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Autonomous Surveillence Boat

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Abstract
The project involves the autonomous functionality of a boat used for surveillance. The entire components used are that of a drone. Autonomous functionality is provided using the Ardupilot board along with the Ardurover firmware embedded in it. The Mission planner software enables us to get the current GPS location and mark the Way-points. The boat then follows the way-point to complete the mission. A HD camera is attached to the boat enables us to monitor the path in which the boat is travelling.
Keywords: *Autonomous, Drone, Mission Planner, Ardurover, Boat.*

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I. INTRODUCTION

Autonomous vehicles are not uncommon these days. They are not only popular in air, but also in water. These days autonomous ships and boats are used to carry out certain measurements and also to collect few samples from the places in water where humans can reach. Also unmanned mission are quite cost effective compared to the ones carrying humans. When there is a need for surveillance through water extreme conditions are inevitable. So there is need of an autonomous system which moves without any human intervention and completes the operation.

II. LITERATURE SURVEY

a. The Autonomous Sailboat gives information about the ongoing development of an autonomous sailboat control architecture and a prototype sailboat constructed for experimental purpose. The main goal of the project is to enable a long program for monitoring the ocean conditions. In order to accomplish such objective, the system relies on wind forces propulsion instead of motors. They present the mathematical model using PID and Fuzzy controllers to control the sail and the rudder. Furthermore, They also present a study of the hardware architecture that enables better control performance of the system missions with endurance of months or years. The use of wind propelled boats are best suited for the tasks that require long duration missions since the propulsion energy requirements are smaller when compared to boats propelled by motors. These boats are called wind vane servomechanism (Belcher, 1982).In order to control the displacement of a robotic sailboat from a given point to another point within a navigable space, several issues and conditions must be addressed, such as wind direction, wind speed, boat heading sea currents.

b. Autonomous Patrol and Surveillance System using Unmanned Aerial Vehicles consist of six components
(1) a low cost vision-based pose estimation of UAVs,
(2) vision-based state estimation,
(3) UAV patrol path planning,
(4) UAV controller to desired waypoints,
(5) Manually controlled using joystick and
(6) Assignment of priority hierarchy to multiple control inputs of a robot. The components were integrated successfully and the designed system was experimented in an indoor setup. Results has shown that the proposed system is suitable and feasible to be used as an autonomous patrol and surveillance agent for indoors use.

This paper is about design and development of an Autonomous Surface Vessel(ASV) for inland water depth monitoring. Water depth measurement a.k.a bathymetry is important for critical areas such as river and water reservoir (dam) to estimate the volume and surface area for environment conservation and safety purpose.

Conventionally, in inland water monitoring, the data obtained from the measurements are recorded in the log book and have to go through some screening process before plotting contour. This procedure is not only slow but also requires a lot of logistic equipment and labor forces. Therefore, an Autonomous Surface Vessel equipped with an echo sounder and data telemetry is proposed. It can be either remotely controlled or run automatically by autopilot navigation software. It is also equipped with GPS and compass for the navigation sensor feedback.. This technology of water surface vehicle is still under development field in robotics. There are various applications of this technology such as in military field, port defense also private sectors in the areas of reconnaissance ,research, search and rescue.

III. BLOCK DIAGRAM AND WORKING

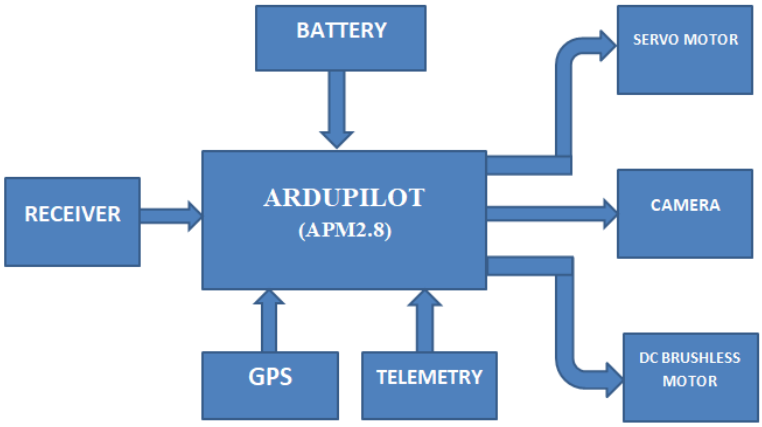

Figure1: Block diagram

Initially the Ardupilot APM 2.8 board is loaded with the Ardurover Latest firmware (version 4.0.0). The FRAME_CLASS is set 2 which is for boats. Also the parameters required are also entered which are suitable for our mission. The Mission planner software is installed in the ground station which can be any PC . The Neo 7m GPS module is used here which gives the exact location of our device in the software. Then the location where the boat has to go is marked using a set of way-points. The point where the boat is armed is called the home location, that is, whenever RTL (Return – To - Location) command is given it returns back to this location.

The boat starts from way-point one and then traverses to the other way-point there by covering the predefined path. A HD camera is attached for surveillance purpose. The telemetry radio instilled in the boat allows us to get the live feed from the boat at the ground station. Manual RC of the boat is possible and a FlySky CT6B transmitter is used. Thereby, anytime manual control can be taken and using the live feed the boat can be controlled.

IV.COMPONENTS

1. A2212/13T 1000KV DC MOTOR

This is a A2212 brushless motor particularly constructed to power Quadcopters . It is a 1000kV motor. It provides high performance, super power and brilliant efficiency. These motors are perfect for medium size quadcopters with 8 inch to 10 inch propellers.

2. 30A BLDC ESC (ELECTRONIC SPEED CONTROLLER)

30A BLDC ESC is a type of Electronic Speed Controller that is made specifically quadcopters and multi-rotors. It provides faster and better motor speedcontrol giving better flight performance compared to other available ESCs.

3. ARDUPILOT APM 2.8 BOARD

This is the new APM 2.8 module. This board is compatible with both multi-copters and rovers. The APM 2.8is a complete open source autopilot .It allows the user to turn any fixed, rotary wing or multirotor vehicle (even cars and boats) into a fully autonomous vehicle and also capable of performing programmed GPS missions with waypoints.

4. **GPS Module**

The Neo 7M GPS module includes an HMC5883L digital compass. The Neo 7M GPS is a low powered system that has 56 channels and outputs precise position updates at 10Hz.

5. Radio Telemetry

The Telemetry has two separate systems one for the ground and other for the air system. The **transceivers** can use UART or USB connections. It enables us to see live data, such as live GPS position overlaid on a map, system voltage, heading, waypoint navigation and much more.

6. LiPO Battery

11.1V 2200mAH Lipo battery is Capable of maximum continuous discharge rates up to 25C, placing this battery among the most powerful Li-Po battery packs in its class! It offers an excellent blend of weight, power and performance.

7. Receiver and Transmitter

FlySky CT6B 2.4Ghz 6 Channel Transmitter and Receiver(FS-R6B) Remote is the popular 6 Channel Radio CT6B manufactured by FlySky. CT6B FLYSKY 2.4GHZ 6CH TRANSMITTER is a 2.4 GHz radio system offering the reliability of 2.4 GHz signal technology and a receiver with 6 channels.

8. Servo Motor

A **servo motor** is a type of motor that can rotate with great precision. Normally this type of motor consists of a control circuit that provides feedback on the current position of the motor shaft, a great precision is attained with the help of this feedback system as the motor rotates. This motor is mainly used when a particular angle is to be rotated.

9.HD Camera

This is all new High Definition 1200TVL CMOS Camera 2.8mm Lens FPV Camera for FPV RC Drone Quadcopter. It adopts 1/3CMOS SUPER HAD II Image sensor, low illumination reaches up to 0.01Lux/1.2F, easy to setup parameters.

V. RESULT AND DISCUSSION

Figure 2: Autonomous Boat

Figure 3: Mission Planner Software(Ground Station)

VI. CONCLUSION

An Autonomous boat is built which is capable of travelling autonomously to any destination. It is best suited method in-order to monitor or explore any new land or place without having much information about the area. Also the HD camera gives access to the live feed of the area which is monitored by the boat. As waterways is challenging and the risk involved is more sending an unmanned vehicle will be the best choice. Thus this model serves this pupose. The model is very cheap and efficient. Future scope is to work on the model and adding new features.

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