The Rwenzori Trekking GIS

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Abstract

The paper deals with the program of surveying of all the trekking routes inside the Rwenzori Mountains National Park (RMNP), of the main data related to the trekking route and to the main points of interest present into the Park. The structure of the geodatabase starts from the ProtSIS protocol (the trekking routes geodatabase structure defined by the Italian Alpine Club).

This database comes from the same structure realized in 2000 and 2006 for the survey of trekking routes in the Himalaya range (Nepal) and in particular in the Sagarmatha, Kangchenjunga and Annapurna National Parks.

From the 27th of July until the 2nd of August 2007 two researchers moved along the routes of the RMNP with a mono frequency GPS receiver and are now working to the final data processing.

The objective of the survey consists in mapping the position of the trekking paths and mainly in the data collection of the information related to the path that can be useful both for planning the maintenance of the pathways and for touristic purposes. The greenways inside the RMNP are often cover by mud and for reason require a frequent and constant maintenance, in particular for the some facilities as bridges, wood ladder, etc.

1. Introduction

The main goals of the trekking route survey, besides the touristic one, are linked to the management planning and to the fruition of trekking route.

To do that it is necessary to achieve a convergence of aims between institutional and territorial institutions in charge of area management and then of the paths; besides is essential to unify the way of "approaching trekking route" and the way of spreading, consultation, management and data updating.

This unity of intentions and action is certainly favoured by the introduction of tools for common management, efficient and sheared, hence operative.

The GIS using in help to the decision concerning the territory, widely spread into the administrations and the territorial corporations, can properly be extended with appropriate integrations, to the management of trekking system, giving excellent data in the economic qualification of intervention of ordinary maintenance, hence constituting an excellent decisions support system.

2. The Italian Alpine Club (CAI)

In this context enters the CAI's activity that is historically involved in frequentation and respect of mountain. This is his big engagement officially confirmed by the Italian State with the 24 December 1985, n.776 art 2 comma/paragraph b) law that says:

> *"… The Italian Alpine Club provides, in favour of both its members and other people, within the limits of the articles of the statute, and in the way established here:*
> *[…]*
> *b) to the contouring, to the realization and the maintaining of trekking routes, alpine works and alpine facilities;*
> *c) to the spread/diffusion/distribution of mountain attending and to the organization of alpine, excursionist and speleological enterprises…"*

Nowadays the network of Italian trekking routes is expanding along dozen and thousand kilometres; many of these has exclusively historical value, and is currently in disuse; the CAI estimates that approximately ninety thousand miles of paths are now used for purposes related to hiking tourism and about sixty thousand kilometres of these are somehow managed by CAI itself.

Despite the paths have often extended regional or even inter-regional only in a few cases, the management has been scheduled on a non-closely local criteria but in an overview.

In the absence of a national policy on paths, each fact is organized themselves and unfortunately often in disharmony with the neighbouring creating over time a palette of colourful signs and trekking routes numbers.

The Central Commission for Hiking of CAI has fixed in 1996 principles and criteria which must be followed about pathway carried out by sections of CAI and with 27.11.1999 resolution the Central Council of CAI has formalised the previous decisions of technical branch. He then set the institutional basis for implementing this long process that involves all the CAI and is increasingly method for Public Body.

In 1997 it was created a special working group for the trails, called SITCAI, which operates directly under the National Presidence Commission of CAI, and that is playing an important filtering role nationally, of technical and training proposal, but also support and connection with sections and technical committees on the territory.

This group is working for building a single large WEBGIS system, collecting all the data surveyed on the fielf by all the peripheral groups of CAI by using of a stand-alone software provided to them. The CAI by implementation of this project recognizes the importance and the help that the world and the virtual digitalization and the GIS system particularly can provide in the planning, management, maintenance of the network pathway.

The steps that have been made toward this digitalization are:
- Creation and distribution of a standard GIS protocol named PROTSIS
- Development and improvement of the SIWGREI web-GIS software;
- Development and spreading to all the CAI groups of the SENTIERIGIS stand alone software

2.1. Protocollo Sistema Informativo Sentieri CAI (PROTSIS)

In 2006 SIT CAI has published a GIS standard protocol by which CAI defines the procedures to build a GIS for trekking routes. This protocol is called PROTSIS, an acronym for Information System "PROTocol Trekking routes". This protocol is proposed to all the Italian community of users, as a standard database for trekking routes data managing.

2.2. SIWGREI: the webGIS for trekking routes network management.

The CAI of the Lombardy Region, in collaboration with the Region Government within a EU founding programme INTERREG IIIa has developed an application, called SIWGREI (WebGIS Information System Italian pathway Network), by which it is possible to manage the pathways data collected in Lombardy and in the future in all Italy.

The SIWGREI information system is a completely manageable, at different levels, via WEB and therefore has all the characteristics to become the single platform management paths of Italy (Fig. 1).

SIWGREI is responds to different kinds of needs:

managerial/operational: the identification of the degradation and maintenance problems; properties of a path and the alternatives to routes no more proposable. The viewing of facilities, of equipment, but also of historical, cultural, environmental exigences, in order to check the usability. The design of new paths and evaluation of neglect for others over the extraction of data to track budgets and obtain financing;

- hiking: viewing the network of paths in a particular area and of emergencies and equipment related to, planning trips with description of the times run and of the gradients;

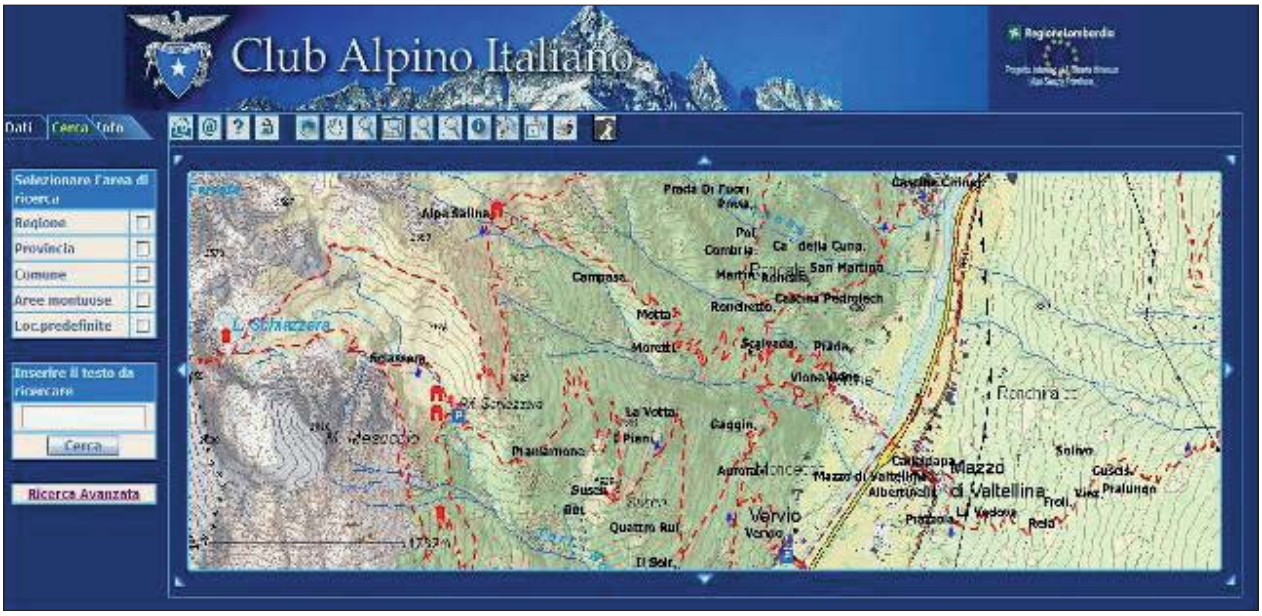

Fig. 1: SIWGREI, the CAI WEBGIS.

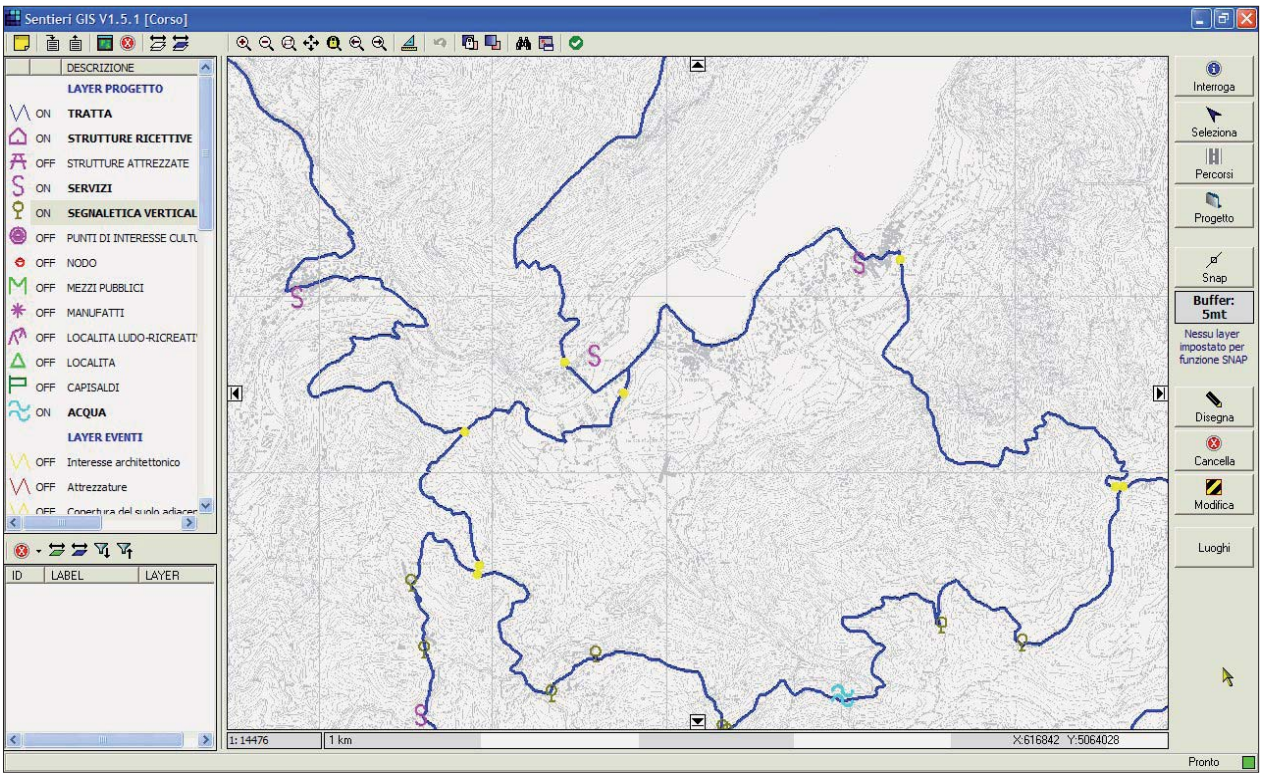

Fig. 2: A screenshot from SentieriGIS software.

- outreach: creation of an ON LINE database that can produce trekking maps, sharing and confluence of data to and from other Web GIS.
- institutional: it allows the exchange and the integration of data with other pathway network operators, regions, parks, mountain communities, provinces, municipalities, keeping/having the Italian Alpine Club as a reference point.

The SIWGREI application is the set of different software components:
- a geodatabase resident on a centralized server;
- a Web Server for the publishing WEBGIS client data via intranet (*Sentieri WEB*)
- a traditional kind of GIS application Client> Servers (*Sentieri WEB*) installed on the local that receives and retransmits data to the database
- an application management (*Sentieri DOC*) that can talk with the central database.

2.3. SentieriGIS

The *SentieriGIS* software – owned by the CAI – operates in stand-alone mode and has been designed and developed in order to allow the upgrade and consulting pathways data in every section or groups of sections of the CAI.

The software is distributed free to all the organised group of the association CAI that request it. To every group is given an opportunity, within its own coordinating peripheral structure, to update pathways network data belong to its area of competence, and then to transmit this information to the central group of CAI, which will validate before publication on SIWGREI.

The *SentieriGIS* program is a tool used to monitor the status of pathways network in order to schedule maintenance both ordinary and extraordinary, on a local scale, but in accordance with the specifications defined at national level. In SIWGREI are stored cartographic information, use of the land, informations on the state of conservation of the paths, and several data related to topics of tourist interest. In addition, the software provides the ability to CAI member to use the system to create trekking routes, maps and reports with all relevant information for excursions (Fig. 2).

3. The role of the University of Brescia

The surveying group of the University of Brescia started the studies on the trekking routes surveying with GIS-GPS approach since 2000 inside the Sagarmatha National Park (Nepal) under the acronym of SATGIS (Sagarmatha Trekking GIS, Fig. 3). In 2002 started a collaboration also with Comitato Ev-K2-CNR The surveying have been made by using a home developed GPS and the GIS standard. The complete surveying of the trekking routes of the Sagarmatha (Everest) National Park required three years of work, from 2000 until 2003.

In the following years started the Nepal Trekking GIS (NET-GIS) project and the survey activities has been extended to the Annapurna (2003) and Kangchenjunga (2004) ranges.

In the October 2005 and October 2006 the researchers returned in the Sagarmatha National Park to update the data surveyed in 2000–2002, and for teaching some local people to the data update of the surveyed data, using both GPS, digital cameras and pre-prepared standard documents.

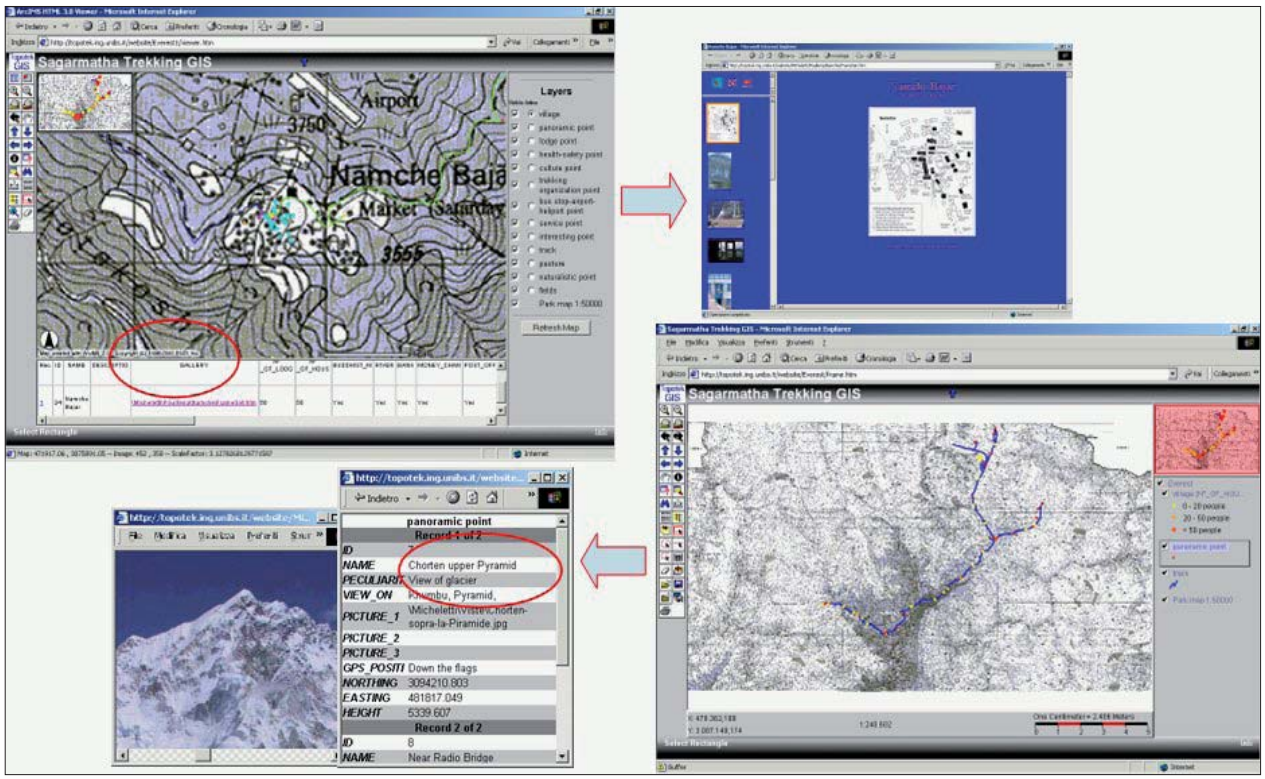

Fig. 3: Screen Shot of theSagarmatha Trekking GIS developed on Open Source basis.

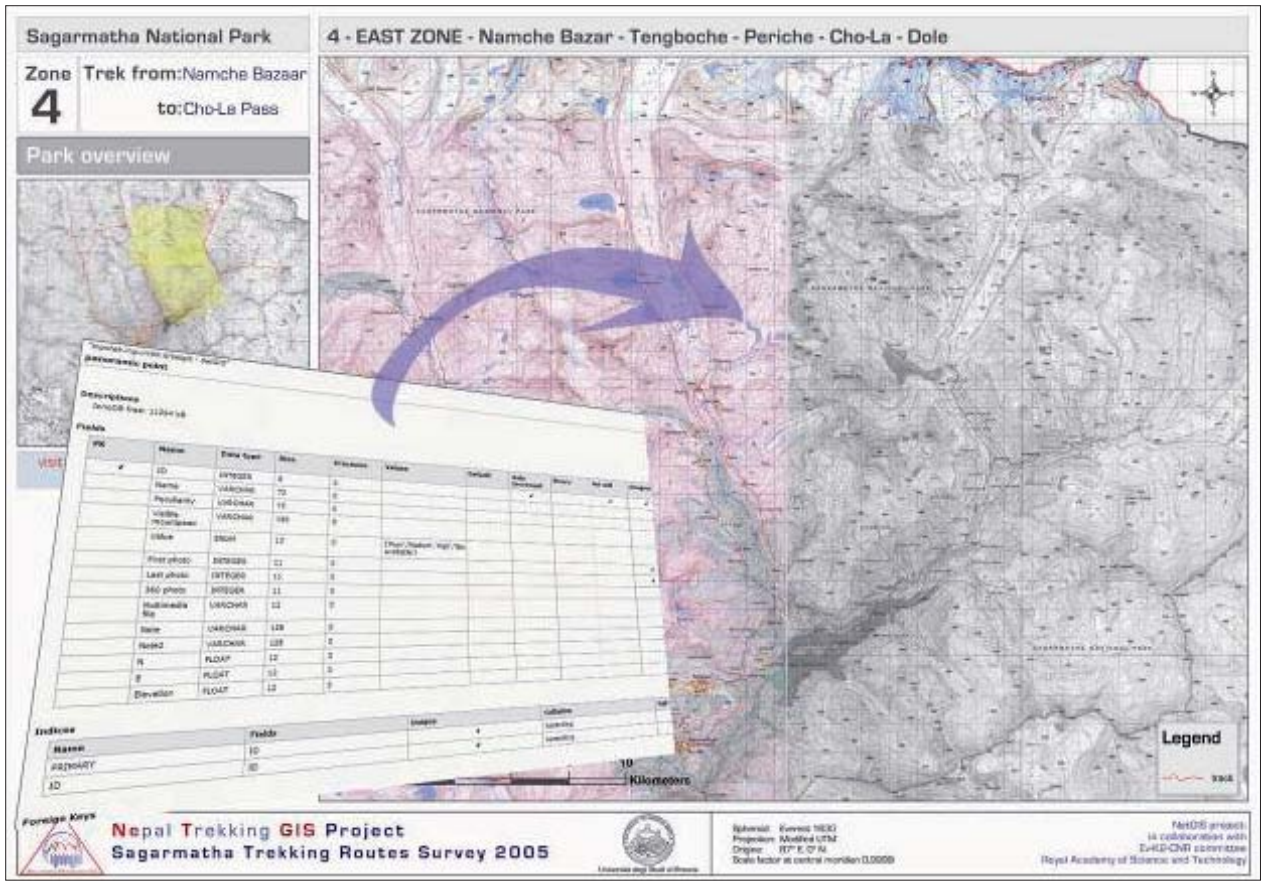

Fig. 4: Surveying update table for SATGIS project.

The data update and the new data surveyed could be loaded in the NetGIS server through an automatic via-web procedure, using the MySQL standard format and PHP pages, between the months of May and June 2007.

The field work in Nepal has been a good and valid experience to study how to apply European Survey Standards to developing countries needs and to evaluate how to use local people for the day by day surveying and data updates needs (Fig. 4).

The trekking routes, their management and organization, their support facilities on the park and the amount of information that arrive at people who cover a route are, indeed, different. The acquired experience has been used to plan the Rwenzori Trekking GIS project.

4. The Rwenzori Trekking GIS

In 1906, inspired by Henry Morton Stanley's last wills, the Duke of Abruzzi led an expedition to the Ruwenzori Range in Uganda. He and the members of his expedition climbed sixteen summits in the range, including the main six peaks. One of them, Mount Luigi di Savoia, bears his name. The highest peak was reached on June 18, 1906 and was named Margherita, the Queen of Italy.

Luigi Amedeo of Savoy's team was made up of Captain Umberto Cagni who, with Lieutenant Edoardo Winspeare, assisted the Duke with geographical observations; the photographer Vittorio Sella (Fig. 5) and his assistant Erminio Botta; Dr Alessandro Roccati, director of the geomineralogical laboratory of Turin Polytechnic, entrusted with geological and mineralogical research; Major Achille Cavalli Molinelli, naval doctor, who, among other things, has the task of collaborating with Roccati in the collection of zoological and botanical specimens.

In the Centenary of such an event the University of Brescia, in collaboration with the environmental association "L'Umana Dimora", registered at the Italian Ministry of Environment, and the Italian Alpine Club in order to celebrate that great event has organized a new expedition on the Mountains of the Moon together with an articulate scientific and cultural action; the outcomes may result into bringing out the environmental features of the Rwenzori range, and in the realisation of didactical and educational tools for Ugandan students, locally spread thanks to a close collaboration with the italian NGO AVSI (International Service Volunteers' Association) and through educational scientific initiatives also for the non-specialist public in Italy concerning the environmental peculiarities of the Rwenzori National Park, and Uganda in general.

This Project is a direct consequence of the scientific interest for the mountain territories of Central Africa and of an historical collaboration in the realisation of research projects shared by some researchers of the Department of Civil Engineering, Architecture, Land and Environment of Brescia University, together with the "Mountain Working

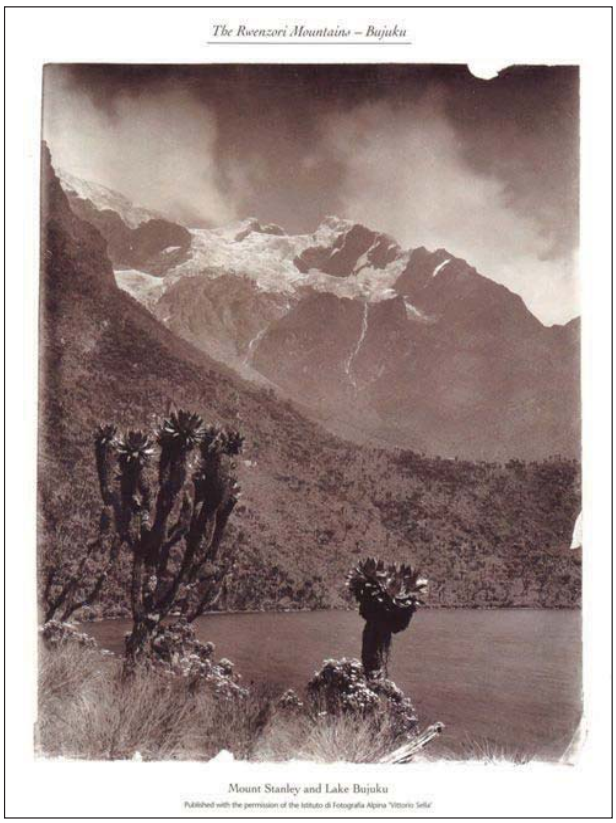

Fig. 5: Mount Stanley by Vittorio Sella

Fig. 6: Surveying in Rwenzori Range

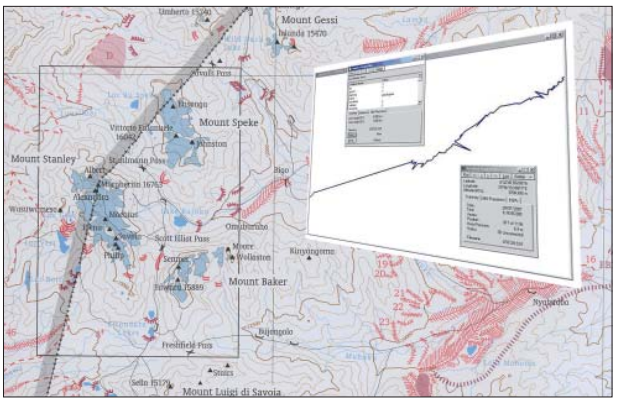

Fig. 7: GPS Raw data on the map

Group" (hereby called Mountain Group), active from many years within the association "L'Umana Dimora".

From the 27th of July until the 2nd of August 2007, one year later, two researchers moved along the routes of the RMNP park with a mono frequency GPS receiver (Fig. 6) and are now working to the final data processing.

The paths surveyed are the following:
- Ibanda-Nyabitaba wasn't surveyed because of the leaf cover;
- Nyabitaba-John Matte. There were big restrictions on this way because of the rich vegetation;
- John Matte – Bojuku was completely surveyed, for a overall length of about 7,5 km.
- Bojuku – Elena Hut, complete surveying for a distance of 4,1 km
- The stages/legs from Elena Hut – Kitandara and Kitandara – Nyabitaba weren't surveyed because of the difficulties met with during the way (mud and slippery and very exposed plates).

The data collected concern particularly:
- the positions of paths mapped out in the park;
- the position and the most important data related to the huts and the lodges in the area;
- the position and the state of maintenance of system of signs;
- the condition of places, particularly of stretch of road strongly degraded;
- the location of panoramic view/points;
- the points of naturalistic interest.

The GPS data have not been processed yet by the differential correction, either filtered or cleaned in any way (Fig. 7).

5. Conclusions

The expedition planned for December 2007 and January 2008, that must have provided all GPS data concerning the Rwenzori Park trekking routes, has not been realised because of the sudden ebola epidemic broken out in Uganda in December. Next data will collect in the next summer 2008 expedition.

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