

Simplifying things: quadcopters

Business



Simplifying Things. Quadcopters Flying robots that can do some pretty cool stuff. Preface People like to make stuff complicated. I don't. I also like quadcopters. This is the product of those two passions.

Hardware Motors For the uninitiated, the motors on a quadcopter are the most defining feature on the device. For good reason too, they are the equivalent of the engine in a car and there are 4 of them. There is in fact a reason there are 4 motors. Let's pretend that you have a yo-yo. For some reason you decide the best course of action is to start swinging this yo-yo madly around your head (it's a normal reaction to the given situation). There are two possible thought processes going on in your head as you read this: "Dude, i've totes swung a yo-yo around my head at dangerous speeds!" Great, that will make the explanation a lot easier.

"What the heck is this dude talking about?" Go grab a yo-yo, some eye protection, and go outside. Swing it madly in a circle. Feel the power of the yo-yo coursing through your veins. Be the yo-yo. Now that you have the requisite experiences behind you, I need you to imagine the feeling that you felt when swinging the yo-yo.

You should have felt the yo-yo tugging on the string in the direction of its rotation. If you didn't two things could be happening: You're in space and are in a gyroscopically stabilized spacesuit. Congrats. You actually did not swing the yo-yo as required. If this is the case, see possibility 2 of the thought processes. The tug that you should be feeling is torque.

Torque is a force that tries to twist things. In the case of the yo-yo, the yo-yo is trying to twist your center of mass. In the case of a quadcopter, the

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propeller are spinning so fast that simple act of a balanced propeller spinning off center on the quadcopter would actually spin the quadcopter like a frisbee. So a quadcopter fixes this by introducing a pair of rotors spinning in opposite directions to cancel out the spin. “ Ok, but why four?” asks the astute individual paying attention. Well here’s the genius: by introducing an identical pair in a square fashion, you can tip the quadcopter in any direction by speeding up or slowing down any adjacent pair of motors.

Spinning simply takes speeding up the pair of the motors rotating in the direction that you want to rotate. Onboard Computer It’s a computer. It gets to do all the fun stuff like the math that we could go into but frankly don’t want to think about. It’s complicated. Just believe me on that. Just know this: the computer figures out how fast each motor needs to go based off the information it’s getting from its sensors.

It relays that information to something called an ESC. I will explain soon.

Electronic Speed Control (ESC) This is an interesting little device. You see the computer figures out how fast each motor needs to go, but there is a slight problem. Firstly it is highly unlikely that any PCB based board can handle the current required.

Secondly the motors need to get the signal in a very specific fashion in order to get the magnets to fire in the right sequence. It’s a lot like being in a foreign country hailing a cab and trying to tell the hard of hearing driver exactly where to go in the wrong language. The ESC is like a translator that can yell very loud. Power Distribution Board The power distribution board is a

module that does exactly as its name implies. It takes the power from the battery and distributes it throughout the quadcopter.

Its pretty self-explanatory really. I'm not even gonna go into analogy for this one. Battery This is where the power goes. Its also liable to explode if treated badly. Treat it well. Conclusion This should give you a basic understanding of the physics and engineering involved in keeping these 4-motor monstrosities afloat.

It should also have been easier to understand than something written by someone fresh off of writing their dissertation. Hopefully you found this to be informative or at the very least, grammatically correct. Now go forth and use your newfound knowledge for good. Or dont. It's your prerogative.