EFITA WCCA CIGR
2013 Conference
June 23-27, 2013
TORINO, ITALY
Sustainable Agriculture through ICT innovation

SIINSAT-V1, a Tool for Decision Support System in Agriculture and Natural Resources

[1]Jesus Soria-Ruiz and [2]Yolanda M. Fernández-Ordoñez

[1]Geomatics Lab. National Institute of Research for Forestry, Agricultural and Livestock (INIFAP). Vialidad A. López Mateos Km. 4.5 Carr. Toluca-Zitácuaro. Zinacantepec 52107, Mexico. soria.jesus@inifap.gob.mx

[2]Applied Computing Program. Postgraduate College in Agricultural Science (COLPOS), Campus Montecillo. Km. 36.5 Carr. México-Texcoco, Montecillo, Texcoco 05230, Mexico. yfernand@colpos.mx

ABSTRACT

There are many examples of tools to support decision making; one such tool is the SIINSAT-V1 system, which we present in this paper. SIINSAT is the Spanish acronym for "*Sistema de Información para el Inventario de Imágenes Satelitales*", an inventory information system to support the selection of satellite imagery for agricultural applications. SIINSAT-V1 supports queries about satellite images of different satellite sensors. The image information is contained in a database appropriately designed and structured. This software system provides historical imagery information available for a specific area of the Mexican Republic of particular interest to decision makers and academia interested in agricultural information. For each image the information includes: sensor information, date of the scene, resolutions, bands and a JPEG preview file to visually present the percentage of cloud cover of the optical images.

The system searches satellite imagery information as requested by the user. The search terms include month and year, geographic and geopolitical area; the query result is displayed in a table of key existing images, resolutions, etc. Also displayed is an image which allows the user to appreciate the percentage of cloud cover and decide whether to use it and download it or not. The current version 1 of SIINSAT runs like a web application and is currently being evaluated by typical users. To facilitate access to SIINSAT-V1 for all interested persons, version 2 (V2) will be enhanced with a redesign of forms and it will be standardized so that it will run on any platform.

Keywords: SIINSAT-V1, decision support systems, agriculture, Mexico.

1. INTRODUCTION

A decision can be defined as a choice that is made between two or more alternatives. Concerning data and information in the geospatial domain, individuals make many decisions every day (Sugumaran and Degroote, 2010). In a decision potential choices are formed after defining certain minimum objectives, and subsequently selecting more demanding objectives. There are many examples of software tools and systems to help people make decisions; one of them is SIINSAT-V1, which we present in this paper. SIINSAT is the Spanish acronym for "*Sistema de Información para el Inventario de Imágenes Satelitales*", an information system to support the selection of satellite imagery for agricultural uses.

SIINSAT-V1 supports queries about satellite images of different spatial sensors. It is available in the Geomatics Laboratory of INIFAP (National Institute of Research for Forestry, Agricultural and Livestock), an organization associated to the Ministry of Agriculture in Mexico. The information from the satellite images is contained in a database appropriately designed and structured. SIINSAT-V1 provides historical imagery information available for a specific area in the central part of the Mexican Republic of interest to decision makers and academia interested in agricultural information because of its relevance in agricultural production (Soria-Ruiz, 2012). The information contained in SIINSAT-V1 includes: sensor information, date of the scene, resolutions, bands and a file in JPEG preview to visually present the percentage of cloud cover of the optical images. In addition, the system allows for continuous updating was images acquired by the Geomatics Lab increase the stock. The aim of this work was to design and implement a query system for the inventory satellite images, which allows a quick search of the satellite image database.

2. MATERIALS AND METHODS

2.1 Database

The database and query system were designed and structured using Visual Studio Vx (Powers and Snell, 2006), with archives from 1998 to 2012 existing in the Geomatics Lab in different storage media. Later versions of SIINSAT will migrate the database to another database management system because the database will continue to increase its stock due to the reception of new satellite images. Table 1 shows an example of the information contained in the tabular database, and corresponding to SPOT satellite imagery.

Table 1. Tabular data for images form the SPOT sensor.

Spot

Id	CLAVE	FID_MGM20	CVE_EDO	CVE_MUN	MUNICIPIO	K	J	FECHA	HORA	COBERTURA	NUM_COL	NUM_REN	DSC_BANDA
1	580/306	2492	1	1	Aguascaliente	580	306	28/12/2010	17:25:25	VII	6000	6000	XS1,XS2,XS3,S\
2	580/306	2492	1	1	Aguascaliente	580	306	28/12/2010	17:25:23	VII	24000	24000	PAN
3	580/306	2492	1	1	Aguascaliente	580	306	28/12/2010	17:25:25	VII	6000	6000	XS1,XS2,XS3,S\
4	580/306	2492	1	1	Aguascaliente	580	306	28/12/2010	17:25:25	VII	6000	6000	XS1,XS2,XS3,S\
5	580/306	2492	1	1	Aguascaliente	580	306	28/12/2010	17:25:23	VII	24000	24000	PAN
6	580/306	2492	1	1	Aguascaliente	580	306	28/12/2010	17:25:25	VII	6000	6000	XS1,XS2,XS3,S\
7	580/306	2492	1	1	Aguascaliente	580	306	28/12/2010	17:25:23	VII	24000	24000	PAN
8	580/306	2492	1	1	Aguascaliente	580	306	28/12/2010	17:25:25	VII	6000	6000	XS1,XS2,XS3,S\

2.2. Design

SIINSAT was created with structured code to run as a web application, using XML and Framework.Net (Pialorsi and Russo, 2010). The application is based on web forms, where the designer options allow dragging of controls, defining data types and other objects, and setting their properties as if the application were a sort of Windows application.

Figure 1 shows the main SIINSAT screen to initiate querying of satellite images. Using the icons on the left the user searches for images, the names of the available sensor imagery such as SPOT, LANDSAT, IKONOS, QUIKBIRD, NOAA, RADARSAT, ALOS/PALSAR y TERRA/SARx are provided. The icons on the right are used by the system administrator to update the database as new satellite images are acquired by the Geomatics Lab.

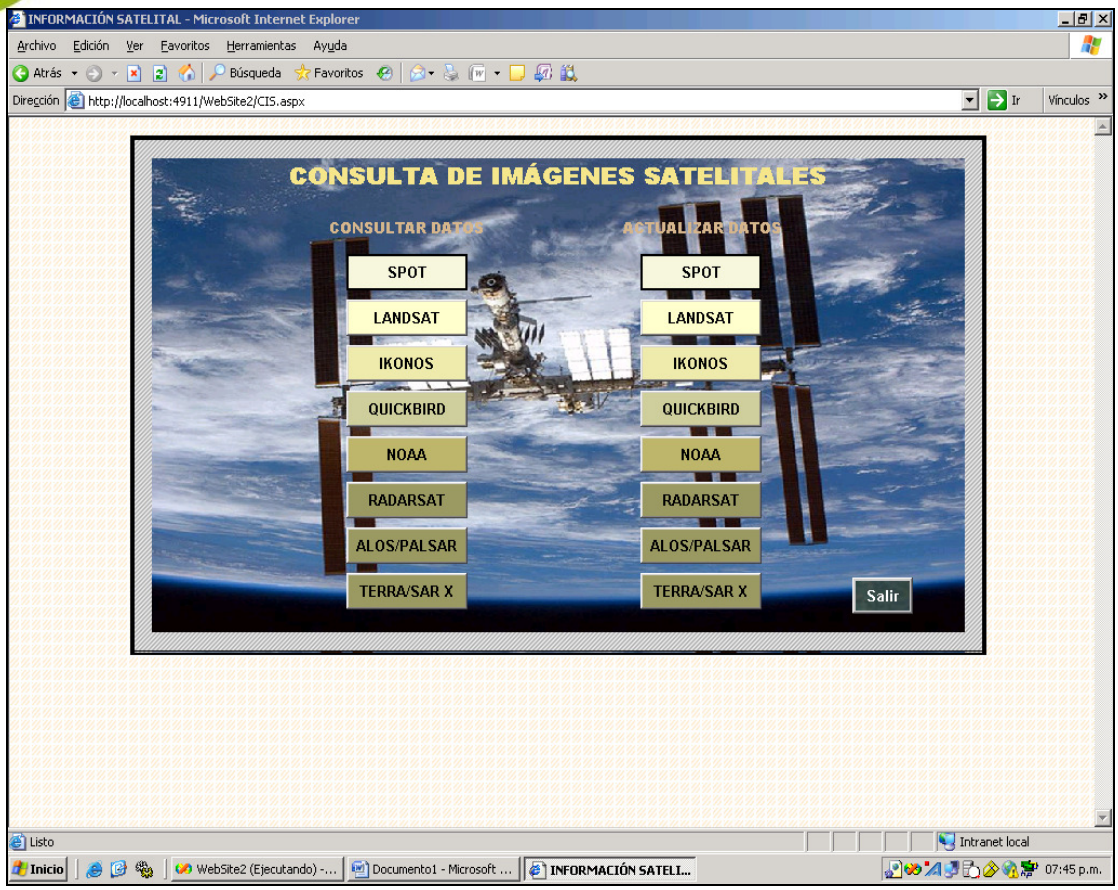

Figure 1. Main screen of the SINSAT-V1 system.

3. RESULTS AND DISCUSIONS

3.1 Search for information

The system has proven useful for searches of satellite imagery information required by typical users. This search can be done by month and year, geographic and geopolitical area, displaying the query results in a table of key existing images, resolutions, and other useful data (Fig 2). The query result also displays an image in JPG format which allows the user to view the percentage of cloud cover. The current version of SIINSAT is fully implemented to run as a web application, where users will be to query the information.

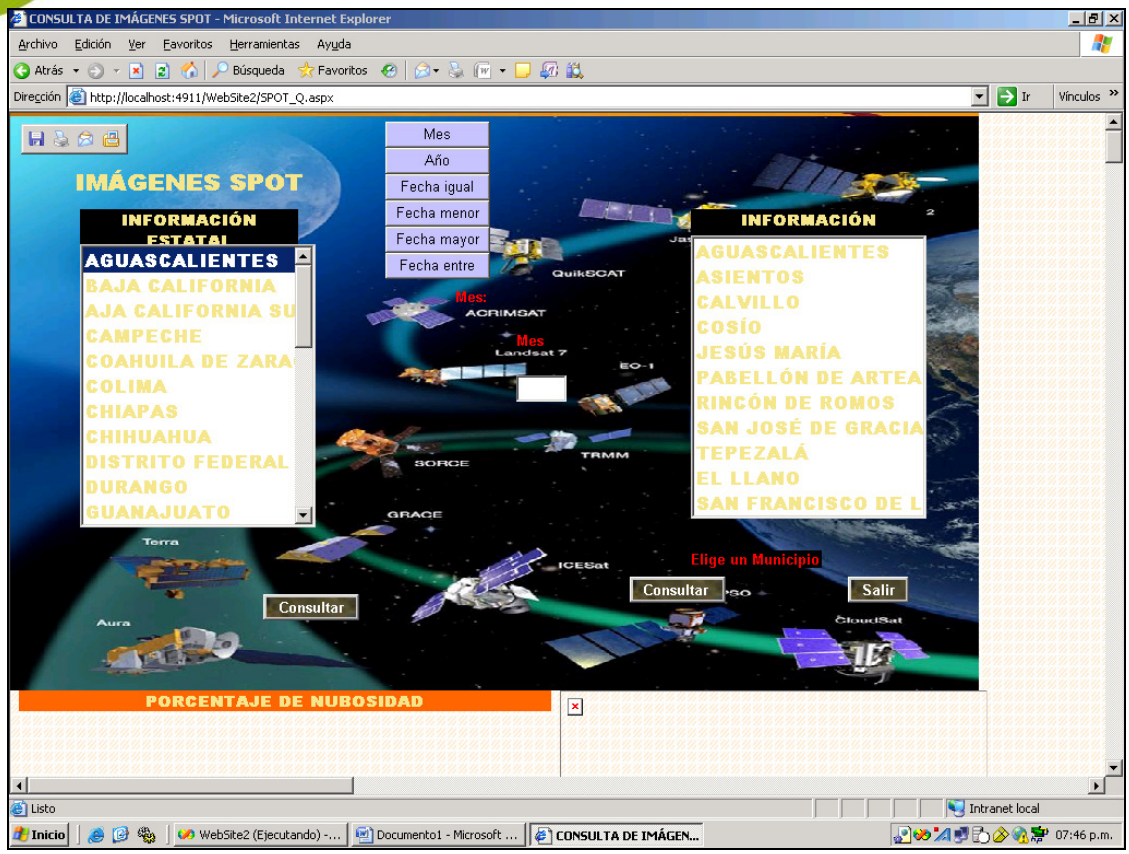

Figure 2. Searh of satellite images information at different levels.

3.2 Following versions

To facilitate access to SIINSAT-V1 users, version 2 (V2) will be migrated to a full Web application where forms will be redesigned and code will be adequately transferred so the system will be able to run on any computer.

4. CONCLUSIONS

Information management systems have extended to many areas especially in recent years. However there are still niches where such kinds of systems have not been developed; one such niche is management of satellite image information for applications to agriculture and land management. SINSAT-V1 is currently being used to manage main satellite imagery from sensors which include Landsat, Ikonos, Quickbird, RADARSART and SPOT among others. In Mexico there is an increasing demand for satellite images in the rural sector and within organizations and institutions which are concerned with obtaining information for research, decision support applications and

services. SINSAT-V1 is an effort to support different kinds of users and to fill an important void in this country.

5. REFERENCES

Pialorsi, P. and M. Russo. 2010. Programing Microsoft link in Microsoft.Net Framework 4. O´Reilly Media, Inc. Sebastopol, California, USA.

Powers, L. and M. Snell. 2006. Microsoft Visual Studio 2005 Unleashed. 1st edition. Indianapolis, Indiana 46240. USA.

Soria-Ruiz, J. 2012. Sistema de Información para el Inventario de Imágenes Satelitales del INIFAP. Ficha tecnológica validada en 2012. Laboratorio de Geomática- CIRCE-INIFAP. Zinacantepec 51350, México.

Sugumaran, R. and J. Degroote. 2010. Spatial Decision Support Systems: Principles and Practices. CRC Press. Taylor and Francis group. Printed in USA.