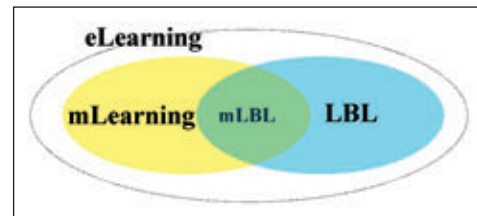


Towards a Mobile Geographic

Why Location Matters in Education

With Galileo just around the corner and data transmitting technologies like RFID available new spatial applications come into mind. One of the brand-new stinging ideas is why we still can't learn at the location where we actually are to get background information on our current experiences.



Classification of mobile Location-based Learning.

By Anja Kipfer



system in front of the art work and creating an easy-to-handle user-interface should do. But there is another side to it which promises to be more fun by taking mobility into account. With more precise positional technologies and more powerful mobile devices available this concept can be extended to the outdoor world. Possible scenarios are users on the move in a nature reserve while learning on plants, land usages, climate and so on in combination with a game platform. Also, travel parties can experience a virtual guided tour in combination with some tutorial support to get away from the passive listeners role. These user cases are a form of mobile eLearning (Mobile Learning) which is didactically related to situation learning with positional information being part of the situational context of the learner. At a first glance, these scenarios sound very familiar also to geographers' ears and resemble Location-based Service-applications.

More Fun

Audio guides in museums already provide information exactly where you need it. This is more fun than teaching yourself in advance or reading through some leaflets. More fun usually means better attention, but besides the motivational aspects building a spatial and thereby visual or haptic connection between a learning object and the learning content stands for a better cognition and remembrance. This concept of adapting educational content to the learners' position is called Location-based Learning (LBL). Obviously, this requires cooperation between scientists and practitioners both from spatial information and pedagogy fields. The following paragraphs are dedicated to finding a definition of LBL and describing its characteristics as well as some research projects. Finally, a description of an LBL-enabling platform is given.

What is LBL?

LBL does not necessarily imply being mobile. The term location-based is not

really 'location technology'-oriented but emphasizes the spatial and cognitive relationship between a learning object and the appropriate content. Our museum scenario also works with fixed units in front of the learning object to profit from the cognitive advantage of actually sensing the art work while getting the relevant information – no locational technologies needed for that. Establishing a computer



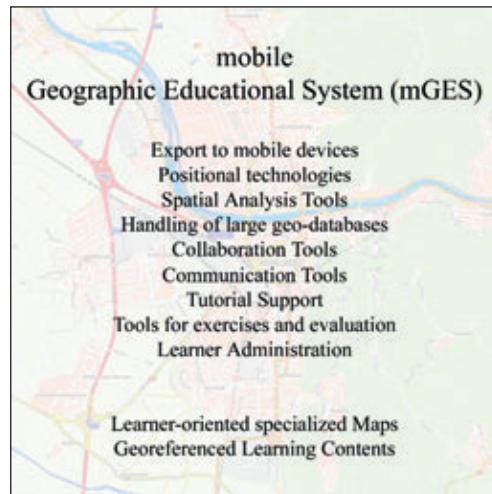
Educational System

Another Location-based Service?

However mobile Location-based Learning (mLBL) is different from being a Location-based Service. Surely both put a focus on providing information to the user related to her or his position and other context information. But mLBL is more aimed at what the user actually does with the information. You could say it is a marriage between Ubiquitous Computing and Ubiquitous Learning. So, a technology which supports mLBL requires a mobile workbench which allows for cooperation with other learners, for solving tasks as well as collaboration tools to work on the same exercise and tutorial support. Of course, these requirements are user-case specific since a school class has other requirements on a learning platform than tourists do. But generally, learning means more than offering an information platform. However it is yet to be proven if this is an idea with a long-term perspective.

Research Projects

It is no use investing in positional technologies and a different infrastructure for mLBL when the whole concept of positional learning with mobile devices will not prove to be an educational success in the long run. The main focus of mLBL is teaching and learning. There are already a few research projects focusing on didactic and technical implications of location-related learning. These are learning scenarios like making first-termers familiar with their campus environment or leading pupils through a nature reserve. Under the auspices of the Nesta Futurelab, Bristol, a research project was accomplished with the didactical focus of connecting mobile gaming with collaborative, self-controlled and experimental learning. Mobile Technologies should allow for learning scenarios outside a class-room. A mobile gaming environment for 7th formers was established to study animal behaviour. The settings were visualized by abstract PDA maps which were enriched with specific game information. In a separate control-room the game activities were presented on an interactive whiteboard. One of the results was that instabilities experienced while using GPS often complicated execution of the game. But again, new technologies like SIRF III-based systems can open up some new opportunities.



Components of an mGES.

Mobile Campus Game

Within the framework of the EU-research initiative MobileLearn at the University of Zurich, the prototype MobileGame was developed. By constructing a mobile campus game first-year students should get an easier entry into university life by performing different tasks concerning important people and places or scheduled or ad-hoc events. Task-solving took place on specific locations which were passed on by the learners in a collaborative way within teams but competitively between teams. With an electronic orientation rally students were led over the campus via digital outdoor and indoor university maps on a handheld PC. Testing the effects of collaborative Outdoor-Gaming on learning was the focus of the project 'Ambient Wood' lead-managed by the Interact Labs in Brighton. Target groups were 11 and 12 year old school kids. In a digitally augmented environment they collaboratively explored the natural setting in pairs. The pupils used probe tools to collect some georeferenced measuring data. Via GPS the position of the kids was deduced and location-specific tasks had to be solved.

Motivational Effects

The projects mentioned above all have in common that they focus on groups of pupils or students with a homogenous age group and put an emphasis on gaming and collaboration. Gaming is known to have strong motivational effects on learners with an extrinsic

learning motivation like being obliged to learn what is important to pass a test. Learning by collaboration is also considered to have positive effects on memorizing learning contents as well as on the development of social behaviour.

Some of the first results point indeed to the fact that collaboration and gaming are also very attractive factors for learners when exploring internal or external environments. So far, these projects have a clear research focus.

Nature Reserves

Another example for an mLBL-scenario which covers environmental learning would be to use infrastructure and educational content that are already available in nature reserves as well as in pedagogical expertise. A lot of people learn about the environment by reading information on huge presentation boards. A survey undertaken in some nature reserves in Germany has proven that learning on environmental issues usually doesn't take place in this environment and therefore the positive effect of sensing a learning object while learning is absent. Fixed computer systems are used in nature reserve centres and of course the good old presentation board is used, although some reserves have quite ambitious projects to get visitors acquainted with the natural environment.

In future learning scenarios RFID tags on natural phenomena like special trees or geological features could send information to the learner's device that can accordingly be used for instance to perform a problem-solving task or to add new data to a specific location. Since RFID requires no visual connection between the tag and the reading device, the learner can even be guided to discover some phenomena on his own. Because the information can be sent to many devices at once, group learning is also feasible. Thereby, spatial information technology can really support didactically sound learning.

Visualizing

Environmental learning is a prominent candidate for mLBL. Visualizing ecological processes is crucial for understanding. Refining maps with own primary or secondary measuring data is a typical exercise for students of related disciplines. Combining those maps

with real learning content to give background information on the natural environment to the student and allowing for explorative on-site learning might solve the gap often experienced between theoretical knowledge from the library and field-trips. Especially, three aspects of the examples described above seem to make mLBL an interesting playground for spatial information scientists and practitioners: 1) choosing the right positioning technology for specific learning scenarios, 2) creating application-specific maps which include learning content and 3) integrating didactic requirements into a geographic platform. These requirements could be covered by a mobile Geographic Educational System (mGES) which would serve as a base to provide for mLBL-scenarios.

mGES

Technological requirements still pose major challenges of Location-based Learning environments. This means outside learning scenarios with an audio guide automatically adapting to your position is still some steps ahead. But with innovation cycles ever so fast let's not talk about hardware devices, but focus on features you could expect from a platform that integrates spatial information and educational requirements.

A mobile Geographic Educational System (mGES) like that would acquire a combination of the known features of a learning platform as well as the components of a GIS. When exporting raster or vector maps and attributing data to a mobile device, why not exporting georeferenced learning content as well? Creating application-specific maps and handling large amounts of geodata would be on the desk of a spatial information expert as well as running spatial analysis tools and supporting mobile devices with various positioning technologies.

The eLearning expert would be responsible for designing the layout of an mGES from a didactical point of view. This would among others cover defining tools for tutorial support, collaboration, task-solving and evaluation. Before deciding on the functional scope of a mGES and the relevant tool support it is crucial to define the spectrum of application scenarios which can be covered by mLBL as well as the appropriate target groups. There don't seem to be clear requirements or definitions yet on how an integration of educational and geographic content can be achieved. As well as from the functional or tool-oriented point of view, creating didactically sound learning material adapted to the users' situational context requires cooperation between spatial information and pedagogic scientists and practitioners. Maybe it would



mLBL in a nature reserve.

be a good starting point to experiment with Google Earth as a base system for an mGES.

What's Next?

An interesting task would be to apply existing research results and integrate them into new application scenarios. Mobile Learning applications have quite some history for mobile workers or being a component in Blended Learning scenarios which use mobile devices as a supplement for existing face-to-face courses. An extension of those projects towards mLBL could provide for an additional value. So, starting from our environmental learning scenario one possible application setting would be an export solution from an mGES to a mobile device which is equipped with positioning technology.

First of all, it has to be decided who should learn what. First formers simply need different learning material than sixth formers. Going from there, necessary content has to be identified and adapted to the specified learners via a target group analysis. Here, nature reserves are an excellent starting point since they often have a mission to educate and possess excellent learning content. Then, media files like audio and video will have to be generated which are connected to the learning content. Appropriate learning exercises and evaluation mechanism have to be added as well. Those 'Knowledge Nuggets' can be exported to the mobile device. This is business as usual but the geographical value comes with the fact that this knowledge would be georeferenced and includes some maps to visualize content and allow for show-

ing the positional data of the user. This scenario could be augmented by data pushed to the users' device while exploring the natural environment. By offering analysis tools and tutorial support it can be assured that the new knowledge is understood and worked on to allow for good educational results.

Summary

As the preceding text has shown, a combination of spatial information technologies and educational applications can provide for mobile Location-based Learning scenarios. Results of mLBL research projects already can be used to find successful configurations for a mobile Geographic Educational System, which could serve as a standard platform for mobile geographic applications with an educational focus.

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