TelloX – Making a Tello Autonomous

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May 1, 2019

Caution: This project is the result of a software engineering proof-of-concept effort, which turned out to be very successful. Please use this software and hardware design with great caution -- use at your own risk.

The Ryze/DJI Tello is a capable $100 drone, apparently aimed at the new-drone owner/beginner, and the educational markets. It is attractive, for this project, because it is physically small, stable, and programable. Numerous programming interfaces are available. They all tend to be run on a separate platform, and make UDP transmissions to the Tello.

This project also controls the Tello using UDP. Here the difference is that the computer controlling the Tello is attached to the Tello! The Tello does not need to remain in radio contact with another platform. For this proof-of-concept effort, the controlling computer is an *Adafruit Feather M0 WiFi*. It weighs about 7 grams and has a street price of around $35.

The original goal was to program the Feather M0 via python but the small print for the WiFi version of the Feather states that python cannot be used. So, the coding is done with the C++ dialect supported by the Arduino IDE. The Adafruit WIFI101 library is also used. A version of the proof-of-concept code is available at https://github.com/rwsenser/TelloX .

The Feather M0 is powered by a 250 Ah LiPo battery. The exact battery used was obtained from Amazon: "YDL 3.7B 250mAh 50230 Lipo battery …. With JST Connector". The cost was around $6.50. *Important note: the red and black wires in the JST connector had to be interchanged to work with the Adafruit Feather.* Not making this change may destroy the Feather.

The white cover was removed from the Tello and the Feather and battery were attached to the Tello with two-sided servo tape. See the pictures below for exact placement details.

The weight of a stock Tello, with battery, was measured at 82 grams. The TelloX was measured at 95.8 grams. Looking at various pages on the web showed that Tellos have been flown with various attachments, including "LEGO men". The consensus seemed to be that the Tello can fly well with up to 20 grams of added weight. The Feather, battery, and tape taken together weight around 14 grams. It is not yet clear how much the flight time is impacted by this added weight.

Flight tests have shown that TelloX flies well and follows the flight plan coded in the program. This version of the software maintains the flight plan as an array of strings. The error handling is minimal. Warning: there is no separate control of the TelloX when the Feather is active. Coding so far has been done for the Tello SDK 1.0. This means, no camera support.

If you choose to create a TelloX, please pay attention to common sense, basic safety and (if in the USA) the FAA drone regulations. The TelloX is well under the 250-gram weight limit for unregistered drones. Looking closely at the pictures, one can see a string tether attached. This tether has been often utilized to keep the TelloX from being "overly autonomous".

Show on the next are numerous photos of a TelloX.

TelloX Pictures

Figure 1: TelloX Front View

Figure 2: TelloX Side View

Figure 3: TelloX TopView

Figure 4: TelloX Back View

Figure 5: TelloX, view of added LiPo battery, used to power the Feather M0

Figure 6: Tello and TelloX