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Denmark Seen from Above- A Crowdsourcing Project
Experiences with User Involvement
Experience with New Use of Aerial Photographs

Summary: The Royal Library launched in oct 2012 a crowdsourcing project with oblique and vertical aerial photographs from our collections. These photographs have often very limited information and no exact geographical position. The aim of the project is to use the local knowledge of people living in the area, to geolocalize the individual oblique aerial photographs and to place vertical pictures as well. Beside this it possible to write other information like the exact address, stories on buildings etc. The library established a workflow with internal scanning, the necessary metadata to place groups of pictures in the right area and a homepage with possibility to give metadata and place the picture on the map.

In the first project the Island of Funen was chosen and app. 250.000 pictures were scanned and launched on the website. It turns out to be a great success, with heavy user involvement and lots of times used in the homepage. It turns out that this project is the place where people spend most time when they are inside the project of all Danish crowd source projects. We have built a user community and in different ways changed the project in order to give better access and possibilities. The project is dependent on funding from outside and later it has been possible to have two new areas with resources from local administrative units and external funds.

In 2013 the island of Bornholm was covered with 25.000 pictures and in October 2014 our newest area covering part of Jutland opened- here app 200.000 photographs will be scanned. The rate of success is tremendous – 99.8 % of the images from the first projects have been placed correctly. By giving access to these pictures, new possibilities of using these pictures have occurred- our phd student have initiated research in using a combination of vertical and oblique pictures in order to show development in land use.

The paper will present the project; show the user involvement and the results from 3 years of action.

Background for aerial photography and mapping in Denmark

The vertical photography as a tool for mapping started in Denmark short after the First World War.

In 1920 systematic photography by glassplates was started, as a cooperation between the survey (at that time part of the navy) and the flying corps.

It only succeeded to take less than a third of the country, before war in 1940 ended all Danish geodetic aerial photography for almost 20 years.

The German airforce was the first to make a complete coverage in 1944 and produce a kind of orthophotomap or least a photomap placed in the frame of Danish ordinary 1:20.000 map sizes, due to German standars the set was downsized to 1:25.000. http://lw1944.flyfotografarkivet.dk/)

In 1945 the RAF photographed all of the country in scale 1:40.000 http://i-gis.dk/Produkter/Flyfoto1945/tabid/72/language/da-DK/Default.aspx), but the best for decades was the very secret mission in may 1954, when USAF completed (in May) a full

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coverage in scale 1:10,000. It was probably a NATO project and can now be seen here: Kortal or Miljoportal -42,000 images were taken to cover the whole country (http://www.kortal.dk/privat/index.asp).

In 1968 the RAF photographed the whole country once more in scale 1:25,000 and about the same time the Survey started a new coverage for helping the mapping activities. RAF continued to use Denmark as place for pilots and photographers to train photomapping and did another complete survey in 1972 and later changed the timing, photographing a third of the country each year. They continued this policy at least until 1994. These images have never been used for mapping purposes by the Danish survey.

The Danish survey didn’t succeed to complete a coverage of the country before 1972, in a number of years they had their own equipment, but later used the new private firms operating to make the pictures after licitation.

These private companies developed from 1960 onwards, they were rather big companies with holdings of several million pictures. All significant collections still exist and are now at the Royal Library.

In 1992 the first private ortho photomap was done by Cowi and they have since then regularly covered the country. All these data are now for free here: http://arealinformation.miljoeportal.dk/distribution/)

Background for the project

The Royal Library has extensive collections of both oblique and vertical aerial photographs from 1913 to 2010, more than 3.5 mill unique pictures. The pictures are taken by a variety of firms and institutions ranging in size from 100 pictures to more than 1.5 mill unique pictures in the biggest collections. Each firm or institution has chosen their way of organizing the collection and retrieval systems for the pictures. The amount of metadata differs very much. Most or all oblique pictures don’t have exact geographical information, while most vertical pictures have some kind of index map to show the centerpoint of each picture. The index maps for vertical images comprise probably of more than 10,000 index maps with routes showing from two to thousands of pictures. The oblique pictures are primarily found by using a general map of Denmark in 1:100,000, where a number covering from 36-80 pictures in each serie, shows groups of pictures. One firm has registers covering each picture, but only with name of owner or maybe name of farm and the date when the salesman have visited the customer.

Normally all oblique series have both negatives and test pictures for sale purposes and for showing colour information. Most vertical pictures only exist as negatives in roll of 100-500 negatives, glued together or photographed in succession. The collection was started as early as 1913, but didn’t grow considerably before the 1970’s when two medium sized firms were accessioned. In 1980 all historical vertical pictures from the Danish survey were brought to the library – primarily because of the situation of nitrate negatives – one agreement was that all historical aerial photographs had to be transferred when out of date at the survey. It didn’t happened because of change in the board of directors at the survey.
In late nineties a growing interest and public relation about the collection occurred, especially after buying the biggest Danish company of oblique pictures, with a tendency to have a number of collections given to the library.

In 1989 the library bought the largest collection in Denmark- Sylvest Jensen- a private company started in 1936 by photographing farms and other buildings and trying to sell the images . It was made by 24 x 36 mm ordinary roll film with a Leica camera. It became a tremendous success and apart from the period 1940-45 when all Danish flying activities were forbidden , the company just continued to grow and produced a number of different series of pictures from single farm to panorama pictures, single parts of town and for a shorter period also vertical pictures. It all ended in 1988 when the collection had grown to more than 2 mill images. This firm was very good with keeping records of the images, but still only with names of owner and farm so the general problem arose that we didn’t have any precise information- it was all manual, time-consuming work to find individual pictures.

The project Denmark seen from above

For many many years the aerial photo images was a special branch of the collection, with special prices but still not a good business. When all the aerial collections were included in the library in the 1990’ies it became a big problem with the time needed to find pictures- we needed a much more easy way to find the pictures, we needed help from users and local historians and we saw new possibilities in having new information and new values by combining oblique and vertical pictures from many different years to construct the landscape in a much better way than just by using historical maps.

It was time for going online and make use of crowdsourcing but we needed funding.

When the ministry of culture wanted to test different digitizing possibilities of bigger collection, we where able to have funding for a pilot project covering app 5-7 % of the collection- we choose to select a smaller area, so we could have test with all different kinds of base material – small and big negatives, oblique and vertical images, paper images, images from 1920 and images from 2000.

The project started up in late 2011- the first process was to construct a list of images from the selected areas. This process was very timeconsuming since many different index maps, protocols, sheet maps etc had to be consulted from a number of collections holdings from different firms or institutions.

Totally more than 20 different collections had to be looked at and afterwards 250.000 negatives had to be taken from many different places and boxes.

The scanning process was chosen internal and many different scanning lines had to be made for different original material. The scanning process was done by students with a proffesional photographer as project coordinator.

The file name system should be easy and accurate- later the files needed the necessary metadata so the images could be placed on a map in groups. The metatada was organized in different types – the essential of the filename, year, name of firm couldn’t be changed by the users. All other fields could be changed.

We used students both for scanning and for giving the essential metadata, with the necessary introduction and control by trained staff from the collection.
The homepage was constructed after some interviews with people from local archives from the area and other local historians. We had no idea whether this site was interesting, easy to use and how many answers could be gotten.

The opening date was Sept. 22, 2012 with 50,000 images, the opening ceremony was not very well visited but some good press gave the site a booming start.

After a few weeks people where used to the site and it worked- before Christmas another group of 50,000 pictures was released and by now Funen is finished with app 250,000 pictures.

Three new areas have been chosen and we were able to have some funding

Bornholm
Kattegat islands
Western Jutland

As can be seen by later statistic the user interest was tremendous and by now more than 370,000 images have been correctly placed by users our of 400,000 online images.

We have had meetings with the most active users and have been able to make a few revisions to the site in order to help people and give them better access and help.

We have constructed a user forum where users can instruct each other and give new ideas. It became clear that some of our most active users have been able to use the site in much more sophisticated ways than we knew of. The library doesn’t have many resources for innovation. We have one person taking care of contact with users, just 5-10 hours a week. There have been and are many emails daily from users.
Figure 2. Example of an area with mostly correctly placed images - the green dots in the sea often represent vertical images.

Figure 3. The page where you can place the image on the online map.
Figure 4. Another feature of the site- comparison between orthophomaps from 1954- 2006.

Figure 5. Statistics on images online and images correctly placed- sorted by area and by different collections.
Figure 6. Activity on the site when new images have been released - redline images online. Black line correctly placed images by users.

Most active users:

Figure 7. Most active users - 3 points are given for each correctly placed image - 2 points for more information on each picture.
Future for the project

It is only possible to continue this project with resources from sponsors until now we have had sponsorship from Ministry of Culture and from local communities. We hope to have private sponsors in the future and at the moment several foundations are asked. Unless money is donated the project will stop.

We have built a very strong work process both with scanning and with metadata to the site, mostly by very good students. The team behind the project is small but very dedicated and we hope to continue until all 3.5 mill images are online.

Another feature of this site is the possibility to use comparison between oblique and vertical pictures from different times to see detailed changes in landscape, in land use and of course in any other development in towns and rural areas. Also changes in coastlines and other changes could be seen.

Currently a land use change study is conducted in the frame of a PhD research and there should be many possibilities in the future, especially when all of the country is online.
Figure 9. Short introduction in english.

The site is primarily for Danish users since it concerns very local information and local history.