Present and Future of GPS in Related Services, Agricultural and Educational Applications in Hungary

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Abstract

A most promising development direction in IT applications in present days is the development relating to global positioning and map services. Severe private investments are attracted to this fiels owing to the spreading access to wide band (mobile) internet connection and GPS equipment. Development in Hungary follow global tendencies, tightly connect to EU development. However, a great deal of arrears is to be made up in a short period of time. Accomplished satellite and terrain GNSS development has achieved that, though within limitations, it can be used (tested) nearly the whole territory of the country. One of the most exciting challenges of present days is to consider and develop possible application fields.
On user side, an increasing demand is present for high precision, integrated service as well as navigation possibilities. Agricultural producers and service companies tend to rely more and more on GPS and GNSS services. The spread of precision farming is a desired state not only from an economic point of view, but is also an environment protection and province development issue. Beside the big systems already widespread in Hungary as well /http://www.ikr.hu/eng/ the development of smaller scale systems with special services (soil protection, soil erosion) is also an important factor.
Highly important is the widest possible spreading of the collected, fast improving knowledge and technology. Relating research at Georgikon Faculty of Pannon University /http://www.georgikon.hu/digkep/kutat.htm/, the Georgikon MapServer /map.georgikon.hu/ launched in 2004. and the GIS IT laboratory are an effective way to supply information presentation. Agriculture university faculties are to play an important role in educating partakers of agriculture. The experiences show that there is a significant demand for this type of education on GIS and related sciences in university education as well as for practising farmers /MEPAR/.

Key words

Digital map, EGNOS, GNSS, GPS, Mapserver

Introduction

A new structure program for setting up a GPS knowledge base (relating to other disciplines like remote sensing, 3D modelling, digital image processing, mobile communication etc.) was launched at our Department in autumn, 2001. The program still goes on and makes GPS issues raising interest accessable as well as provides market-based services. The needs of

university education was also considered when setting up and developing the system. To satisfy educational demands, the services of the independent ArcIMS, ArcSDE server that relates to the system can be accessed by the students and teachers of the Faculty.

The following programs and tenders helped the software and hardware development of the GIS System:

1. Management alternatives for reducing diffuse phosphorus load from the watershed of Lake Balaton
http://www.georgikon.hu/nkfp

2. IKTA-00112/2000 Creating 3D Model to Simulation
http://www.georgikon.hu/digkep/ikta112.htm

3. IST-2001-32595 Wireless supporting of agricultural and forestry information systems– extension Trials IST5 WirelessInfo Project [1]

3.1 The official website of the program:
http://www.wirelessinfo.cz/

3.2 Info on research program:
http://www.georgikon.hu/digkep/ist5.htm

4. Mobile Information Systems in Agriculture (MISA2002) Workshop with international participation
http://193.224.81.33/misa2002/index.htm

5. ITEM-28/2002 Developing Multimedia Based, Multifunctional Research and Education Materials
http://www.georgikon.hu/digkep/kutat.htm

GEORGIKON MapServer

Figure. 1: MapServer GEORGIKON

map.georgikon.hu

- Hardware

Evo W6000 2.4GHz Xeon dualprocessor. Integrated into the internal network of the University, organized into a domain.

- Software realization

ESRI GIS 9 Software System

Georgikon MapServer (Figure 1.)created and maintained by the Department supplies GIS data on the whole watershed of Lake Balaton. [2]

Accessible services:

- Topographic map of the watershed of Lake Balaton

EOV 1:10000

- Topographic map of the watershed of Lake Balaton

EOV 1:100000

- General agricultural registration/census data (procession of KSH /Hungarian Central Statistical Office/ data on the watershed)

- 'Viziterv'- 1980 erosion study

- Partial watersheds (terrain examination points, processed maps)

- Sample watersheds (aerial images, terrain sample provision points with data)

- Point-like terrain examination data on the watershed

- Terrain maps on the watershed

- Bed-silt map of Lake Balaton

- Aerial Images of the watershed of Lake Balaton

-Satellite images of the watershed of Lake Balaton

Under development:

- CORINE 2000 Hungary

- Soil maps of Zala county

GNSS in Hungary

The possibilities of GPS applications are widened by the accuracy of GPS measures, the achievement of under 1 meter or even decimeter accuracy, and an adequately integrated service. The use of GNSS /Global Navigation Satellite System/ services providing geodetic accuracy measurements make new quality work possible in most fields of agricultural applications. For increasing accuracy, the data provided by EGNOS, Omnistar, and SGO (Satellite Geodetic Observatory, Penc http://www.sgo.fomi.hu) are most often used in Hungary today. EGNOS services face severe challenges as the provided values of accuracy and integrity are significantly under the required. The greatest disadvantage of the Omnistar system is that it has to be paid for, though its special services (homogenious accuracy optimised on a small area) play an important role in the development of agricultural applications [3] [4].

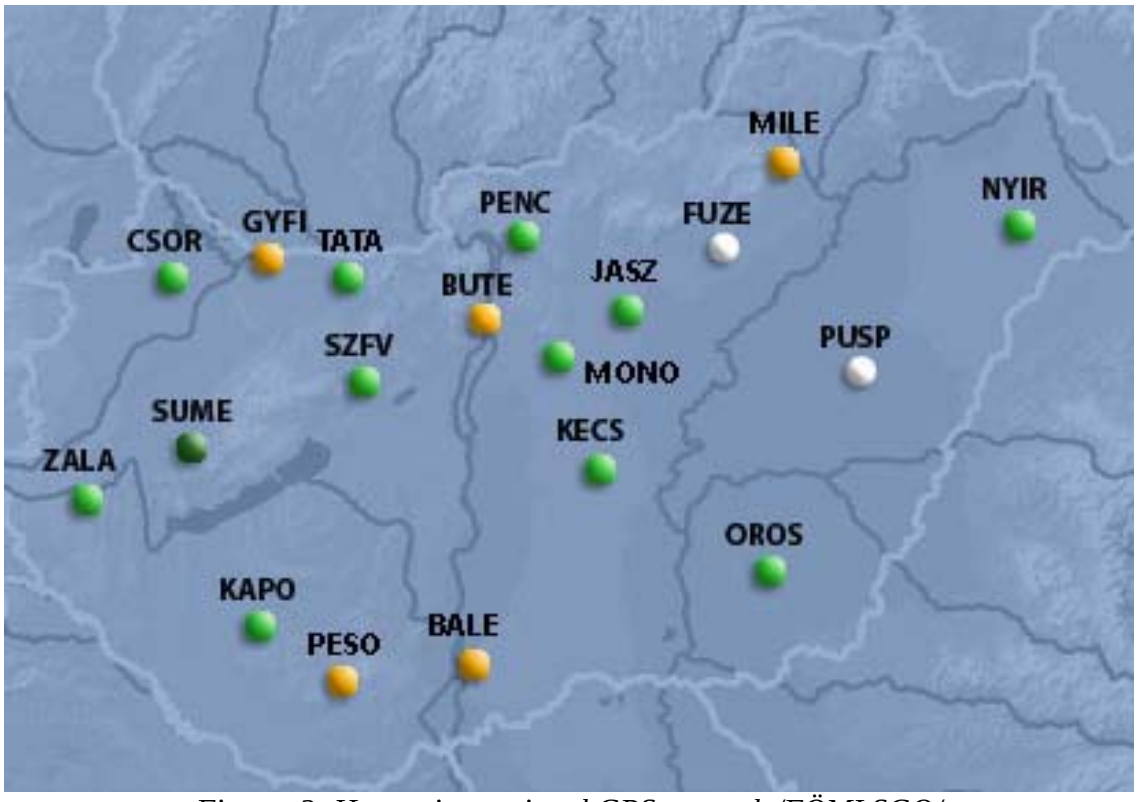

Figure. 2: Hungarian national GPS network /FÖMI SGO/

The establishment of the Hungarian GNSS services is under continuous construction. The stations working today (Figure 2.) provide accurate values for online processing in a test mode via the internet free. Post-processing can be accessed as a paid service. The otherwise difficult question of EUREF-EOV conversion is solved by a free software downloadable from the web site.http://www.gpsnet.hu

Figure. 3: GeoXH handheld

On the basis of the information accessible on the website of the provider no significant breakthrough was expected from the correction. No significant development in accuracy was guaranteed on some GPS equipment categories that we used. To test the service, we managed to obtain a Trimble GeoXH (Figure 3.)equipment with RTCM (Real Time Correction Support). Our research team has set up a prompt pace plan to carry out testing (working together with SGO and the regional country development offices) with the help of further, higher precision equipment.

Education

An important task for agricultural education is to integrate the latest achievements of precision agriculture and the relating fields into higher education, both at undergraduate and adult education levels.

GIS and GPS knowledge is getting more and more integrated into the education at Georgikon Faculty of Pannon University. Students had the possibility to choose digital image processing and remote sensing as a facultative subject before 2002. There have been Mobile Communication since 2002 and GIS since 2004 for them to choose [5] [6]. There has been a high interest in these subjects mainly among general agriculture engineers. A compulsory subject for environment engineers has been GIS for two years. There has been a strong tendency on our part to include the latest results in the curriculum. For this reason our department developed a collection of digital educational material in Hungarian called MAMIKA 2004 (Developing Multimedia Based, Multifunctional Research and Education Materials) [7] in which subject elements like graphics, 3D terrain modelling, mobile communication, as well as GPS, navigation, and data collection were included. An interesting issue in this material is that the server serves the user depending on client type eg. a cell phone on wap interface through online access. Considering the educational experiences gained within these years it can be stated that the interest of students is getting higher and higher throughout their studies provided that the instruction is based on wide practical knowledge and is supported with high technology hardware and software (mapserver, database server). Terrain practice, mapping, GPS mapping and digitalizing raise students' interest and the number of diploma work related to these subjects is rapidly increasing. Unfortunately, the continuous development of equipment following the latest technology is often accidental (tenders) and difficult (financing of universities).

High emphasis is to be placed on adult education as well, since after the EU integration, area-based support is accessible for farmers (MEPAR), which requires fast and new adaptation on their part. The IT and GIS knowledge of not only village agronomists and clerks, but also of farmers should be developed. We have experienced a strong interest with them as well, but their knowledge is to be developed from a very low level. 60% of the partakers of our special course for agronomists could be described as practically computer illiterate. This can be helped only by means of state help, with the development of IT infrastructure (internet access, spreading computer use).

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