

Amphibian Military Robot

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Abstract— This paper aims at amphibian assault vehicle. It is designed in such a way so that it can potentially replace the soldier in combat due to which the human effort as well as risk related to human life is reduced.

The basic design of amphibian military robot is used for both water and terrestrial purpose is named as water buggy. Buggy is propeller driven and can be controlled from remote location using PC or further hand held devices which form a command and control section and RF link module is used.

Buggy which is mounted with on board camera. The on board camera is a wide angle field camera with night mode operability. It will be also provided with a gun assembly which will make it self sufficient.

Keywords— Amphibian assault, Buggy, Camera.

I. INTRODUCTION

A robot is capable of replicating or resembling the human actions with the collection of components like sensors, power supplies and controls. The essential characteristics of the robot are Sensing, Movement, Energy, and Intelligence. These characteristics have enabled them to replace the human beings in many critical situations. The high accuracy and precision in their work make them more efficient than the human beings. [3]

This project of military technology uses a remote controlled military water buggy which is controlled by RF link module. Buggy is propeller driven and is relatively easy to control on harbors and ports. Buggy can be controlled from a remote location using a PC or further hand-held devices which form a command and control section. A GPS module is to be integrated on the buggy for its precise positioning. We are also trying to integrate the device into a fuzzy logic network so that a collection of buggies like these can work in tandem to protect the shores from unwanted infiltration. It will also patrol 24x7 and visit places which are difficult for humans.

A gun assembly is fixed on the buggy which is loaded with ammunitions for terminating the target and also will make it self sufficient to do particular task.

Surveillance is a process of continuously monitoring a area/field to gather sufficient information about the type and nature of the surrounding environment, for this purpose on board camera of wide angle field with night mode operability is mounted. In a particular sensitive area where security is main priority like nuclear areas, ship building yards etc. Certain areas which are based on or near water bodies makes them vulnerable against any form of aggression aimed at them through water. It

is very easy to have access to these sites through water because the security measures are a bit relaxed on water as compared to land. Regular human patrolling on boats is tedious and not effective. Also it is not viable to reach every nook and corner of a water body by security forces on boats owing to design and economic constraints.

II. BLOCK DIAGRAM

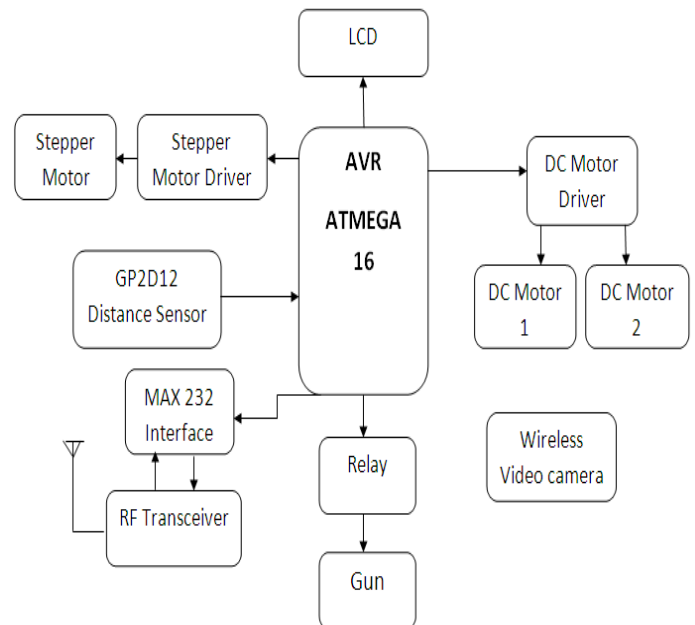


Fig.1 Functional block diagram

In above given block diagram components on the transmitter side are depicted. Microcontroller At mega 16 from AVR family is used. DC motors are used for movement of vehicle and they are interfaced with L298D driver IC which is interfaced with AVR controller. Similarly the stepper motor's which are used for the displacement of gun are interfaced with ULN2003 driver IC. Number of driver IC's differ according to number of motors used. GP2D12 Distance sensor is directly interfaced to the microcontroller. Output from distance sensor is analog in nature thus it is converted into digital by using ADC which is inbuilt inside AVR controller.

MAX 232 interface is used for serial communication. Normally it is dealt with only one node, so RF link is used. If the number of nodes increases then for reducing the complications we can use ZIGBEE module. A PC or any

controlling hardware is used to give particular input to the robot. The input and reply is managed with help of RF transceiver. Microcontroller takes actions by operating actuators like motors, guns, and relay. The live conditions are monitored by using wireless camera as ATMEGA16 is not capable of sending images. LCD is mounted on the vehicle for testing purpose.

FLOW CHART :

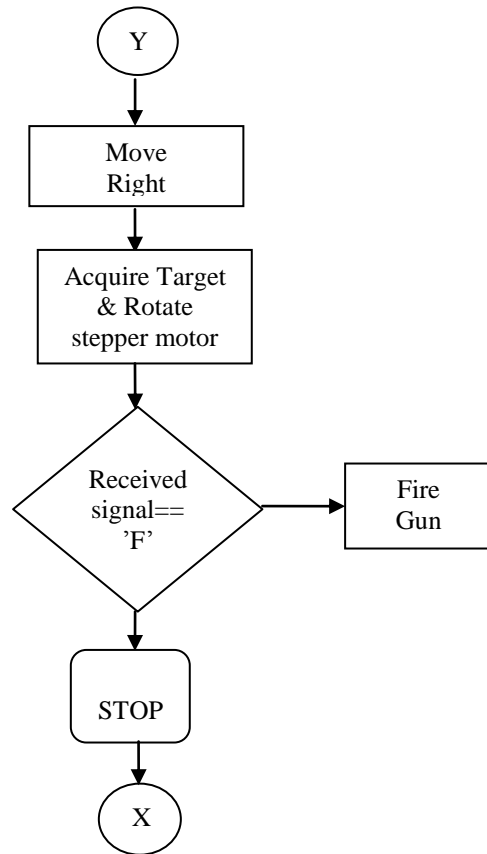
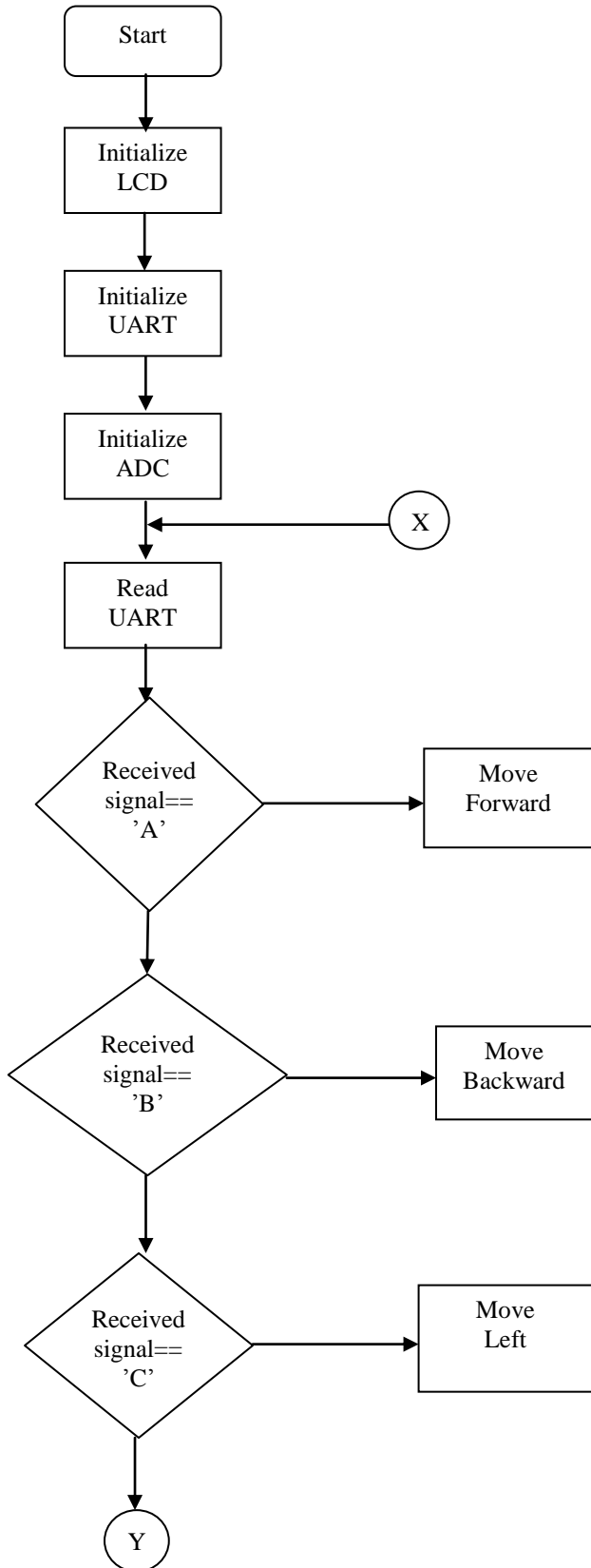


Fig.2 Flow chart

Equations :

Speed of DC Motor :-

$$Ns = 120 \frac{F}{P} \quad \dots \text{equ.1}$$

Where, F is the frequency
P is the Number of poles in DC motor

Torque of Dc Motor :-

$$T = FR \sin\theta \quad \dots \text{equ.2}$$

Where, F is the force in linear direction.
R is the radius of the object being rotated.
 θ is the angle, the force F is making with R vector.

Torque of Stepper Motor:-

$$T_a = J \times A$$

Where, J is moment of inertia.
A is the acceleration rate

Advantages

1. Human effort required is less which makes this robot more reliable.
2. Cost for building basic design is less, and can be further upgraded as per the required application.
3. As compared with human being accuracy is more, portable and efficiency is more.

Result

Output of distance sensor GP2D12

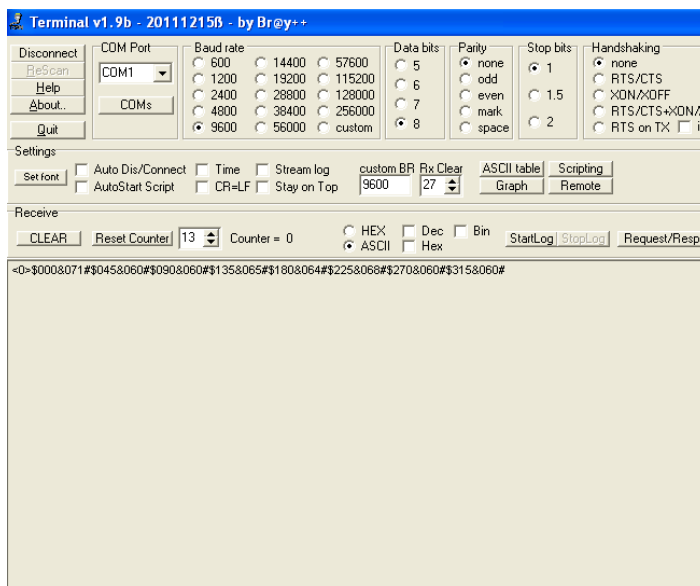


Fig.3 Distance sensor output

Visual basic output

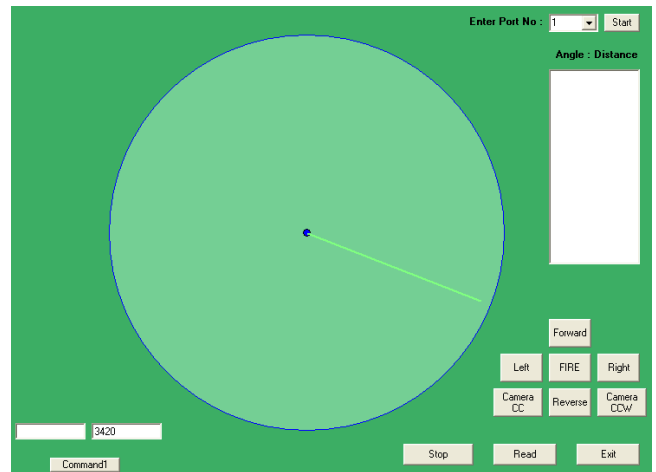


Fig.4 Visual basic output

Stepper motor interface

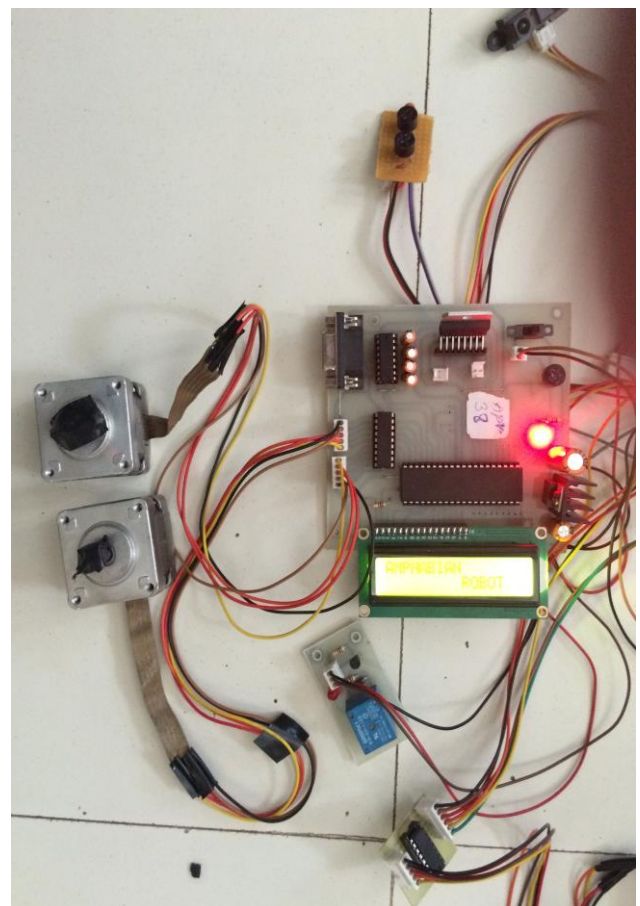


Fig.5 Stepper motor interface

Mechanical design

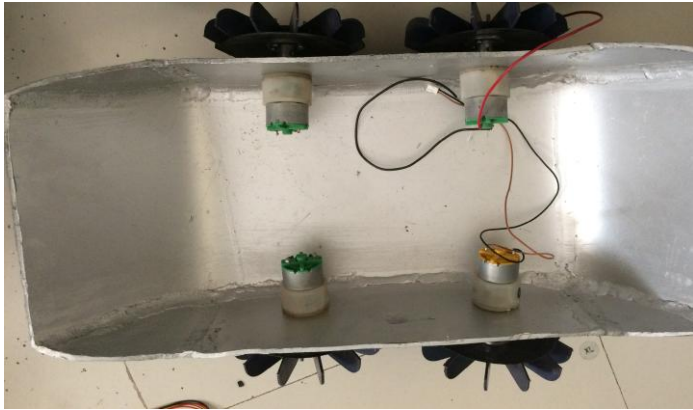


Fig.6 Mechanical Design

CONCLUSION

The project on which the work is being carried out will provide helping hand in certain complicated task, which are impossible to be performed by human.

The monitoring of the work which is performed is done easily with the help of camera. Human effort is reduced up to certain limit. Amphibian military robots are used in different kind of applications like military, surveillance, security service, riot control, hostage situation, police, law enforcement, border patrol, working in chemical environment

is area with incompatible circumstances etc. It is used to augment the soldier's capability in the field of military operations.

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