Name(s)	Project Number
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Project Title

Development of an Autonomous Navigational System with Applications in Homeland Security, Transportation, and Research

Abstract

Objectives/Goals

The goal of this project was to design, build and demonstrate the feasibility of a low cost, GPS based, navigational system to pilot an aircraft without human input. The autonomous navigational system must be reliable and accurate yet easy to modify to meet the specific needs of a diverse set of future applications which may include scientific, military and commercial uses.

Methods/Materials

The navigational system, designed to mimic the human nervous system, was built using two microcontrollers programmed in BASIC (peripheral nervous system), and a central processor, AutoNavigator (central nervous system) which was written using the LabVIEW programming language. The first microcontroller collects wind speed and direction, GPS coordinates, altitude, heading and velocity, using an anemometer, compass, clock, PING and GPS unit. To test the navigational system, a propulsion system was also designed and built. The propulsion system built for this project uses 4 drive motors that can moved in the X,Y and Z axis. A test device was also built which facilitated troubleshooting, fixing and upgrading both the navigational system and the propulsion system.

Results

An autonomous navigational system was build, integrated into a test device and successfully tested. Results demonstrated the basic stamp can collect, package and send the data to AutoNavigator program for analysis. Based on the logic built into AutoNavigator, motor control commands were generated and sent to the motor control basic stamp for implementation. Initial test runs were designed to optimize the AutoNavigator program. The current version of AutoNavigator can perform a controlled takeoff, maintain a specified altitude and correct for wind speed and direction while navigating toward a pre-programmed target. A manual override was also incorporated into the AutoNavigator program allowing a remote operator to take control and navigate when desired.

Conclusions/Discussion

A functional, autonomous navigational system was developed, incorporated into a prototype propulsion system and successfully tested in a test device. The AutoNavigator program is easy to use, reliable and can be integrated into lighter-than-air aircraft to perform a variety of different applications including Homeland Security (monitoring of the borders), scientific research (tracking and monitoring endangered species, pollution) and transportation of commercial goods.

Summary Statement

The purpose of this project was to design, develop and construct an autonomous navigational system and incorporate it into a novel propulsion system that can be used on lighter-than-air aircraft.

Help Received

Mr. Craig Williams helped with the math and my father helped with construction of test device.

Ap2/06