



Free Software in Multirotors

The Freedom to Fly!

Agenda



1. What is a multirotor
2. Basic structure
3. Where is the software?
4. Multirotors Applications
5. Open Source Research and Development

1- Multirotor - Common Sizes

Micro < 200mm



200mm < Mini < 300mm



300mm < "standard" < 480mm



> 480mm: no specific name, but hexa, octo...

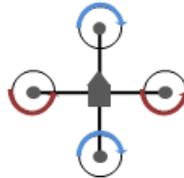


1- Multirotor - Arrangements...

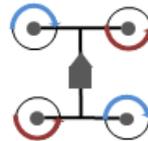
X4 or X
Quadcopter



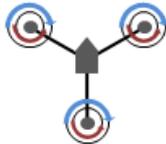
I4 or +
Quadcopter



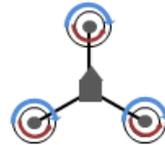
H4 or H
Quadcopter



Y6 or Y
Hexacopter



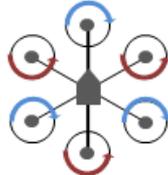
IY6 or IY
Hexacopter



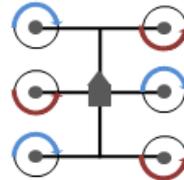
X6 or X
Hexacopter



I6 or I
Hexacopter



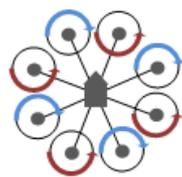
H6 or H
Hexacopter



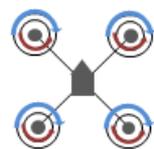
I8 or +
Octoapter



V8 or V
Octoapter



X8 or X
Octoapter



2- Basic structure



- **Frame** (usually in Carbon for weight...)
- **Flight controller** (Various types of open source controllers...)
- **Arms** (Nowadays in Carbon tubes, but also in aluminum, 3D printed, G10 Composite...)
- **ESC** (from 6Amps to 60Amps and High Voltages 20A ESCs are also flashed with open source firmwares sur as SimonK or BLHeli for example...)
- **Motors** (Various base sizes from 9mm to 50+ mm with various KV specs depending on your setups - Only Hardware, no firmware required)
- **Propellers** (Mostly in ABS plastic but also available in Carbon for robustness...)
- **Radio Tx & Rx** (The only open source Firmware is called OPEN-TX and can be flashed on several brands such as FRSky and Turnigy for example - No limitations in the functionalities, all types of operations on switches and control features are possible with an ease of programming through the Companion9X soft or the remote itself!)
- **Video Tx & Rx & Analog Cam & OSDs**

3- Software & Firmware



- Radio controller: Open-tx
- Flight controller:
 - cleanflight
 - Pixhawk
 - ROS/Erle-brain
- ESC:BLHeli
- Mission planning
 - Mission planner
 - APM planner
- Mission processing: Open Drone Map
- Simulation: TUM Simulator

4- Applications... Non Exhaustive!



- Indoor flying (entertainment and flying practise)
- FPV racing (entertainment and competition with newly organised races since 2015)
- Pro and semi Pro's examples:
 - Entertainment
 - photography, movies, etc
 - Agriculture (orthoPhoto conso for example: ODM Github)
 - Terrain mapping,
 - color matching
 - watering, sniffer for wine vineyards
 - Inspection (Infrastructures Private or National)
 - bridges , Construction Sites,
 - rooftops tiling inspections etc...
 - remote areas such as Electrical HV and MV lines...
 - Security/safety
 - Search & recovery disaster
 - Exploration
 - Dangerous areas

5- R&D



Doctorate programs on autonomous flying robots

- Turin University
- Munich University
- Ohio State University
- Tübingen University
- Small World Cambodia (NGO robotics)
- ...

Self learning curriculum

- Edx: autonomous flying and non-flying robots

Youtube

- Your best source for self taught courses about any part! ;
-)

Achieving That! in FPV Ent'

FPV safe flying
Cambodia



What's next?



1. Hackerspace PP does build and fly regularly
2. FPV Cambodia does build and fly regularly
3. There is a small Cambodian RC Club
4. And more people online searching...
5. Find safe and open areas for flying safely...