Archiving and geoprocessing of historical aerial images

Current status in Europe

Sébastien Giordano, Clément Mallet

Univ. Paris-Est, LASTIG STRUDEL, IGN, ENSG, F-94160 Saint-Mande, France

June 3th 2019
State of current practices concerning archival aerial images set up by IGN-France with the help of Swisstopo in 2017:

- mainly focused on analogue aerial surveys,
- complementary information: digital aerial images, terrestrial images.

Official Publication No. 70 (2019), http://www.eurosdr.net/publications

Outline:

1. Introduction and presentation of the participants,
2. aerial surveys characteristics,
3. archive status information,
4. digital processing of analogue aerial images,
5. distribution policy,
6. current and future exploitation.
Table: Participants to the survey, listed by chronological order of responses.
Participants: 19 organisations from 13 countries

Figure: Participating countries to the survey accompanied with additional statistics: time interval of the acquisition, number of images archived, and percentage of digitised images.
### Purpose of the aerial image surveys

**For which purpose have these analogue aerial image surveys been carried out?**

<table>
<thead>
<tr>
<th>Analogue image surveys</th>
<th>Digital image surveys</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topographic map generation and update</td>
<td>Topographic map generation and update</td>
</tr>
<tr>
<td>Visual interpretation</td>
<td>Orthoimage production</td>
</tr>
<tr>
<td>Orthoimage production</td>
<td>DTM or DSM production</td>
</tr>
<tr>
<td>Heritage documentation</td>
<td>Visual interpretation</td>
</tr>
<tr>
<td>DTM production</td>
<td>Heritage documentation</td>
</tr>
<tr>
<td>Spatial and urban planning agriculture construction</td>
<td>Spatial and urban planning agriculture construction</td>
</tr>
</tbody>
</table>

**Figure:** Main purpose of aerial survey acquisitions.
Can you give an estimation of the time interval of the acquisitions?

(a) Number of institutions having carried out aerial surveys (analogue or digital) in the past 12 decades.

(b) First digital aerial surveys.

Figure: Temporal behaviours of analog and digital surveys.
Can you give an estimation of the total number of digital surveys that have been carried out?

**Figure:** Number of aerial images acquired by the organisations.
Spectral dimension of the archives

For analogue image surveys, what type of photo medium were used?

Figure: Percentage of organisations that acquired aerial images with the various media and spectral bands (middle: 0% → outside: 100%).
Among all the analogue images acquired, what is the part (%) of nadir images (vertical) compared to oblique aerial images? Were the surveys carried with a photogrammetric approach?

(a) Distribution of the organisations according to the ratio "number of nadir/oblique" images.

(b) Percentage of organisations that acquired data with a photogrammetric approach.

Figure: Photogrammetric approach for aerial surveys.
Was there a common parameter for forward/side overlap (overlap between photographs along the same/adjacent flight line)?

**Figure:** Analogue image survey overlapping characteristics. Distribution of the organisations according to the forward and side overlaps.
Among all the analogue image surveys that have been acquired, can you give an estimation of the homogeneity of the following parameters: spatial resolution, spectral channels, and temporal sampling?

**Figure:** Assessment of the homogeneity of the spatial, spectral, and temporal characteristics of the analogue aerial surveys.
Can you give an estimation of the percentage of analogue surveys archived? Are the archives centralized by a unique national body or dispatched in several public/private bodies?

(a) Archival status of the analog photographs.

(b) Storage strategy for the archives.

Figure: Archival status of the analog photographs.
Data archived with the analogue surveys.

What information concerning the analogue surveys have been archived?

**Figure:** Data archived with the analogue surveys.
Has your organisation started digitalization of the physical supports? Can you give an estimation of the percentage of the analogue surveys that have been digitised (%)?

(a) Percentage of organisations that initiated the digitisation process.

(b) Progress of the process.

Figure: Status of the digitisation process.
The digitisation process deals with which kind of data?

**Figure:** Data involved in the digitisation process (for 17 institutions).
**Additional terrestrial surveys**

**Introduction**

**Aerial surveys**

- **Archives status**
- **Processing**
- **Distribution**
- **Exploitation**
- **Conclusion**

---

**Additional terrestrial surveys**

---

<table>
<thead>
<tr>
<th>Survey Type</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only analogue</td>
<td>Topographic map generation and update</td>
</tr>
<tr>
<td>Only digital</td>
<td>Visual interpretation</td>
</tr>
<tr>
<td>Analogue and digital</td>
<td>Heritage documentation</td>
</tr>
<tr>
<td>None</td>
<td>Medicine (human body) Machinary</td>
</tr>
<tr>
<td></td>
<td>Archaeology and architecture</td>
</tr>
</tbody>
</table>

**(a) Existence of terrestrial surveys.**

**(b) Main purpose.**

---

**Figure:** Nature and purpose of surveys of terrestrial images.
Are you aware of initiatives on analogue aerial image processing?

Does a database of permanent Ground Control Points is available for archival image orientation?

Figure: Photogrammetric exploitation of archival aerial images.
Digital processing

Are you aware of thematic exploitation? Which applications? Do some of these studies use automatic remote sensing methods?

(a) Initiatives to produce remote sensing products.
- No: 38.89%
- Yes: 61.11%

(b) Adoption of automatic remote sensing methods.
- No: 60.00%
- Yes: 40.00%

(c) Main applications.
- Agriculture or forest management: 11
- Land-cover change: 9
- Ecological studies: 8
- Climate change: 2
- Support to customers: 1
- Environmental surveys: 1

Figure: Status of the derivation of remote sensing products from archival data.
Does a visualization platform exist for these products? Can you name and link such platforms if they exist?

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orthoimages</td>
<td>14</td>
</tr>
<tr>
<td>Analogue digitised images</td>
<td>11</td>
</tr>
<tr>
<td>Survey metadata</td>
<td>4</td>
</tr>
<tr>
<td>Digital Surface Models</td>
<td>1</td>
</tr>
</tbody>
</table>

**Figure:** Existence of a visualization platform, categorized according to the various potential metadata.
Table: Link to visualisation platforms. *First year* indicates the date of the first images that can be viewed.

<table>
<thead>
<tr>
<th>Poll #</th>
<th>Area</th>
<th>First year</th>
<th>Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Norway</td>
<td>1937</td>
<td><a href="http://www.norgebilder.no">www.norgebilder.no</a></td>
</tr>
<tr>
<td>4</td>
<td>Spain</td>
<td>1929</td>
<td><a href="http://fototeca.cnig.es">fototeca.cnig.es</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2004</td>
<td><a href="http://www.ign.es">www.ign.es</a></td>
</tr>
<tr>
<td>6</td>
<td>Cyprus</td>
<td>1963</td>
<td><a href="http://eservices.dls.moi.gov.cy">eservices.dls.moi.gov.cy</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><a href="http://www.geoportal.gov.cy">www.geoportal.gov.cy</a></td>
</tr>
<tr>
<td>7</td>
<td>Czech Republic</td>
<td>1937</td>
<td><a href="http://lms.cuzk.cz">lms.cuzk.cz</a></td>
</tr>
<tr>
<td>8</td>
<td>Finland</td>
<td>—</td>
<td>Human customer service (internal use)</td>
</tr>
<tr>
<td>10</td>
<td>Germany (Bonn)</td>
<td>1996</td>
<td><a href="http://www.tim-online.nrw.de">www.tim-online.nrw.de</a></td>
</tr>
<tr>
<td>13</td>
<td>Switzerland</td>
<td>1979</td>
<td><a href="http://map.geo.admin.ch">map.geo.admin.ch</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1926</td>
<td><a href="http://www.swisstopo.admin.ch">www.swisstopo.admin.ch</a></td>
</tr>
<tr>
<td>14</td>
<td>Sweden</td>
<td>1960</td>
<td><a href="http://geolex.etjanster.lantmateriet.se">geolex.etjanster.lantmateriet.se</a></td>
</tr>
<tr>
<td>18</td>
<td>France</td>
<td>1919</td>
<td><a href="http://remonterletemps.ign.fr">remonterletemps.ign.fr</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1950</td>
<td><a href="http://www.geoportail.gouv.fr">www.geoportail.gouv.fr</a></td>
</tr>
</tbody>
</table>
### Distribution platform

**Does a distribution platform exist?**
**Can you name and link such platforms if they exist?**

<table>
<thead>
<tr>
<th>Poll</th>
<th>Area</th>
<th>First year</th>
<th>Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Austria</td>
<td>1949</td>
<td><a href="http://www.bev.gv.at">www.bev.gv.at</a></td>
</tr>
<tr>
<td>4</td>
<td>Spain</td>
<td>1956</td>
<td>centrodedescargas.cnig.es</td>
</tr>
<tr>
<td>5</td>
<td>Slovenia</td>
<td>—</td>
<td>Human customer service</td>
</tr>
<tr>
<td>6</td>
<td>Cyprus</td>
<td>2014</td>
<td>eservices.dls.moi.goc.cy</td>
</tr>
<tr>
<td>8</td>
<td>Finland</td>
<td>—</td>
<td>Human customer service (internal use)</td>
</tr>
<tr>
<td>13</td>
<td>Switzerland</td>
<td>1926</td>
<td><a href="http://www.swisstopo.admin.ch">www.swisstopo.admin.ch</a></td>
</tr>
<tr>
<td>14</td>
<td>Sweden</td>
<td>1930</td>
<td>Human customer service</td>
</tr>
<tr>
<td>15</td>
<td>Germany (Erfurt)</td>
<td>1943</td>
<td><a href="http://www.geoportal-th.de">www.geoportal-th.de</a></td>
</tr>
<tr>
<td>18</td>
<td>France</td>
<td>1919</td>
<td>remonterletemps.ign.fr</td>
</tr>
</tbody>
</table>

**Table:** Link to distribution platforms. *First year* indicates the date of the first images that can be downloaded.
What is the condition of access for the products generated with analogue photographs?

**Figure:** Condition of access for the products generated with analogue photographs.
Existence of web/on-line services for data processing?
Name and link to the webservice?

**Figure:** Existence of on-line data processing services.
Current and future exploitation

Existence of web/on-line services for data processing? Name and link to the webservice?

Figure: Outreach activity of archival images.
Current bottlenecks

- production of orthoimages with analogue aerial images,
  - (i) missing metadata information (camera calibration),
  - (ii) the availability of Ground Control Points (GCPs),
  - (iii) the lack of automatic methods for the generation of orthoimages.

- digitisation process,

- clear and beneficial use cases are missing,

- not enough users/customers for this type of information, despite an obvious attractiveness from the general public.
Conclusions

- **Making explicit the main common issues** towards the definition of an automatic and fast photogrammetric pipeline, and in particular orthoimages;

- **Generating in-between first datasets** over the largest period of time in order to stimulate first thematic use-cases;

- **Organizing workshops** in order to gather people interested in methodological and thematic developments;

- **Refining such survey** with additional institutions and questions
Thank you for your attention

Question(s) ?

clement.mallet@ign.fr
sebastien.giordano@ign.fr