Electronic Speed Control Apply on Platypus Airboat

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Introduction

Platypus Airboats are some small airboats that used to work cooperatively and automatically to monitor water environment. And the brain of these boats are Android Phones.

Electronic Speed Control(ESC) is an electronic device used to change the speed of motors. The dynamic part of an Airboat is two set of motor and propeller linked with ESC. Using ESCs controlled by the Arduino on the airboats can make the motor work on different speed, so that make the airboat more agile.

Fig1 Platypus Airboat

Fig2 “Brain” of the Boat

Problems and Results:

Problem 1:

The old ESCs can only let the motor spin positively. That means while the boat is turning, one of the motor stop working while let the other one work. Thus, we came up an idea, why we don’t use an ESC able to make the motor spin negatively. That will make the boat turning much faster.

Result 1:

We adopt the new version ESC: Vapor Pro(Fig 3) to control the boat. And these Vapor Pros can make the motors spin negatively. And also can make the boat reverse when it got stuck.

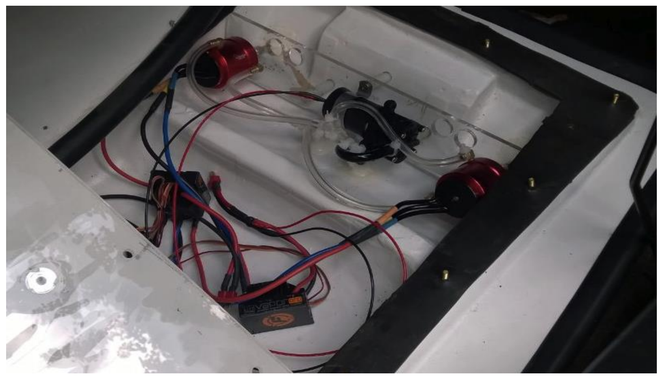

Fig 3 ESC and Motor

Conclusion

After we adopt the new ESCs the boats become more agile, and can work more efficient. It can turn as quick as we wish. Also, after we rewrite some part of the code, it can even reverse when it stuck in the bushes.

Problem 2:

The new ESC didn’t work well after we mount it on the boats. These new ESCs have a larger working PWM range. After we calibrated it,it will make the motor negative spin under a pulse from 1000-1500 microsecond ,stop at 1500 microsecond, and positive rotate under 1500-2000 microsecond pulse.

Result 2:

First, I changed the working range from 1500-200 to 1000-2000, but it still didn’t working very well. Later, I found that the safety factor in the code is 0.1, so that will make the input pulse mainly on 1450-1550 microsecond. And the new ESCs are not that sensitive like the old one on the range of 1500-1550 microsecond. So I changed the safety factor from 0.1 to 0.4 to avoid the PWM range of 1450-1550, and that makes the boat works well on the new ESCs.

Problem 3:

After we changed the safety factor, we need to have some protection on it. Also, we have burned an ESC before. So we need a protection device.

Result 3:

We use a LM35 temperature sensor to detective the temperature of the esc and motor. If the temperature got too high, the Arduino board will cut down the input signal of the ESCs, and let them cool down by the fan or water cooling system.