SE&M | Group Qi: Building a Raspberry Pi Autopilot

Project Outline

Our project for this semester will be to build a quadcopter and fly it. A quadcopter is a multirotor aircraft that uses variation of RPM to control lift and torque. We will use a raspberry pi to communicate between the computer and the autopilot, as well as to stream the video from the quadcopters camera to our computer screen.

Technologies used

The quadcopter is assembled from scratch, the components have been bought separately and we will assemble it ourselves. To pilot the quadcopter we will use an advanced autopilot, called Ardupilot. It's based on the Arduino Mega and runs open source software.

We will send the commands to the autopilot from our laptop over WiFi. The raspberry pi will be mounted on the quadcopter and transmit these comands to the Ardupilot. We will use VLC to stream the video from the raspberry pi. We will use an XBOX 360 controller to control the aircraft.

Tasks

The project is divided in different modules. Once module 1 is finished, all modules can be worked on separately and are not dependent on the results of another module. The modules are furthermore divided in several tasks that can be assigned to different people. The basic requirements for the semester project will be met early on, after competition of module 1. Further modules can be added or replaced during this term.

Module 1 – building a Raspberry Pi controlled quadcopter

Goal: quadcopter is assembled and it can fly. It is controlled via WIFI from a computer and it can be commanded from a first person view through the video stream.

Task 1 [Getting the basics done]

1.1.1 – build the quadcopter with the radio controller and the *Ardupilot* chip;

1.1.2 – learn to fly the quadcopter;

Task 2 [Raspberry communication]

1.2.1 – get an input over a wireless network to the *Raspberry Pi*;

1.2.2 – display the screen of a *Raspberry Pi* on another computer;

1.2.3 – get the commands from Xbox360 controller to the *Raspberry Pi*;

1.2.4 – attach the camera to the *Raspberry Pi* and stream the video to another computer;

Task 3 [Raspberry power]

1.3.1 – find a portable power supply for the *Raspberry Pi*;

1.3.2 – attach the *Raspberry Pi* to the quadcopter;

1.3.3 – connect the *Raspberry Pi* with the *Ardupilot* chip;

Task 4 [Taking command]

1.4.1 – map the commands from the Xbox360 controller;

1.4.2 – Test every axis separately;

Task 5 [Fly it]

1.5.1 – fly quadcopter;

All following modules are optional

Module 2 – extra commands

Goal: quadcopter has the option to react to voice commands and recognize faces/movements, using open source software.

Module 3 – special maneuvers

Goal: *Autopilot* is modified, giving us more freedom in what we can do with the quadcopter. For example special moves, like a flip.

Module 4 – app control

Goal: a 4G USB stick is mounted to quadcopter, allowing commanding it from anywhere. An android app is created for controlling it.

Module 5 – musical drone

Goal: quadcopter is modified to play music, preferably the A-Team theme song.

Module 6 – artistic drone

Goal: a spray can (or any other tool to paint) is mounted to quadcopter. It is combined with a program, so that quadcopter is capable of painting an image on wall.

Module 7 – delivery drone

Goal: quadcopter has ability to pick up packages and carry them.

Module 8 – battery surveillance

Goal: to build a communication between the quadcopter and user, so the user could watch over statistics of battery and/or Internet connection.