



AR Drone 2.0 as A Research Platform

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Why AR Drone

- **Arducopter**
- is an open-source platform
- Uses Arduino Mega 2560 & has a highly modifiable hardware

- but need too many configurations and programming to make it ready for computer vision projects.

Why AR Drone

- **AR Drone**, on the other side, has many advantages:
 - Good price: about £300 with everything needed
 - Ready to use hardware including camera and video processing system
 - Provides software APIs which can boost the project at least 10 days
 - is widely used in research and is good supported by ROS

AR Drone 2.0 Editions

Edition	Configuration	Price
Elite Edition	15 minutes flying time HD Camera. 720p 30fps Wide angle lens : 92° diagonal Low latency streaming Total weight 380g with outdoor hull, 420g with indoor hull	£279.99
GPS Edition	Elite Edition + GPS Flight Recorder	£319.99
Power Edition	Elite Edition + improved battery power Providing 40 minutes flying time	£319.99

Hardware - Main Features

- Extreme precision control and automatic stabilization features.
- 1GHz 32 bit ARM Cortex A8 processor
- With 800MHz video DSP TMS320DMC64x
- 1Gbit DDR2 RAM at 200MHz
- Wi-Fi™ b/g/n
- Linux 2.6.32
- USB 2.0 high speed for extensions

Hardware - Sensors

- 720p (1280*720), 30fps, H.264 encoding frontal camera
 - 60 fps vertical QVGA (320*240) camera for ground speed measurement
 - 3 axis accelerometer +/- 50mg precision
 - 3 axis gyroscope 2000°/second precision
 - 3 axis magnetometer 6° precision
 - Pressure sensor +/- 10 Pa precision
(80 cm / 2.6 feet at sea level)
 - Ultrasound sensors for ground altitude measurement
- } Attitude
- } Height

Software – AR Drone SDK

- Communicate with a PC through Wi-Fi / UDP
- Control AT Commands
 - Takeoff / Landing / Stop / Move / Configure the drone
- Navigation Data: status and preprocessed sensory data
 - yaw / pitch / roll / altitude / speed estimation
- Video Stream
 - Supports QVGA (320*240) / QCIF (176*144) @ 15 FPS
 - can switch between two cameras, but CANNOT work at the same time.

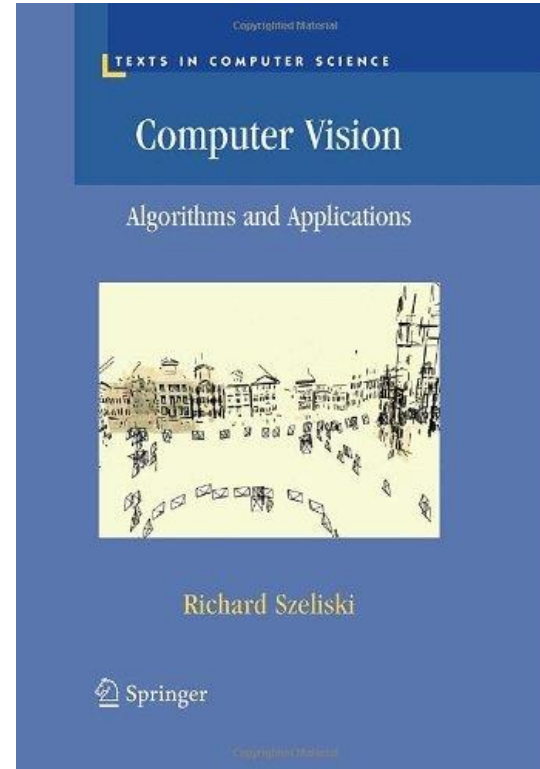
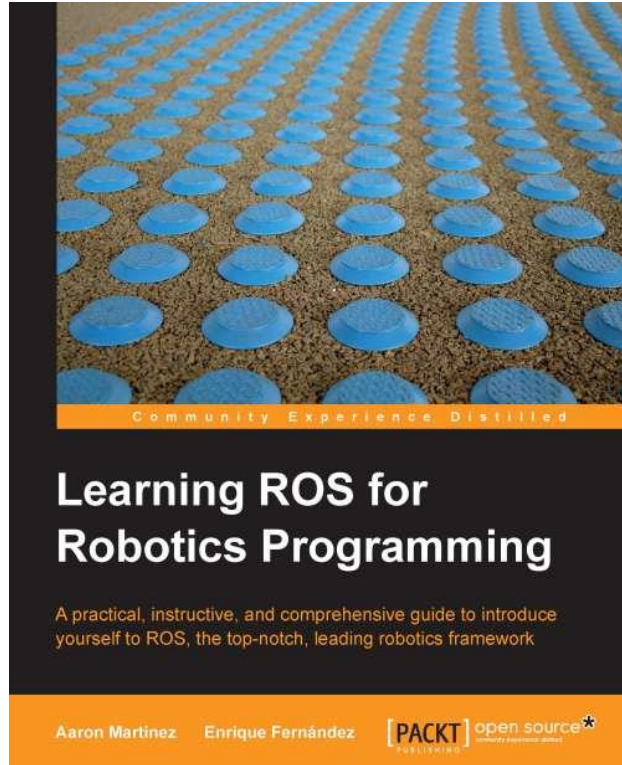
Software – Ardrone_autonomy

- is a ROS driver for Parrot AR-Drone quadrocopter.
- Based on official AR-Drone SDK version 2.0 and supports both AR-Drone 1.0 and 2.0.
- ardrone/takeoff, ardrone/land and ardrone/reset
- Speed control: send geometry_msgs::Twist to cmd_vel
- Topic:: ardrone/navdata
- Topic:: ardrone/mag
- Topic:: ardrone/image_raw
- Topic:: ardrone/front/image_raw
- Topic:: ardrone/bottom/image_raw

Further work

- Buy one AR Drone 2.0 Power Edition (£ 319.99)
- Buy addition hardware for UGV:
 - Xbee x 2 and PC adaptor ($35.4 * 2 + 21.38 = \text{£ } 92.18$)
 - RAZOR 9-DOF IMU module (£100.48)
- Study the manual and API reference book of AR Drone
- Learn ROS, OpenCV and Kalman Filter

Further Reading



Discussion

- How to keep a log book
- Invalid link of the UGV resources
- New time schedule
- [A related work](#) by Czech Technical University
- Some guides about how to start computer vision and path-planning