

DATA PAPER

UAV Survey Data from Clifton Camp (ST56557330), Bristol, UK

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This data was collected via low-altitude UAV (Unmanned Aerial Vehicle) survey of an area of Clifton Camp (Ordnance Survey Grid Reference ST56557330), best known for its Iron Age promontory fort. The dataset comprises of metadata records, near-vertical photographs and a derived 3D polygonal mesh.

This dataset has been constructed with two kinds of reuse in mind: Firstly, the area surveyed is culturally rich and underexplored; while some of the non-natural features detected by this survey can be identified, others cannot. This data is intended to inform future investigations of the site.

Secondly, the survey methodologies employed and the structuring of the resulting dataset are intended to act as an exemplar, a standard method of creating survey data while prioritising open technologies, and of organising UAV survey datasets to ensure maximum re-usability.

Keywords: Archaeology; Clifton Camp; UAV; Unmanned Aerial Vehicle; photogrammetry; 3D
Funding statement: None.

(1) Overview

Context

Spatial coverage

Description: Clifton Camp (ST56557330), Bristol, City of Bristol BS8 3NA, UK

Northern boundary: +51.457520, -2.626756

Southern boundary: +51.456569, -2.626211

Eastern boundary: +51.456892, -2.625649

Western boundary: +51.456869, -2.626926

Temporal coverage

AD250-1945

(2) Methods

Steps

A custom-build hexacopter UAV was used to collect data, running Ardupilot 3.1 firmware in conjunction with Mission Planner v1.1, the flight was conducted at approximately 35m above ground level at a vertical speed of approximately 2.5m/s. The camera used was a Canon Powershot S110 running CHDK 1.2.0 and a standard intervalometer script. Ground control point (GCP) location was established using a Garmin GLO.

The 3D polygonal mesh was generated using Agisoft Photoscan 1.1.5 software.

Sampling strategy

GCPs were placed at intervals of approximately 10m. The intervalometer script was set to take a photograph every 5 seconds (the fastest speed mechanically possible when using the camera used).

Quality control

GCPs were used to support the georeferencing of the photographs. Transparency of data processing methods is facilitated by the inclusion of unprocessed images and lens calibration photographs. The dataset includes the elements required to generate many kinds of derived data. The 3D mesh is intended to act as an example of derived data.

Constraints

The ground-based GPS unit used is accurate to within 3m (manufacturer's error rate) UAV survey of other portions of the site was prohibited by tree cover to the North and East. These areas were not of primary interest.

The number of photographs taken was ultimately constrained by flight time, limited by the capacity of battery used to power the hexacopter. Due to storage space restrictions an image set in .tif format is not provided.

(3) Dataset description

Object name

UAV Aerial Survey - Clifton Camp (ST56557330)

Data type

primary data, processed data, interpretation of data

Format names and versions

.tif, .obj, .mtl, .jpg, .gpx, .csv, .mp4, .txt, .zip

- 'Readme' inventory in .txt format
- Camera native image set in .jpeg format (compressed as .zip)

- Image set with legible GCP markers in .jpeg format (compressed as .zip)
- Image set metadata in .csv format
- Derived polygonal mesh of site in .dae and .obj formats with .jpg textures (compressed as .zip)
- Images derived from polygonal mesh in .jpg, .tif and .mp4 formats (compressed as .zip)
- Ground Control Point data in .gpx format with .tif preview (compressed as .zip) derived from Mission Planner Flight Data
- Lens calibration images in .jpg format (compressed as .zip)
- Flight data in Mission Planner 2.0 .txt format (compressed as .zip)
- Camera position information exported from Agisoft PhotoScan in PhotoScan structure file format (.xml based) and Bundler .out format (compressed as .zip)

Creation dates

01/11/2014

Dataset Creators

Stephen Gray

Language

Eng

License

CC0

Repository location<http://dx.doi.org/10.6084/m9.figshare.1372405>**Publication date**

09/04/2014

(4) Reuse potential

Despite its accessible location, little investigation has been done on this site. This survey helps further establish several non-natural features seen by Russell [1] in archival aerial photographs. These features include:

1. Excavations believed to relate to Brunell's unfinished reservoir of 1845 (see area marked as '2' in 'features-of-interest.tif')
2. A rectilinear enclosure, believed by Russell to be a mediaeval animal enclosure (see area marked as '1' in 'features-of-interest.tif' - the much later reservoir pipeline can be seen cutting through, diagonally).
3. Several other non-natural features (for example see area marked as '3' in 'features-of-interest.tif') are suggested both by the results of this survey and by Robert's [2] geophysics survey of 2011.

Given that the site is a scheduled ancient monument, it is hoped that the further investigation required to identify such features will soon be undertaken. This data supports the generation of Orthorectified maps, Digital Elevation Models and 3D meshes.

A second driver for creating this dataset was the high degree of interest amongst the archaeological community in the potential application of new and affordable UAV technology. It is hoped that this dataset will act as an exemplar for the standardisation of results from similar, low-altitude aerial surveys. This dataset relates to two guides published by Jisc [3] and the Archaeology Data Service [4].

Acknowledgements

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References

1. **Roberts, A J** 2011 *Geophysical Survey at Clifton Camp*. Archeoscan.
2. **Russell, J** 2010 *Archaeology of the Parish of Clifton*. Bristol & Avon Archaeology, 16. Bristol & Avon Archaeology.
3. **Gray, Stephen** 2014 *Archaeology use case: 3D surveying with a UAV*, <http://www.jiscdigitalmedia.ac.uk/infokit/3d/uav-survey> Accessed: 01/12/2014.
4. **Gray, Stephen** 2014 *UAV Survey: A Guide to Good Practice*, http://guides.archaeologydataservice.ac.uk/g2gp/AerialPht_UAV Accessed: 01/12/2014.

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