Personal Digital Assistants for fieldwork Training in College Campus

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Abstract—Education supported by mobile computers has been widely done for some time. Teachers have attempted to use mobile computers and to find concrete subjects for student's fieldwork training in college education. The purpose of this research is to develop software for Personal Digital Assistant (PDA) to conduct fieldwork in our campus, and to report a fieldwork class using PDAs in the curriculum of the Department of Regional Environment Studies.

Keywords—Development of software for PDA, fieldwork training, computer supported education, experiential learning.

I. INTRODUCTION

FIELDWORK is currently included in the curriculum of different departments in many colleges and universities where learning through practical experience is considered very important in higher education. Among these are the Departments of Geography, Sociology, Archaeology, and Regional Environment. Teachers have been able to use mobile computers with some success in their fieldwork classes; and there are some good examples [1]-[9]. In the Department of Regional Environment Studies we have developed our own PDA software equipped with GPS because we found that it is difficult to conduct fieldwork according to our educational plan using software currently available on the market. Our "Fieldwork Basic Practice" class is open to freshmen entering the Department. New students study what it means to live in harmony with the environment based on the culture, history, and lifestyles of the region. Our philosophy is that students need to do more than study in the classroom; they need to go out to the region to understand with greater clarity existing conditions. Educational fieldwork is an integral part of student experience. We also feel strongly that, in order to learn how to perform fieldwork, students need to become familiar with IT equipment, particularly the function of GPS and how to use it effectively. One of our goals is to motivate students to become more interested in GIS (Geographical Information System). We fully expect that in the future the introduction of GIS learning will assume even greater importance for students in the Faculty of environmental studies. The purpose of this research is two-fold: 1) to develop software for Personal Digital Assistant (PDA) to conduct fieldwork in our campus; 2) to report a fieldwork class using PDAs (Fig.1,Fig.2) in the curriculum of the Department of Regional Environment Studies. An subject of this fieldwork is for students to locate what we like to call their "positive power spots," both positive and negative, on the campus. The operational definition of a positive power spot is a favorite place or a zone of personal comfort; an area of solace, serenity, happiness or well-being. A negative positive power spot, by definition, is quite the opposite. Another objective of data collection is to promote a more comfortable campus design through the identification of student positive power spots. We planned to submit these data, including the results of a questionnaire survey that we developed, to the Chairman of the Board of Directors of our college. This information should prove useful for future campus planning efforts. Additionally, students in the class have to provide a rationale for why certain locations are positive power spots and to discuss their findings with other classmates to broaden group understanding. Another point that should be made is that we feel that it is safer for new students to conduct fieldwork within our campus. The class is conducted from the beginning of April until the end of July at a time when freshmen are not that familiar with the campus and have not communicated much with other new classmates. Thus, our class should help students get to know each other better as well as the design of the campus, adding to the educational benefits already described.

II. DEVELOPMENT OF PDA SOFTWARE

For a number of years we have been developing and improving PDA software for fieldwork. For example, we have already performed historical fieldwork research using PDA in which an old map from the Edo period (1603-1867) is stored. We were able to visualize and understand the post town using PDA. The difference this time is that we are using it for fieldwork on our own campus.

We begin with the assumption that most students have little familiarity with the mobile computer. Therefore, we try to simplify the operation of the mobile computer to decrease the possibility that students will develop negative attitudes toward the instruments because they consider them to be overly complicated. Keep in mind that one of our objectives is to stimulate interest in PDA and GPS through initial on-campus fieldwork.

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Fig. 1 PDAs used in our class

Fig. 2 Campus map

Fig. 3 Campus fieldwork   Fig. 4 The scene of operating PDA

Fig. 5 The scene of their presentation

Fig. 6   Fig. 7
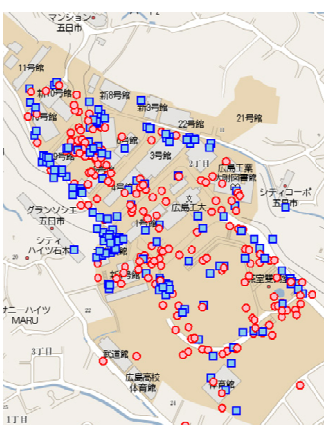

Fig. 6 A route example students walked
Fig. 7 Display of positive power spots (circle mark) and negative power spots (square mark) on campus map

TABLE I
MANAGEMENT OF A CLASS

	1st	2nd～4th	6th～7th	8th～10th	11th～13th	14th
Teacher A	Guidance	sub-class1	sub-class2	sub-class3	sub-class4	Summarize
Teacher B		sub-class2	sub-class3	sub-class4	sub-class1	
Teacher C		sub-class3	sub-class4	sub-class1	sub-class2	
Teacher D		sub-class4	sub-class1	sub-class2	sub-class3	

In our fieldwork class we rely on the following functions of PDA software:

1) Preparation stage:

To store the maps and names of investigation items, to store google map or scanned paper map in mobile computer automatically, three kinds of scale maps are stored, to store route information students walk, to store information about objects where i marks are shown, they are location (latitude and longitude), names of buildings, sign, icon's color, names of image files, names of sound files, names of text files. When students put the icon, they can get some information, for example, the picture and the explanation by text or sound are shown on the display.

2) Fieldwork execution stage:

To input information collected in their fieldwork using a touch pen, for example pleasant or unpleasant spots, the reasons, and memorandums, to store information on the exact locations by clicking on camera icon where pictures were taken.

3) Outputting stage:

To output data collected in the mobile computer in their fieldwork, to convert data in KML (Keyhole Markup Language) format because we show the data on the google map or other maps stored in simple GIS (Geographic Information System) we have developed.

III. CONDUCTING FIELDWORK TRAINING

One hundred and twenty eight students who took the Fieldwork Basic Practice class in the first semester for freshmen were divided into four sub-classes. Four different teachers taught this subject (see Table I), and each one gave the fieldwork problem to a sub-class. The four sub-classes were further divided into seven groups comprised of 4-6 members. Each group used a PDA. In order to solve the fieldwork problems, students were required to attend three 90-minute classes. During the first class, students walked along a pre-determined route assigned to members of their group (Fig. 3). As they walked, group members placed a circle or a cross on the PDA display to designate a positive or negative power spot. Each group member recorded some of the circles and crosses on the PDA (Fig. 4), which they could later confirm with the campus maps they were given. This also allowed each person to make a report showing the specific individual marks they had made.

The second class provided the students with the opportunity to submit a report by completing a questionnaire. Some examples of the questions are as follows: a) How was the operation of the PDA and how would you evaluate it? b) Write your reasons for selecting positive or negative power spots. c)

Write some useful opinions presented by your group members during the discussion. During the third class session, students completed their posters and made presentations (Fig.5). One or more presenters were selected by members of individual groups. Each presented the group's positive and negative power spots, catch phrases (slogans) for the power spots they identified, and locations for potential new positive power spots they would like to see.

IV. FIELDWORK RESULT

This section describes the reports completed by the students. Fig. 6 shows a route example students walked. Fig. 7 shows location of the circles and squares identified by the class members. Table II and Table III show the number of answers and the reasons why they were selected as positive or negative power spots (duplicate answers were permitted). Some of the most popular pleasant spots were locations where flowers, shade trees or a lawn exist. Others include a bench, a good viewing location, and a yard with a tea ceremony house. In addition to green areas, we also mentioned an open space like a play yard, attractive objects (e.g., bronze statue, illumination through solar or wind energy); a kiosk, a campus restaurant, and a vending machine. Looking at all the responses, we can conclude that pleasant spots tended to be rich green areas, panoramic views, places with benches and interesting sculpture, and locations where they can rest. Having the campus located at the foot of the mountain was also viewed in a positive manner. Additionally, as previously noted, places that provide nourishment to body and spirit (e.g., campus restaurant, etc.) were identified as positive power spots.

Survey responses related to negative power spots proved interesting. For example, on our campus a main road rises from the south gate to the north gate, and the slope gets quite steep. It is not surprising to find that students perceive the slope as a negative power spot, most likely because of the stress on their bodies. A large number of student responses also identified "unsafe places" and areas considered "gloomy" or where relaxation was difficult as unpleasant spots. Although not mentioned by most students, it was clear from their responses that a number of class members were quite sensitive about smoking areas because of health problems. We know, unfortunately, that most smoking areas are located at some open spaces and/or at good viewing areas. These locations become a problem when they take away places of recreation and relaxation from non-smoking students.

Three other key questions or tasks given to the students and typical responses include the following:

Question 1. "Make a catch phrase for the best power spot identified by your group."
- o "Be cured through natural power"
- o "Be cheerful through the power of the sun"
- o "A space of relaxation filled with green"

We can tell from their answers that students consider nature (e.g., sun, trees, and etc.) to be very important because it provides them with energy.

Question 2. "Write your ideas of some good power spots that should be created on our campus."
- o "A forest park"

TABLE II
POSITIVE POWER SPOT

Reason	Number of answers
There are green, flowers, and lawn.	154
There are benches and rest spaces.	55
It has a good view point or open space.	54
There are benches and rest space.	50
There are trees to shield us from the sun.	19
There is a restaurant or a vending machine.	14
The others	36

TABLE III
NEGATIVE POWER SPOT

Reason	Number of answers
It is hard to walk on slope or stairs.	91
It has safety problem.	49
The space is a mess. It has a smoking area. A flower bed is not in good repair.	49
The others	36

- o "An open space that cures our body and mind"
- o "0An area (square) for athletics"

Student reports strongly indicate their need for open space because they want to be fulfilled or cured by nature. They also want an area where they can gather to play or just chat with friends. Other responses express similar themes:

- o "A space where they can touch animals"
- o "A pond containing fish and other living things"

In addition to various features of the "natural environment," students also identified desirable man-made objects or places that can be considered components of the "built" environment:
- o "A bank automated teller machine"
- o "A car park"
- o "A clothes store"
- o "A convenient store"
- o "A coffee shop"

Collectively, these responses reflected places that were convenient for them or added to their sense of well-being. In addition, one other factor is worth mentioning. Although the designation of pleasant spots was done at specific times of day, it should prove instructive in the design of comfortable space if we can (1) identify any changes from hour to hour, (2) analyze student patterns of movement, and (3) visualize the scene and the geographical features they encounter on their way to power spots.

Question 3. "Propose new types of fieldwork you would like to do."

On-campus fieldwork:
- o "Find some new locations for disposing of trash"
- o "Find treasure"

Off-campus fieldwork:
- o "Find something interesting"
- o "Find shorter ways to their destinations"

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The student responses related to new fieldwork proposals reflected interest in searching and exploring. At the same time, they also looked upon the mobile as a kind of machine for playing games they might enjoy. Additionally, one of the other more interesting and potentially useful student proposals was for a "before and after" fieldwork study comparing a townscape before a park is constructed with one after it is constructed. This would require storing and making changes to the two maps in the PDA; nonetheless, fieldwork of this type would be both a practical and valuable application of the PDA.
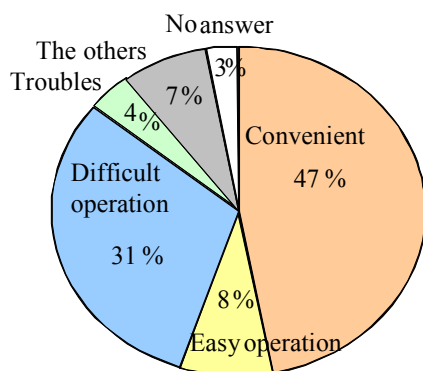

Fig. 8 PDA evaluation by students

Fig. 8 shows the student evaluation of the PDA system. More than half of the students found that the PDA was easy to understand and operate. However, about one third of the respondents had negative comments. We feel that much of the difficulty they experienced was probably due to an insufficient explanation of the hardware and the operation of the PDA.

V. CONCLUSION AND FUTURE WORK

Software developed for fieldwork training worked well. This class also worked well as an introduction to fieldwork and the use of a PDA. Students were interested in the functions and capabilities of GPS and PDA, and were eager to learn about their operation. It is likely that, the more students use PDAs and recognize their value for fieldwork, the more they will devise additional fieldwork applications for themselves.

The educational effectiveness of the class can be summarized as follows: a) students were able to understand the function and capabilities of GPS and PDA; b) they learned how to input data into the PDA for fieldwork, how to make a report, and how to make effective presentations with the slides that they had made themselves. We feel that it is important for each group member to perform these tasks independently. We also were pleased that the novelty of the class and the interest students showed in the work led to some imaginative ideas. Some of the more interesting were the construction of a ropeway, an automatic moving road (people mover).

In Section 1 we indicated that we also submitted this report to the Chairman of the Board of Directors of our college. He was interested in the fact that students found it both difficult and, more importantly, dangerous walking up the steep slopes and the outdoor stairways. The buildings on our campus are constructed on steep slopes. On rainy days, in particular, using long, steep stairways is very hazardous. Even when the weather is good, students dislike walking up the slopes. After evaluating the report, our chairman discussed various measures for improving the situation such as constructing a covered escalator or a covered moving walkway outdoors. There is one thing that we have made a contribution to our college. Smoking areas have been moved to some other places.

By analyzing these students' reports, we could use the findings from our fieldwork classes to address mobility problems and other issues, and contribute to future improvements in the management and design of our campus.

As to the future work, we would still like each student to be able to use a PDA. However, these instruments are expensive to buy and it also takes many hours to set PDAs properly before doing fieldwork. One possible solution may be cell phones. Every cell phone manufactured in our country after April 2007 must have GPS capability. Since most students already have cell phones equipped with GPS and web service, we hope to take advantage of this important change in technology for future constructive changes in our fieldwork classes.

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