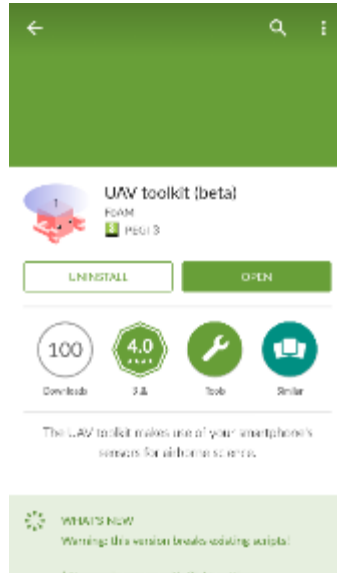


## Guide to the UAV Toolkit App (beta/experimental 0.8) – October 2015

The **UAV Toolkit** app is designed for fast, low-cost remote sensing data collection from small, cheap aerial platforms such as UAVs and kites. The app is able to capture information from a smartphone's on board sensors using time or space based triggers to collect images and other sensor data (e.g. location, orientation). The app can be downloaded for free from the **Google Play store**.



### Basic use



The home screen of the app presents some basic parameters that you need to set before using the app on a flight.

**Altitude:** the height the phone will be above the ground – if unsure, opt for an underestimate. [This is used to help calculate the frequency of image capture that is required to achieve the desired image coverage.]

**Image coverage:** the percentage overlap needed between photos. Used to set the frequency of image capture.

**Timer:** How often the camera checks its settings to determine whether a photo should be taken.

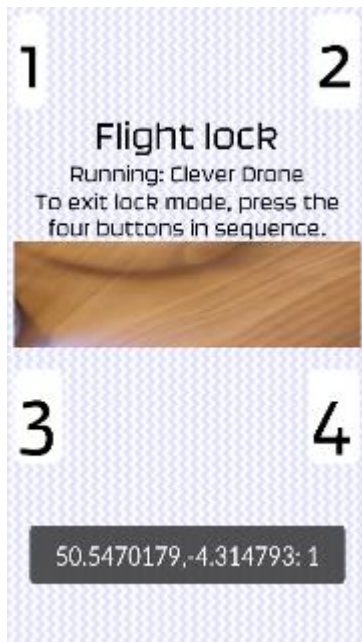
**Start flight mode** presents four ‘off-the-peg’ modes which can be used to capture images from a drone or kite.

**Clever Drone** uses the **Image Coverage** and **Altitude settings** to instruct the phone to take a photo when the phone is in a new GPS location, such that photos achieves the desired overlap.

**Clever Kite** operates in the same way as **Clever Drone**, but also prevents the phone from taking photos when the camera is either not facing downwards or is experiencing substantial shake.

**Timed Drone** instructs the phone to take photos based simply on the time interval specified in the **Timer** field – e.g. take a photo every 3 seconds.

**Timed Kite** operates in the same way as **Timed Drone**, but also prevents the phone from taking photos when the camera is either not facing downwards or is experiencing substantial shake.



When a mode is selected, the **Flight Lock** screen will appear.

The **Flight Lock** screen locks the phone to prevent the app being interrupted during a flight. To unlock, press the four numbered keys in order.

Whilst in **Flight Lock**, the app will run the selected mode, display a portion of the camera’s field of view, and will sound a noise and flash up GPS coordinates every time an image (and associated sensor data) is captured.

### Writing and editing programs

Whilst the four main modes can be used straight away, selecting **Modify code** on the bottom right of the home screen allows you to edit existing code, write new code and access further information.



**Your programs** presents the four pre-set programs found in the home screen, and selecting each program allows you to edit the code which is used in that mode. For example, the **Clever Drone** code looks like:



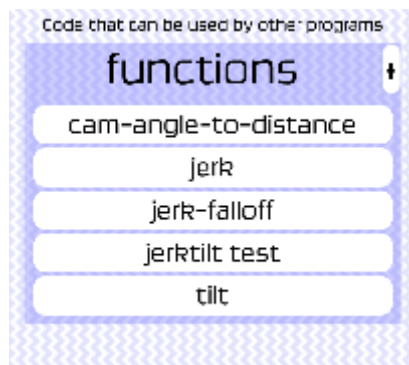
The program interface uses a visual programming drag-and-drop approach to building code. Code blocks can be selected from the **blocks** menu and added into the program, whilst existing blocks can be moved and removed by dragging into the **rubbish bin**. Pressing **save** stores your code to the **Your programs** list.

For example, in the **Clever Drone** mode, the code tells the app to:

1. When in a new GPS location (according to the altitude and desired coverage set in the home screen)...
2. ...save the following information to a database named *clever-drone*:
  - i. Orientation
  - ii. Gyroscope
  - iii. Gravity
  - iv. Accelerometer
  - v. Magnetic-field
  - vi. GPS
  - vii. A photo...
3. ...and play a noise to let you know when a photo is being taken.

As well as editing existing modes, new modes can be written by selecting the + next to the **Your programs** heading on the **Modify code** screen.

The **code library** stores functions built from basic code blocks and saves them for use in programs. Again, custom functions can be created using the + button.



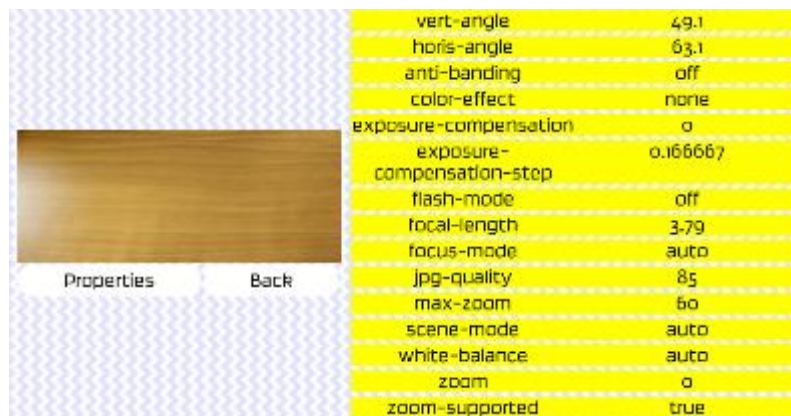
### Viewing data

Data can be viewed by selecting the **View data** button in the **Modify code** screen. To select which mode you wish to view data from, select the **purple box** on the top right. Each row represents a photo. By selecting a row, all the data recorded along with that photo can be viewed.

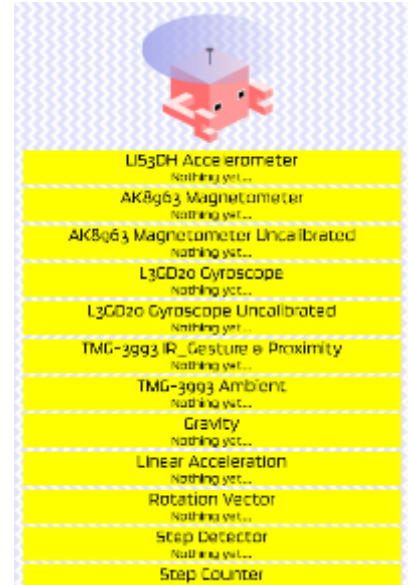


### Checking your camera and sensors

Sometimes it might be useful to check that your camera is functioning properly. In the **Modify code** screen, **Check the camera** can be selected to test the camera and view the camera settings (by selecting **Properties**). If you wish to change the camera settings, this can be done through the regular camera app on your smartphone.



The app also lets you check the specifications of all the relevant sensors installed on your phone by selecting **Peek at your sensors** from the **Modify code** menu.



### Downloading your data from the phone

Photos can be downloaded directly from the phone's storage in a file called **uavtoolkit**. Photos are stored as JPG images. The rest of the data is stored in a database in the same folder.

A workflow for incorporating the location data from the database into the image files themselves in the form of Geotiff files is currently being developed...