Breeze Board v2.0

Specifications

1) Introduction

Breeze is an autopilot system for UAV. Our goal is to provide innovative features to small aerial vehicule in order to improve takeoff, flying and landing capabilities. An UAV is composed by an electronic device which collects data from sensors and controls the actuators, but also a ground station which aims to communicate with the UAV and also the UAV itself, seeing as a mechanical device.
In this document we focused on the board. A previous version called Breeze Board v1.0 as been developed based on Atmega 2560 processor which runned at 16Mhz. Our goal is to provide a much better version while keeping its size and weight around 20 grams.

2) Changes from v1.0

The cornerstone of the v2.0 is its processor : ARM Cortex M4. In fact such processor keeps power consumption low while providing more than 180Mhz. We also want to improve our prototyping method by finding reliable companies which produce PCB board and assemble them in a good manner.

3) Risks

Type	Description	Solution
Production & Factory	Ability to find a reliable and cheap company to produce and assemble board	
ARM Cortex code	Difficulty to adapt the Atmega2560 code into ARM Cortex (see library cmos on github)	See library open-source
Voltage	Providing the right voltage +3.3v and +5v where its needed (ARM runned at 3.3v, while PWM needs 5v)	
Magnetic & RF interference	Magnetic or RF perturbation between magnometer and Xbee	

4) Performance requirements

Type	Description	Ensured
Clockspeed	Over 180 Mhz	
Weight	Keep weight under 20 grams	

Size	Keep it under 5x5cm (or which size in stick mode ?) Any benefit with 4 layers	

4) Specifications

- On board inverter logic for Futaba SBUS port (Only three pins (signal, +5v, ground) on the Rx)

4.1) Components

Type	Name	
MCU	ARM Cortex M4	
IMU and magnometer	MPU9150	
Barometer	BMP085	
SBUS on board signal inverter		

4.2) Pins

Type	Number	
Analog	3	
SDA/SCL	4 pins with +3.3v 4 pins with +5v (for LIDAR Lite laser)	
PWM 3 signal pins on timers	at least 9 (how many timers on ARM cortex TBD)	
SBUS on board signal inverter	tx - rx - +5v - ground	
GPS (Ublox LEA-6) Serial 3 pins	rx - +5v - ground	

5) Work packages

- Review of the specifications
- Designing the board, producing eagle and gerber files
- Producing and assemble PCB

6) To be defined

- How many timers are available on ARM cortex, TBD each timer used on Breeze for motors
- How many PWM ports are available, TBD PWM for servos (related to timers)
- Xbee signal strength, which pin is needed on the ARM to have RSSI data ?
- Is it interesting to embed two MPU9150 and combine the data ?
- Which ARM Cortex to choose ? (Look library libcmos to see ARM available for this lib)