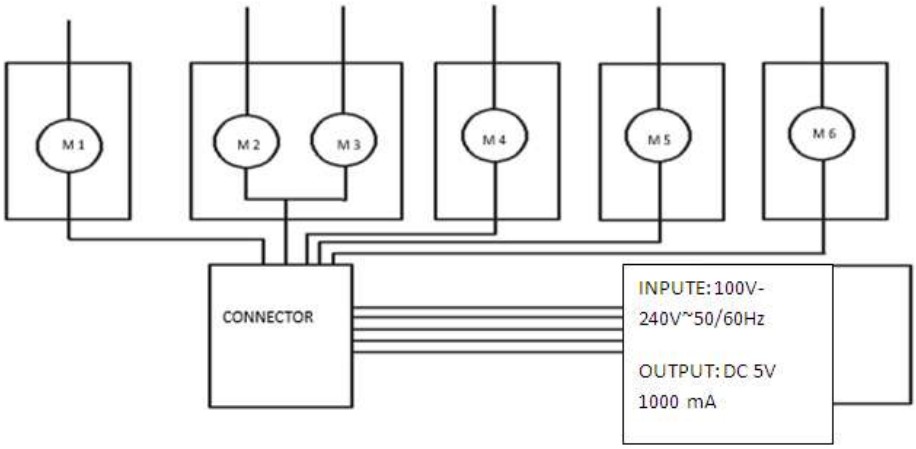


**Fig: Refers to Robotic Arm Controlling remote controller circuit.**

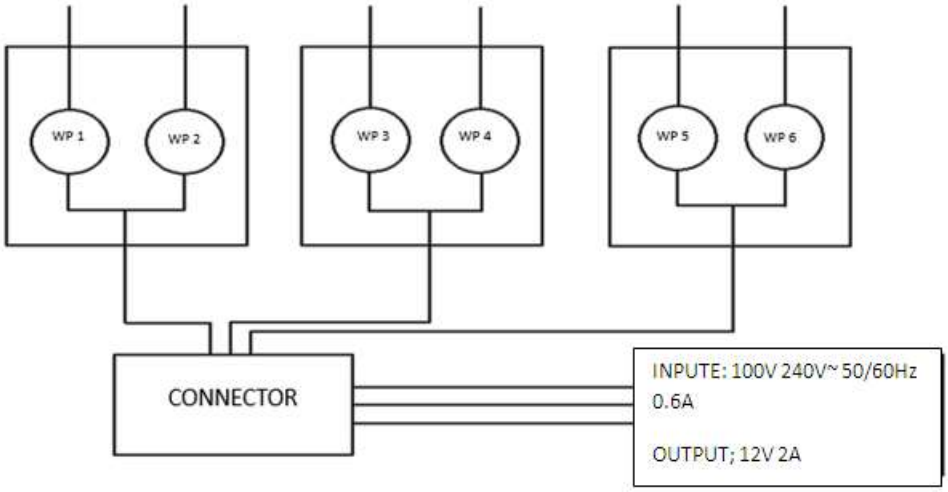


**Fig: Refers to Vehicle body handling remote controller circuit.**

In above diagrams both;
M: Motor
WP: Wheel Pair

***Voltage Regulation***

Under this topic the voltage regulation and distribution of power supply is shown:
Mainly there are two power supply given to this machine one is for arm and one is for vehicle body. The two power adapter is given one of 5V for arm and one of 12V vehicle body. This voltage is distributed to the motors and water pumps through the power connectors.

***Interface***

If the ROV is going to be handled by software then the below tables and pictures shows the flow of handling and interfacing of software with respect to ROV. The authentication of admin user and controls of workers or naïve user are clearly understood by referring below pictures.
Below 3 figures 1.1, 1.2, 1.3 refers to Software interface on which naïve user or worker is going to operate or control the ROV.

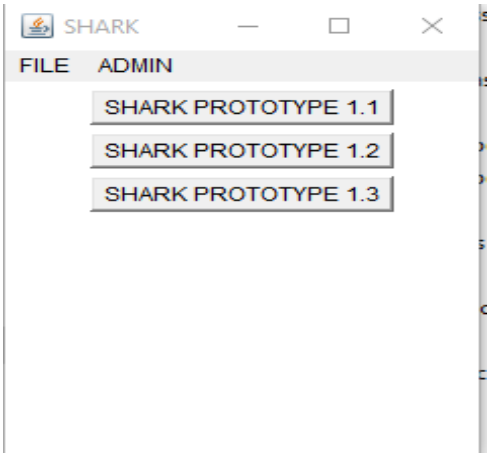


**Fig.1.1: Choosing appropriate machine to work on.**

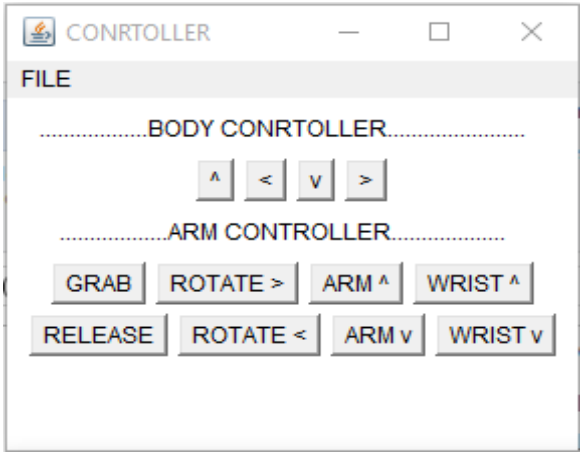


**Fig.1.2: Controller interface with various predefined operations.**

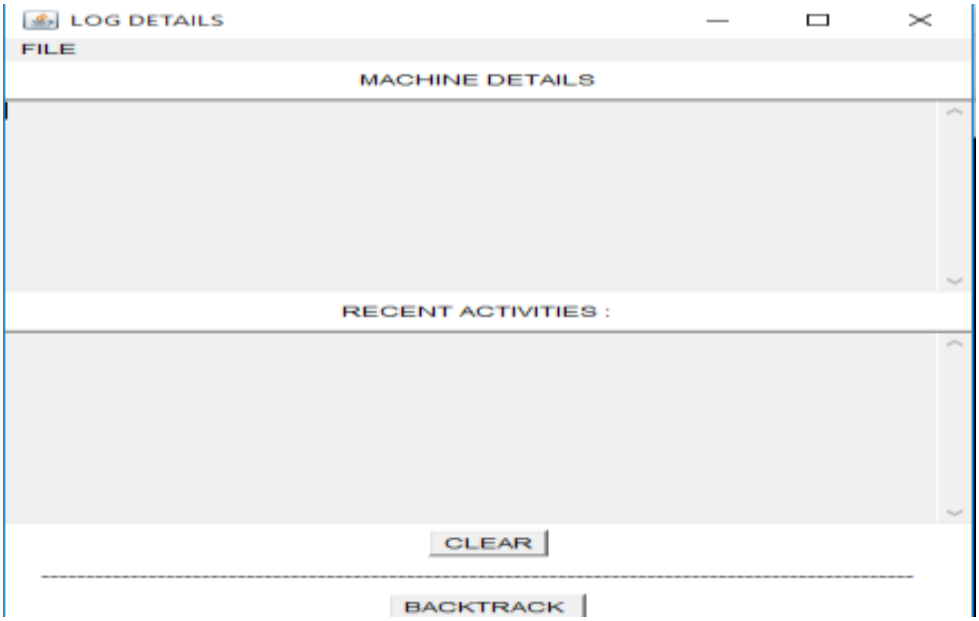


**Fig.1.3: Machine details which will be read only for worker and only editable by admin,**

Recent activity log for reviewing any previous activity for recovery or maintain ace purpose.
Below 3 figures 2.1, 2.2, 2.3 refer to software interface by which admin can use its rights for admin authentication, choosing appropriate machine and changing machine details.

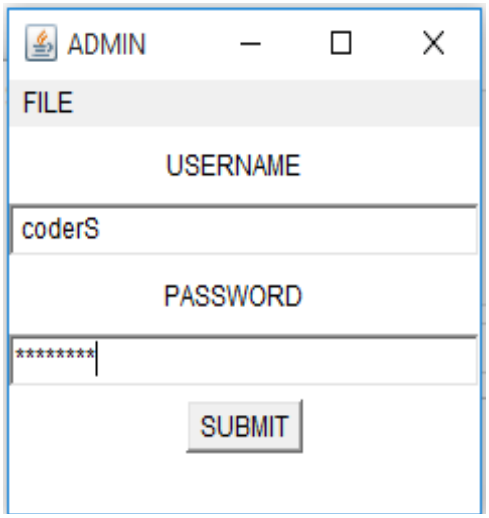


**Fig.2.1: Enter username and password of admin.**

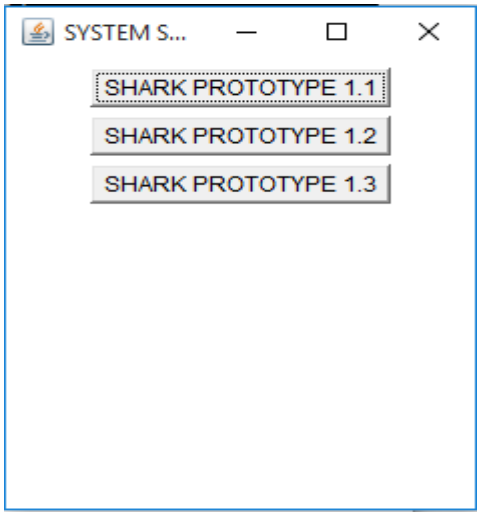


**Fig.2.2: Choosing desired machine for manipulating details.**

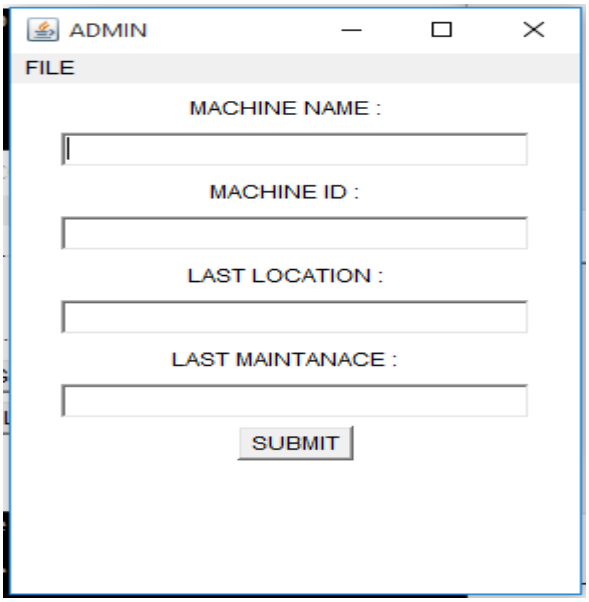


**Fig.2.3: Actually entering machine details which will be visible in Fig.1.3.**

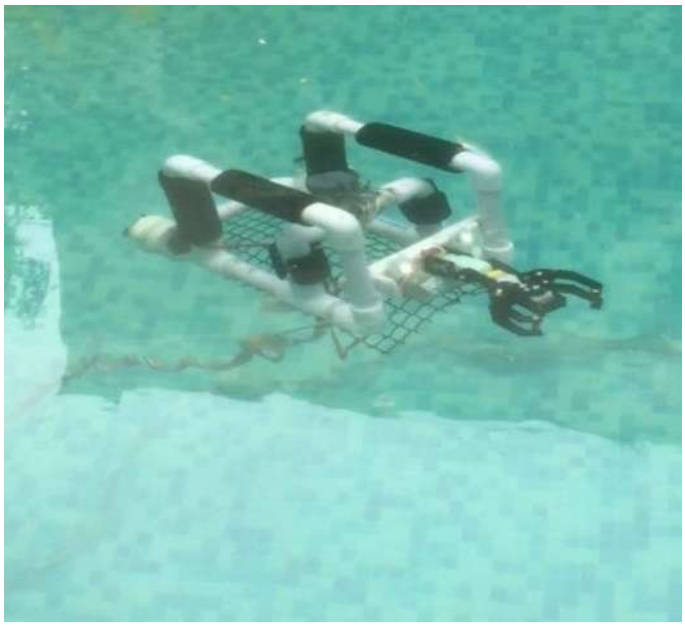

**Fig: Photo of Final Product**

Above image shows the output of final results, ROV fully submerged in water and with all its functionalities of Robotic arm as well as body. Also as it can be seen satisfactory amount of space is still available to mount any more circuitry or sensors, extensions.

## V. Conclusion

The design of underwater remote controlled robotic Vehicle has been completed. A prototype was build and confirmed functional. This system would make it easier for man to unrivalled the risk of handling dangerous and hazardous in its present environment and workplace. Complex and complicated duties would be achieved faster and more accurately with this design.

## References

[1]. www.electronicprojects.com
[2]. www.mkElectikindia.com
[3]. Magazines-electronics for you
[4]. http://seminarprojects.org/t-pick-and-place-robot
[5]. www.wikipedia.com
[6]. www.ecropose.com