Remote Sensing Archaeology

Virtual Prospection in the Internet

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Introduction

Aerial Archaeology is operated generally more or less before „the own door “. The picture service portals in the Internet however can overcome distances very fast and already one is in the „global neighbourhood“ of our world: The search range will be in England, somewhere east of Bristol, where within the range of the locality Avebury (the largest stone circle of the world) is to be looked for historical pregnant ground characteristics. On the basis of the approach and the possibilities of the Internet the aspects resulting from it are to be discussed.

Picture examples from England (Internet)

An investigation or a prospection of historical artifacts does not only have to take place before the own door, i.e. one does not only have to look at his own feet. With the „tool“ Internet it is possible to go on the search to foreign places far away from the own desk without having to climb into an airplane or into a satellite. The data (aerial and satellite photographs) lie in a data base in the Internet. On the virtual globe we look around with a magnifying glass or a telescope.

But where the virtual journey shall go to? Exemplarily we leave Germany and want to travel England. In this context the aerial archaeologist perhaps thinks of Stonehenge, of buildings and settlement places of the Roman occupation time. The search could begin arbitrarily. Or however one looks for reference points. What is more comfortable than to enter with key-words into a search engine (e.g. google) - perhaps „Henge “(round earth work with embankment and ditch) and „England “. The result of the search are several „hits“ that refer at first to the megalithic monumental building of Stonehenge. Directly afterwards emerges „Avebury Henge“ resp. „Avebury Stone Circle “. It belongs to a network of neolithic holy places that lie on a 320km long line, which pulls completely itself through South-England. Here we have it to do with the largest stone circle of the world, 427m in diameter. It covers a surface of approx. 15 hectares including the surrounding embankment, today cultivated partially and consists of the large outside circle and two smaller internals. It is built approximately around 2600 B.C. and thus older than Stonehenge, which

lies close by, about 150 km away from London. And here one can start and search whether perhaps still further traces can be found in this historical pregnant field.

Apart of this Internet-supported approach for archaeological searching the temporal expenditure is interesting. Through the Google search for „Henge “and „England“ the place Avebury was found. Arbitrarily picked out, this is the input for the geographical localization in the image service portal (FlashEarth, GoogleEqarth…) [1] and so already begins the archaeological tracing with zooming eyes in the county Wiltshire.

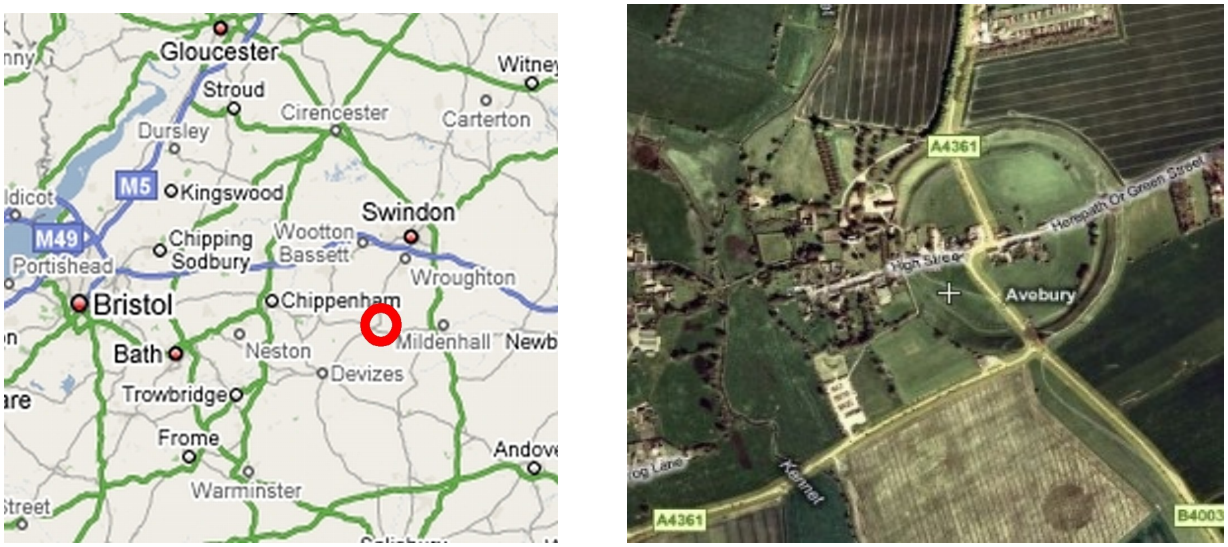

Fig. 1 Geographical localization of the area around Avebury

The first entrance over GoogleMaps represents the British picture situation completely different. What falls immediately into the eye in this region is the unrest and variety that one can call the pictorial material in „the domestic“ Lower Saxony / Germany nearly boring. But this is not dramatic. On the contrary: The numerous finds which were made in the past years in the north-Hanoverian area point again only to the potential which seems to lie in the area 150km west of London. Fig. 2 shows a larger area cutout east the locality Avebury with very remarkable geometrical alignments: Two strongly minted rectangles with thick edge at the upper contour, within the right range many rectangular mosaics, partly with round recessing. All these brightly minted lines speak for (former) embankments/fills (heights). On the other hand the large rectangle at the lower contour appearing weaker has a dark bound, indication of the dark-damp backfillings of a former ditch work (recesses).

Fig. 2 Range east of Avebury

A cut-out (fig. 3a) shows two enlarged rectangles next to one another, with intermediate distance. To this scene is confronted the corresponding cut-out from the portal of FlashEarth (Abb.3b), here from the picture basis of Microsoft VirtualEarth (MS-VE).

Fig. 3 Two rectangles with strong embankment

a) GoogleMaps b) MS VirtualEarth

The geometrical and radiometric dissolution seems to be somewhat better, although the aerial-archaeological conditions seem to be unfavorable for „the moment “. The rectangles clearly

stepping out in Fig. 3a are not to be confirmed in Fig. 3b. Here it shows up that just in aerial archaeology always the site conditions are important - which time of day, year, which kind of vegetation furnishes the conspicuous characteristics of the underground?

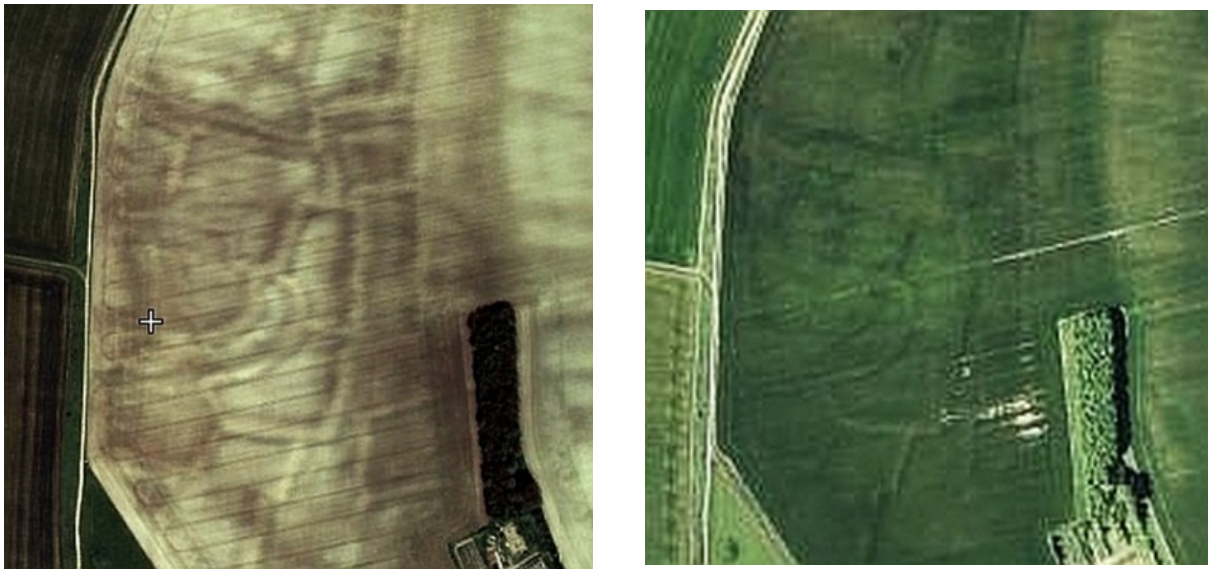

Fig. 4 Chessboard-well-behaved mosaics - Celtic Fields??

The second discovery site lies somewhat further east. The hit here (fig. 4a) was obtained in the aerial photograph (MS-VE). Also these structures do not seem to have „grown“ naturally. The strict geometrical alignment shows many, quasi chessboard-like surfaces lying side by side with embankment demarcations. It may be Celtic Fields, a typical English feature: small, more or less rectangular fields of the Bronze-, Iron- and Roman age.
This cultivation form carries the names „celtic fields “, since it admits for the first time in England and was brought in connection with the Celtic Age. The fields measured about 20 to 50 meters of edge length and were all around surrounded by a small embankment, similar to the today's breaks. Forms of this kind are for example straight here, in the county Wiltshire well-known and proven. The corresponding picture from GoogleMaps/Earth (Fig. 4b) shows also more or less significant structures, but not in this clarity like its „neighbour“.

Utilization of the found information, view

What happens with the found archaeological structures, fixed and documented in the form of screenshots of the monitor? The interested Searcher can hereby begin only a little. A possibility would be to go on a journey several hundreds or thousand-kilometers long and begin with „digging“ - theoretically. But it would be meaningful and practically to pass the found information on to the appropriate competent (national) authorities (monument authorities) so that there can be proceeded

further: Classification of these information into an existing „knowledge base“. By Internet (Google-Searching and eMailing) the data can be dispatched. A more interesting idea would be the structure of an infrastructure which can be created in the Internet: A portal, over that structures discovered by aerial archaeologists (possibly in the majority of amateurs) could be stored into with all describing characteristics of the image-content-situation (location, coordinates, description of the structures, picture etc.). This data base could use and evaluate the responsible offices and organisations via Internet.

Terms discussion: „Remote Sensing “- Archaeology instead of „Aerial“ - Archaeology?

The term „Aerial Archaeology“ stands for almost 100 years. The pilot uses a camera from the airplane with which he photographs recognized characteristic structures. As carrier platform there were also balloons. Or the information can be derived of a photographic chamber inserted into the airplane ground, which produces (for the aerial archaeology of strange purpose) perpendicular aerial photographs. The spectrum of the systems however must be still further seized. Just satellites are characterised by multi-spectral scanners, in the visible spectrum, in the IR or microwave range. Other systems take up with Laser-Radar. Independently of archaeology the term „Remote Sensing“ was established more than 20 years ago (French : „Télédétection “). Historically the term comes from the military reconnaissance. Contrary to other recording methods here is understood the non-contact investigation of the earth's surface including the terrestrial atmosphere which requires the direct access to the object.
Into this spectrum naturally falls the aerial photography / photogrammetry, but not only. By the use of the meanwhile most different sources of image data, which are produced from most different carrier platforms, also the classical aerial archaeology became the user. Would it be not only sense-bringing, but also necessary, to speak today by the extension of the application scope in archaeology of a „Remote Sensing Archaeology “[2] instead of „Aerial Archaeology “? Not at least the Internet makes these remote sensing data available, which are based on different sensors and carrier platforms, in different portals. And we already use these and/or we can them use.

Conclusions

In double sense here can be spoken of „Remote Sensing Archaeology “. In the original meaning is meant the „contactless radiation measurement“ of the distant object. In addition it can be called Remote Sensing by the supply of the image sources in the Internet and access of the observer to the shown object in even this virtual, global space. If the examples in the south of England, presented

above, were prospected from Hannover/Germany, then also each other place is conceivable, e.g. the enormous jungle area of South America, where possibly artificial line structures refer to gone down settlements.

Literature

[1] Heller, E. - Flash Earth : online-Bilddienste im direkten Vergleich – Neue Möglichkeiten neben GoogleEarth. VDVmagazin, 1/2008, S.12-13.

[2] Heller, E. - Suche von Bodendenkmälern mittels Fernerkundung Diplomarbeit am Institut für Photogrammetrie und Ingenieurvermessungen Universität Hannover 1987.

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