A Union of Dispersed Knowledge and People: Achievements of Archaeo-Gis Workshop 2007–10

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Abstract:
Since the introduction of Geographic Information Systems (GIS) into archaeology in the 1980s, most of the problems that archaeologists encountered in the course of utilising the geospatial technologies had not been explained anywhere and thus had to be resolved only through a redundant process of trial and error. In order to share knowledge and experience on GIS applications to archaeology, a self-motivated group of Japanese researchers inaugurated an online-based academic forum, Archaeo-GIS Workshop (AGW), in 2007. This paper reviews concepts and activities of the AGW in the past three years and then discusses current agendas and future tasks. The AGW employs two complementary communication channels: online social networking services and offline hands-on workshops. The administration and operation of the AGW relies exclusively on the spirit of volunteerism and financial self-sufficiency. The AGW welcomes wider audiences across disciplinary boundaries and encouraged more members to actively participate in the events and projects.

Key Words: *Geographical Information Systems (GIS), Online-Based Academic Forum, Hands-On Workshop, Sharing Know-Hows, Interdisciplinary Collaboration*

Introduction

Background

Over decades, we have obtained an increasing amount of archaeological data, both in analogue and digital formats, from excavations and post-excavation processes. Archaeological spatial analyses have employed a variety of digital data sources, including satellite imagery (Parcak 2009) and topographical, geological, hydrological (Harrower 2010), and climate maps (Banks et al. 2008). Since their introduction in the early 1980s, Geographical Information Systems (GIS) have provided sophisticated means to integrate, manage, manipulate, and analyse these data to visualise spatio-temporal patterns of material culture (Conolly and Lake 2006).

Problems

In Japan, knowledge and experience with practical applications of GIS to archaeological research have been dispersed across academia. This is partly because there are very few opportunities for Japanese archaeologists to take a training course in GIS and otherwise they have to teach themselves. It also means that they have to purchase, install, and operate a GIS package for themselves. However, there is a dilemma here that commercial GIS suites are generally too expensive for students and tight-budget researchers on one hand and charge-free open-source GIS programs are too difficult to utilise in some cases on the other hand. This dilemma has discouraged potential newcomers and resulted in the situation in which a small number of GIS analysts are dispersed in the archaeological research community in an isolated manner. Hence, most of the problems that archaeologists encountered in the course of utilising GIS and related geospatial technologies had not been explained elsewhere and thus were often resolved through a redundant process of trial and error.

A series of valuable know-hows gained from such a process should be accumulated and made freely available to those interested. In the wake of this situation, a self-motivated group of researchers and students in archaeology and the related fields of study, based at different institutions, inaugurated an online-based academic forum, Archaeo-GIS Workshop (AGW), in January 2007. This paper reviews the concepts and activities of the AGW in the past three years and then discusses current agendas and future tasks.

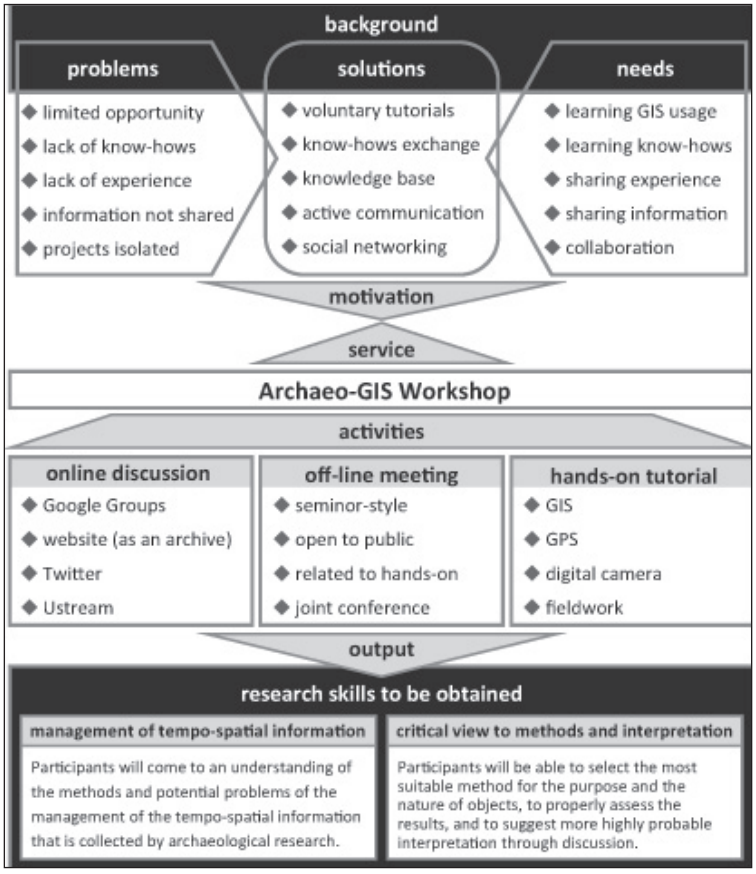

Figure 1. Concepts of Archaeo-GIS Workshop.

Figure 2. Portal site (http://archaeo-gis.com/).

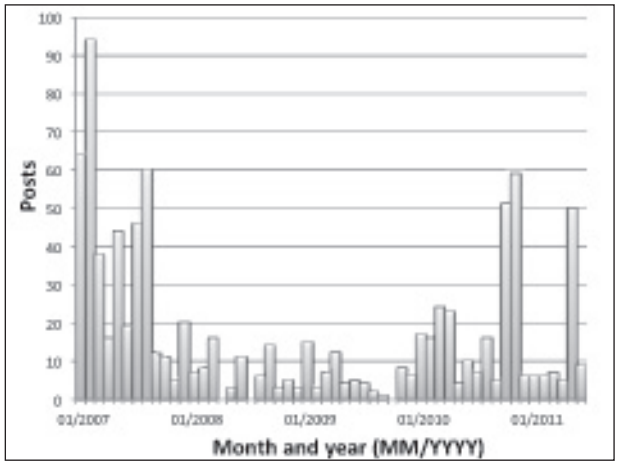

Figure 3. Posts to Archaeo-GIS Google Groups per month (from January 2007 to June 2011).

Concepts

The main objective of the AGW is to share knowledge and experience with GIS applications for archaeology. For this purpose, the AGW provides online and offline platforms to: 1) learn the usage of GIS, GPS (Global Positioning System), digital camera, and other digital devices for archaeological fieldwork and laboratory work, 2) share the techniques to use these devices, and 3) establish an active, self-motivated academic community through these activities (Fig. 1). The online communication is maintained by the portal website, Google Groups, Twitter, and Ustream, while the offline meetings consist of hands-on tutorials and fieldwork (see the following sections for detail). The AGW expects participants to obtain two research skills through these activities: first, participants will understand the methods and potential problems of the management of spatio-temporal information collected through archaeological research. Second, they will be able to select the most suitable method for the purpose and nature of their research objectives, to properly assess the results, and to suggest more highly probable interpretation through discussion. It is underlined that the administration and operation of the AGW have relied exclusively on the spirit of volunteerism, and the activities have financially been self-sufficient to be free from any other specific profit, political, or academic organisations.

Online Activities

Portal website

The portal site (http://archaeo-gis.com/) summarises the concepts and activities of the AGW. The website consists of both dynamic and static components. The Twitter gadget displaying the latest tweets of the AGW members, the Google Groups headline (Discussion Live!) and the Google Calendar are embedded and automatically updated (Fig. 2). On the other hand, the latest news (What's New?) on the top page and the concept, event, archives, and link pages are manually maintained. The weblogs of individual members are listed on the link page as well. The AGW is planning to transfer this portal site to Google Sites, a charge-free web-based content management system (CMS), in order to get more members involved in editing the website.

Google Groups

The AGW employs the Google Groups mailing list service for daily communications and discussions (https://groups.google.com/forum/#!forum/archaeogis). It facilitates the exchange of news, ideas, common problems,

Figure 4. A screenshot of Archaeo-GIS Ustream "TOMOBIKI Night!!" (http://ustre.am/fAyw).

Figure 5. The first seminar held at Tokyo Institute of Technology in January 2007.

and practical tips, and thus plays a role of a knowledge base. At present, seventy-four members are subscribing the mailing list. As of June 30, 2011, when fifty-four months had passed since the foundation of AGW in January 2007, 893 posts had been submitted in total and 17.5 posts per month in average. The number of posts per month gradually decreased from the peak in the first year (Fig. 3). Supposing that the number of posts and responses reflects the activeness of communication among the members, the pattern indicates a low activity rate during the time period between 2008 and the middle of 2010. However, the communication was reactivated in the second half of 2010, when the members discussed the presentation of the AGW in CAA 2011 and another exhibition.

Twitter

Twitter has dramatically increased its users in the past three years, which resulted in the formation of a new academic community (Oguchi et al. 2011). The communications between AGW members via Twitter (twitter.com/yaskondo/archaeo-gis) are very active. A variety of information on archaeological discoveries, events, research ideas, and new digital devices are frequently posted in an informal manner, and some of the important tweets are archived by means of Togetter (http://togetter.com/). Responses to the Ustream broadcasting are also posted through Twitter (see below).

Archaeo-GIS Ustream "TOMOBIKI Night!!"

Similarly, a charge-free video streaming service, Ustream (http://ustream.tv/), has increasingly been employed as a new communication channel through which researchers express and 'mash up' ideas. Along with this movement, Ako and Kondo (2011) have broadcasted a streaming program titled Archaeo-GIS Ustream 'TOMOBIKI Night!!' (http://ustre.am/fAyw) since May 2010. The program (Fig. 4) is broadcasted every twelve days on average (or every other *tomobiki* day in the Japanese lunar calendar system). It covers a variety of topics associated with archaeological GIS, including: 1) guest interviews, 2) an informal talk on new research ideas and projects, 3) a demonstration of digital devices and computer applications, and 4) an announcement and report on academic conferences. On broadcasting, real-time responses via Twitter, displayed beside the video streaming, create and enhance the interaction between the broadcaster and viewing audience.

Figure 6. A GPS tutorial held at a kofun (tumulus) park in Tokyo, February 2007.

Figure 7. On-site tutorial on GPS and digital photography held at an open-air architecture museum in Tokyo, June 2009.

Figure 8. Tutorial on GIS and georeferencing held at Kyoto University in May 2010.

Offline Activities

Seminars

As of June 30, 2011, the AGW has held two offline seminars. The first seminar was held in January 2007, in which the latest GIS-aided archaeological research projects in Japan were presented (Fig. 5). The second seminar, held in May 2007, focused on the usage of GIS in overseas and maritime archaeology. These seminars contributed to a more in-depth understanding of specific topics. In addition, questions that arose from daily online conversations and offline workshops were formally addressed in a special session of the 25th Semi-annual Meeting of Japan Society for Archaeological Information, held at Tokyo, in September 2007.

Hands-on tutorials

The AGW also provides participants with opportunities to learn practical operation of digital geospatial devices. The topics have covered: 1) on-site collection of geospatial data using handy GPS receivers (Fig. 6), 2) attachment of Exchangeable Image File Format (Exif) information to digital photographs (Figs 7 and 3) georectification of hard-copy maps by means of open source GIS software (Fig. 8). Many of the tutorials were held as a combination of data collection in the field and data processing in the lab. The AGW regards 'hands-on' as the best way to learn practical tips and know-how. Therefore, the participants operate devices and software for themselves in every tutorial, through which they are expected to obtain further interests in using GIS and the related technologies in their own research.

Spin-off projects

The seminars and hands-on tutorials have

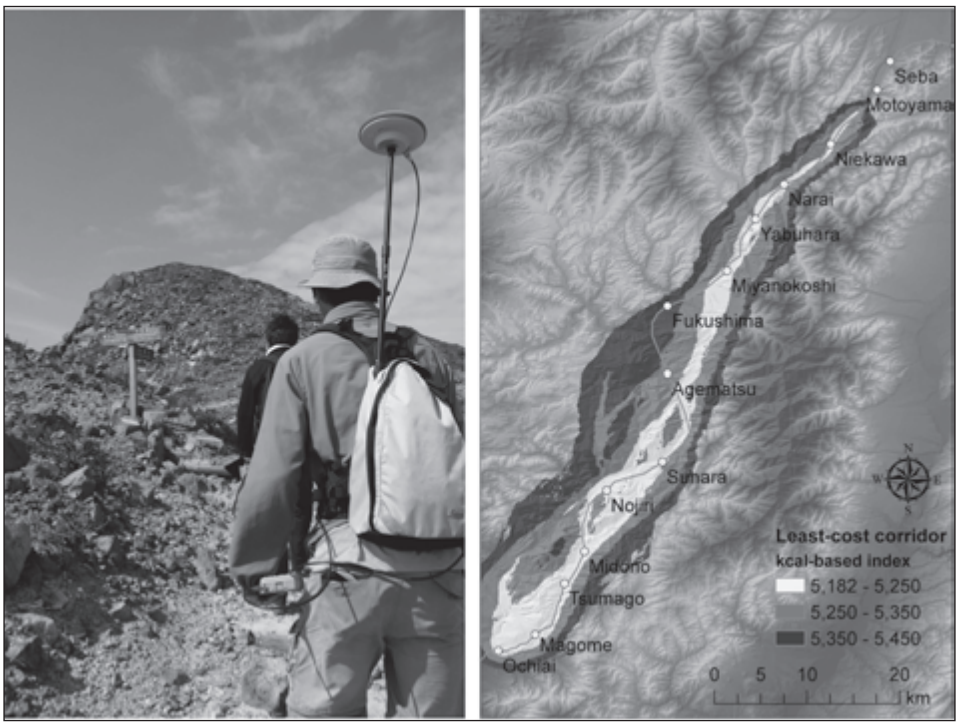

Figure 9. Spin-off field experiments for re-modelling the travel-cost algorithms. Left: A group of examinee walking with GPS receivers. Right: Least-cost corridor and walking tracks in Nakasendō-Kisoji, central highland Japan (after Kondo and Seino 2010).

resulted in a new collaborative research project. For instance, the algorithms for calculating travel-cost and least-cost paths were questioned during the first two seminars. Consequently, a group of the AGW members carried out the field experiments to assess the validity of the Tobler's algorithms (1993) in a remote island (Kondo et al. *in press*; Fig. 9, left) and a historical road in the mountainous area (Kondo and Seino 2010; Fig. 9, right). These field experiments yielded a new method to set parameters in the travel cost function.

Discussion

Current problems: a survey

As indicated by the decrease of Google Groups post rate (Fig. 3), the AGW was inactive during the period between 2008 and the middle of 2010, in spite of the achievements mentioned above. To analyse this situation, the current members were interviewed online. Ten members suggested a number of possible reasons, which can be classified into internal, threshold, and external factors:

Internal problems

The most serious problems seem to be attributed to the internal structure of the organisation. Although the number of members has gradually and continuously increased, the members that have constituted the core of the AGW activities have spontaneously been fixed and exclusive in spite of originally supposed flexibility. In a matter of time, those core members became busier running their own doctoral and postdoctoral research. As a result, it became difficult for them to spare time for planning new activities for the AGW. This inactiveness of the core members and the disproportionate workload on them lead to the stagnation in the long term.

Threshold problems

The polarisation between the skilled members and the beginners caused another problem that discouraged potential newcomers from joining the AGW. Theoretically, the budget-versus-skill

dilemma explained in the introduction can be solved through the AGW tutorials for learning the usage of open-source GIS. However, in fact, the learning process is more time-consuming than expected by beginners, and they are likely to feel that it is too difficult to catch up to the advanced users. Additionally, a newcomer encountered a difficulty in finding a tutor in one's career of archaeological GIS.

External problems

The external problems are mainly associated with the availability of data sources. In Japan, the basic GIS data sources such as digital elevation models, drainage polylines, and administration boundaries have already been published as a format of the National Land Numerical Information (http://nlftp.mlit.go.jp/ksj-e/) and National Fundamental Map Information (http://www.gsi.go.jp/kiban/). Nonetheless, a certain level of knowledge and experience is required to convert these data to a format that is readable in GIS programs.

With regard to the archaeological data sources, the National Cultural Heritage Online (http://bunka.nii.ac.jp/) serves the location of the state-designated cultural properties, and the Nara National Institute for Cultural Property hosts the national database of archaeological sites (http://mokuren.nabunken.go.jp/Iseki/). In addition to these, Internet GIS of the designated cultural properties and sites is available for several prefectures (http://saimaizou.jp/ for example). An increasing number of excavation reports have been digitised by the Repository of Archaeological Reports project (http://rarcom.lib.shimane-u.ac.jp/). However, these systems are not designed as a WMS (Web Map Service) server to provide data in a GIS format. Although it still remains to be debated whether the importance of GIS in archaeology has faded or not, it can be said at least, that GIS has become a common infrastructure to integrate a variety of data sources and analytical methods of archaeology and the related fields of study.

There is another external problem derived from the nature of archaeological community in Japan. Although there have been published a few books on archaeological GIS (Kaneda et al. 2001; Uno 2006), GIS is still an immature sub-field of Japanese archaeology. For instance, GIS-based spatio-temporal analyses of archaeological sites and objects (Crema et al. 2010; Kondo 2008) have not so much been applied in Japan. Researchers and students still seem to wait to see how things will turn out, awaiting practical merits from the latest achievements of GIS applications elsewhere. Unfortunately, the AGW has not yet fully responded to this circumstance.

Improving community and communications

The interviewees above also suggested some solutions to reactivate the AGW. According to them, the most effective means may be to encourage more members to actively engage in planning and administrating tasks. Major agendas at hand for the years to come include: 1) improvement of digital data collection and handling in field archaeology, 2) standardisation of system scheme for archaeological GIS projects, 3) establishment of a standardised curriculum of geospatial technologies for archaeologists, and 4) further encouragement of interdisciplinary collaborations in GIS-aided archaeology projects (see below). Well-planned and scheduled workshops held at a regular interval may also contribute to bringing life to our diminished activities.

Another view: a formation of new academic community

Among the members of AGW, there is a contradictory opinion to the issues discussed above. It is argued that the AGW has never stagnated, but rather the communication channels have been changed. The AGW originally intended to create two complementary

communication channels – the online mailing list by Google Groups on one hand and the off-line workshops on the other hand. However, this preference has transformed through the changing usage of the Internet and changing interests of the participants. First, although the frequency of posts to Google Groups gradually declined (Fig. 3), social media such as Twitter and Ustream has come to be used much more frequently. Nonetheless, we do not expect that Twitter can substitute the mailing list because a tweet is limited to 140 letters. The mailing list is still more suitable for in-depth discussions and announcements. Second, the seminar-style workshops have come to be replaced by the hands-on tutorials at the participants' request. In our view, the hands-on exercises are essential to hand down the knowledge and experience to the next generations. Therefore, the AGW is planning to hold regular tutorials such as the usage of handy GPS receivers (Figs 6 and 7) and open-source GIS (Fig. 8).

Importance of interdisciplinary research

The AGW opens its doors to wider audiences across disciplinary boundaries. For further integration of GIS and archaeology from a broader perspective, the AGW actively encourages the researchers from surrounding disciplines to join its activities. For instance, informatics specialists, human ecologists, landscape ecologists, architectural historians, and geomorphologists have thus far been involved in the activities and successfully shared and exchanged useful information and ideas on GIS with archaeologists. We expect that further interdisciplinary interactions will provide us with opportunities for new, leading-edge research. There is no doubt that GIS will serve as a common infrastructure for such interdisciplinary collaborations.

Conclusions

This paper presented the achievements and agendas of AGW for the last several years. Through the operation of this online-based academic forum, it has become clear that social media, Twitter and Ustream in particular, play an important role in exchanging information and ideas on one hand, and that 'offline' meetings and tutorials are essential to enhance skills and personal connections among the forum members on the other. We hope that our experiences in AGW serve as a precedent and help other researchers establish a new, online-based community in archaeology and other fields of science.

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