

Fondo Español de
Garantía Agraria

Evaluation of the use of Digital Pens in the updating of SIGPAC graphic database



MINISTERIO
DE AGRICULTURA, PESCA
Y ALIMENTACIÓN

FEGA

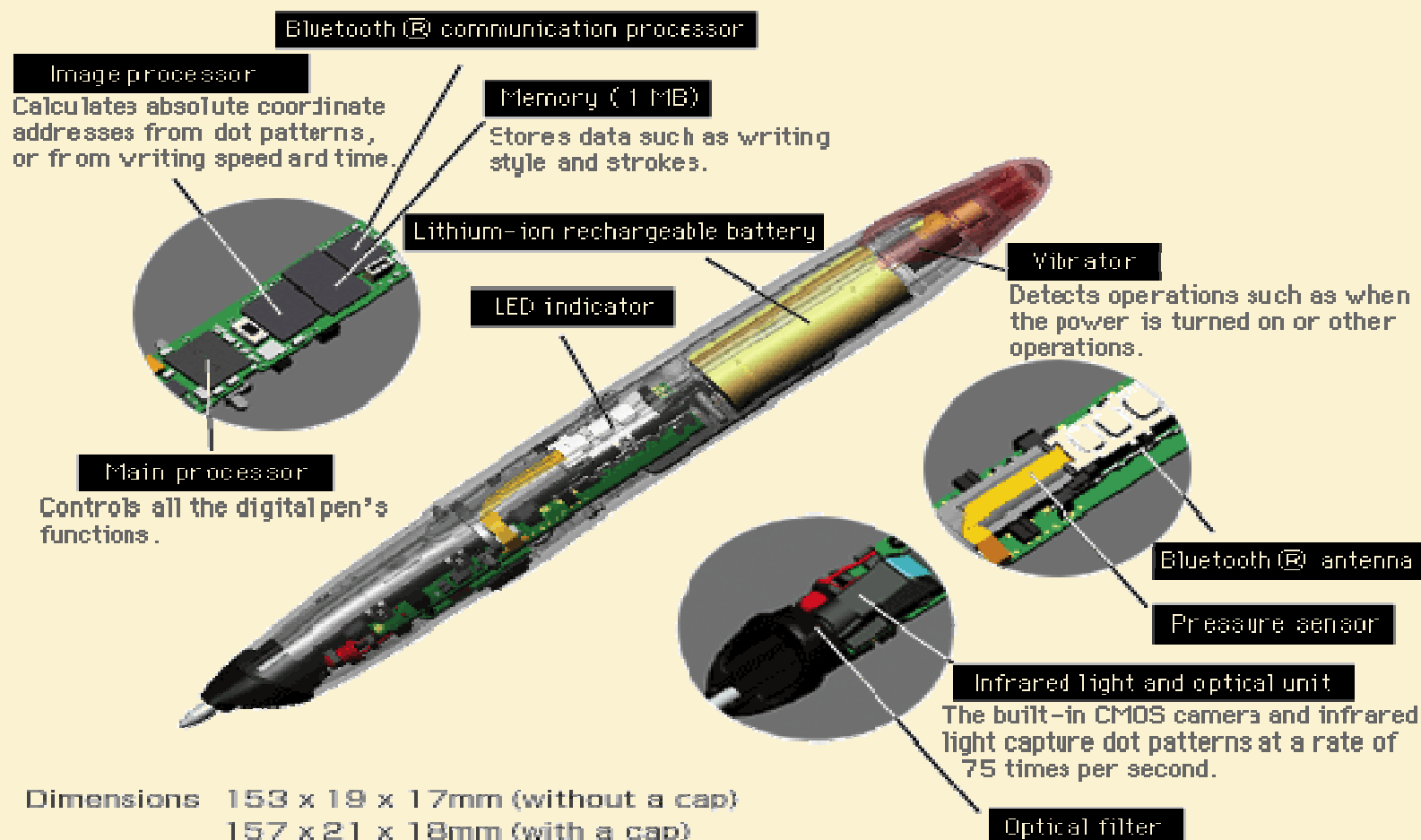




What is a digital Pen?

- A Digital Pen is a device which contains a built-in infrared camera, and is able to capture handwriting, and read the exact movement of the Pen on a working paper.
- The Pen recognizes the information thanks to a grid of small black dots, almost imperceptible to the naked eye, which are printed on the working paper.
- The grid, known as pattern, enables the digital Pen to capture the exact positions of the Pen tip as it moves on the page, and to instantly store the written or drawn strokes.

Necessary elements: Digital Pen



Necessary elements: pattern

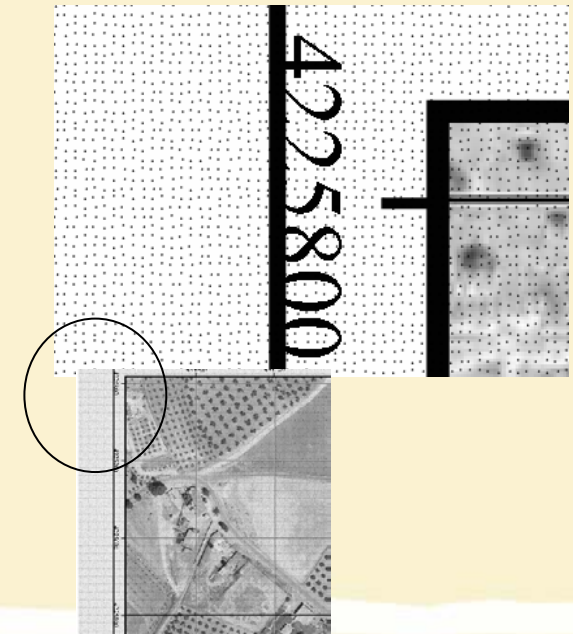
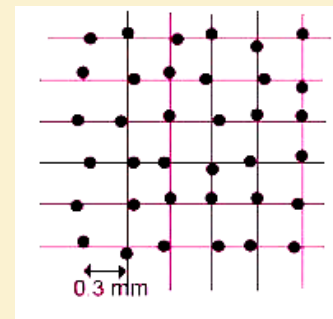
For storing data exactly as they have been written, the Pen needs to retain the coordinates of the Pen strokes on the paper. This is achieved using Anoto technology.

The pattern is printed on an ordinary paper and consists of tiny dots in a square grid. Each dot is spaced about 0.3 mm apart and lightly displaced from the mentioned grid.

The displacement of the dots in regard to the grid defines each Pen stroke of each Anoto document in a unique way.

There are two types of patterns:

- Unique pattern, in which each paper has a unique identifier in the whole Anoto universe.
- Copied pattern, in which the same pattern is used in several papers; the user decides when to start a new page. In this kind of pattern, there has to be a piece of data in the form that can be uniquely identified (bar code, etc.)



Standard forms

Text and marks

Text, Pen strokes and bar codes

Ejemplo de un formulario

Menú Archivo Salir

Datos del Formulario

Obs: Inconcreto Obs: Generar Fichero
Sabor y Aroma: Inconcreto Obs: Ins. para OCR

Textura y Otras Sensaciones en boca: Aceptable Obs: Ampliar

Persistencia y Gusto Residual: Bueno Obs: Ficha de Cata

Impresión Global: Aceptable Obs: Nº de Muestra

Obs: Fecha

Obs: Grupo

Obs: Firma


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SigPac SISTEMA DE IDENTIFICACION DE PARCELAS AGRICOLAS

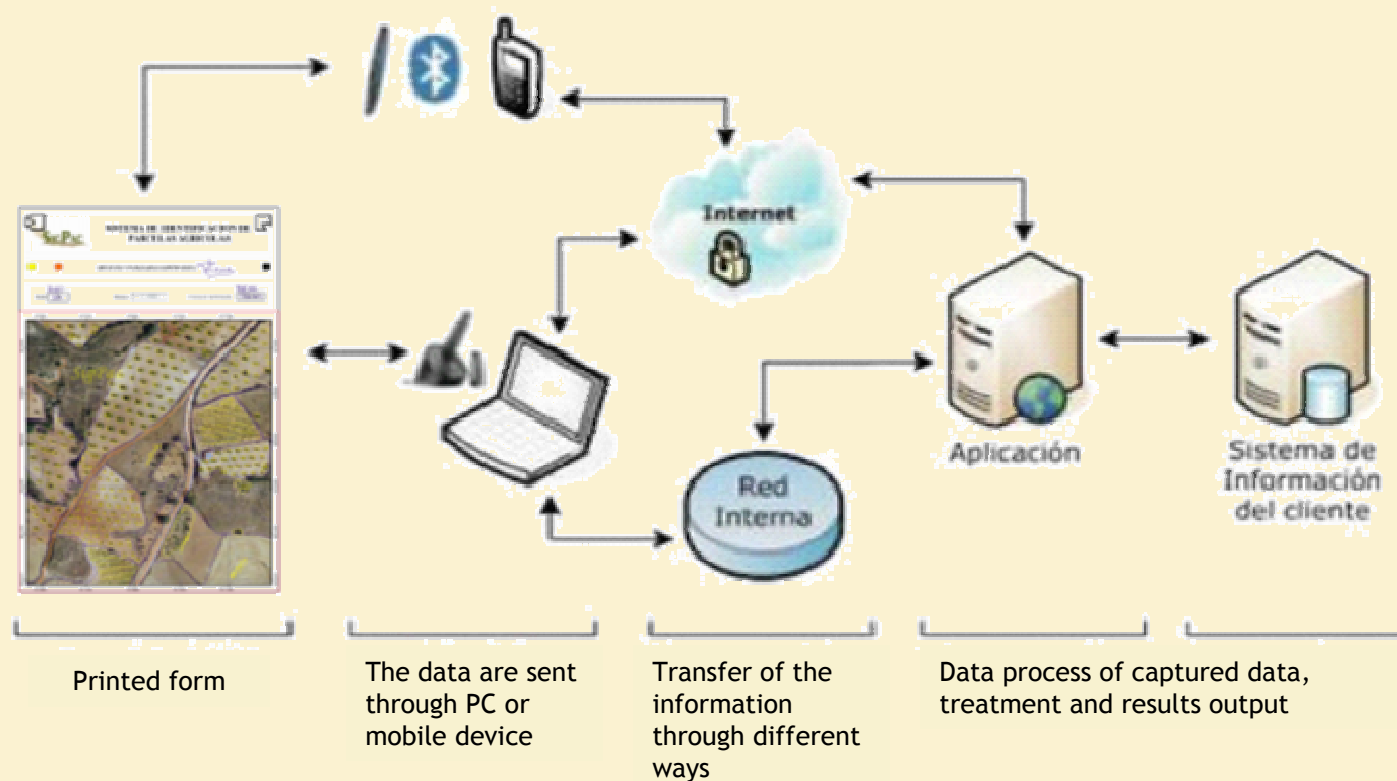
ORTOGRAFIA Y ANÁLISIS SUPERFICIES

HECHA: 22/05/2007 ESCALA: 1:10000 PERÍMETRO DE INTERÉS: 1000m

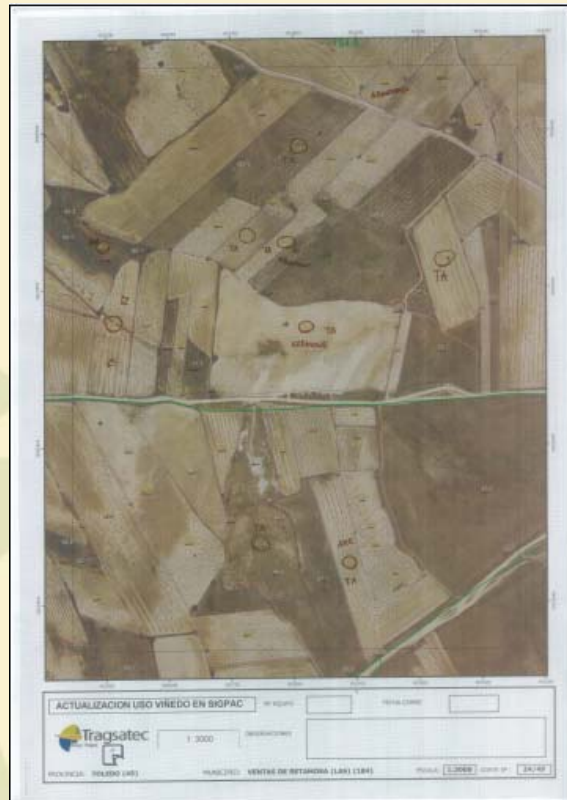
SigPac



Flow chart of a procedure based on the use of Digital Pen



Scheme of the updating SIGPAC process with Digital Pen



Collecting field data

(Graphic output in A3 format) Anoto form

Data transmission

(YFTP files)

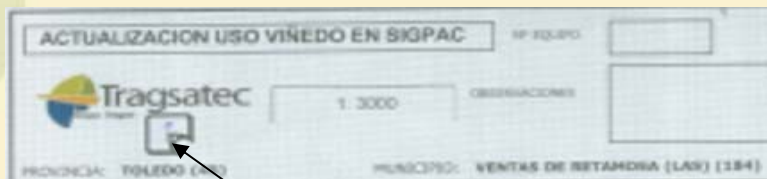
Processing on the screen

(Editor: SHP layer)

Data transmission



The Pen connects with a Bluetooth device (mobile phone or PC) and sends the data (approximately 20 Kb per handwritten A5 page).



Icon for sending information from the Pen to the phone via Bluetooth.

The mobile device should send the file through GPRS to a Web service.

Data reception

For each transmission, a proprietary Anoto PGC file is received.

The files contain the following information:

- Identification of the Pen.
- Identification of the dot pattern on which the form has been printed.
- Identification of each page.
- Pen strokes

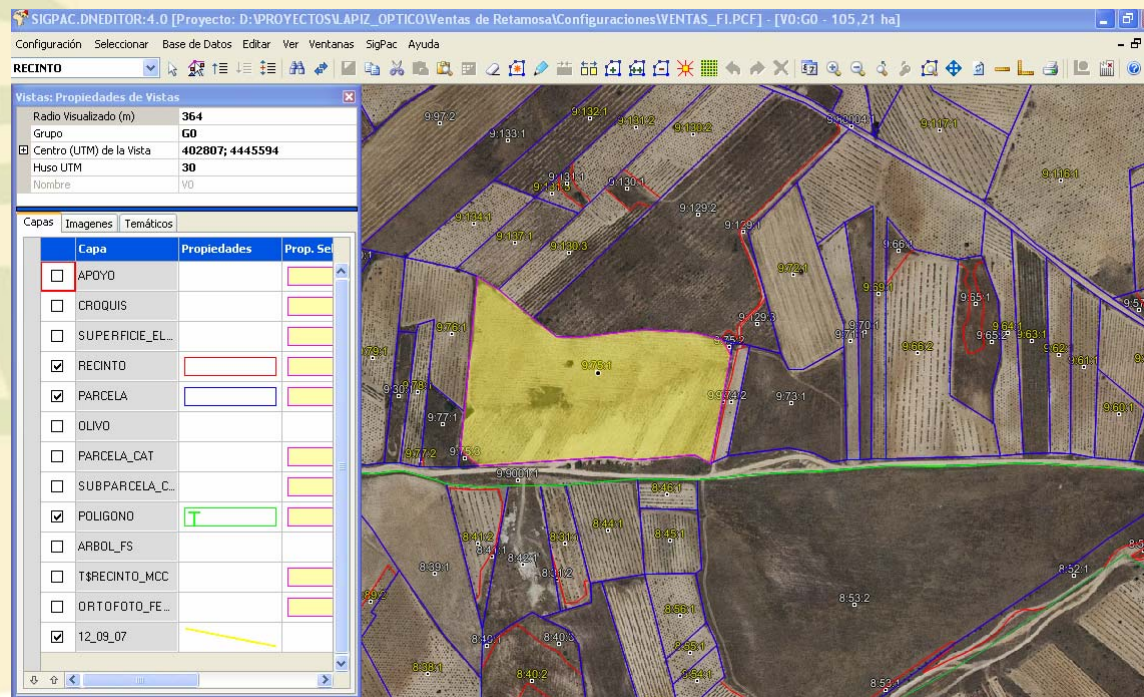
From this file, the following can be obtained:

- A graphic file (PNG, JPG, BMP) that represents an exact image of what has been written.
- A vector file (SVG), with the representation of each one of the actual strokes, which can be transformed into SHAPE format.

DNEditor: the tool for updating the SIGPAC graphic database



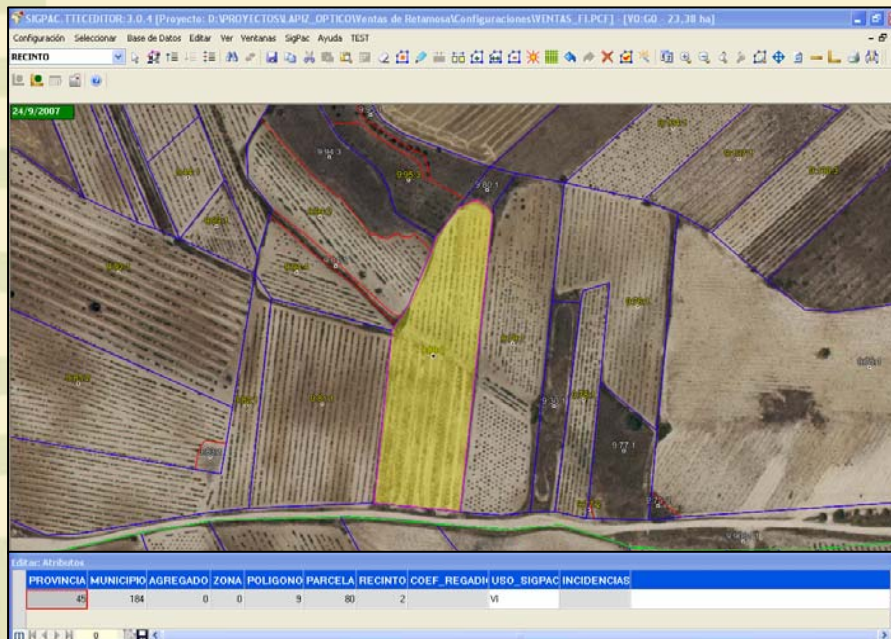
Once the field data has been obtained, transformed into Shape format and viewed on the computer screen, the modifications are integrated into the data base using DNEditor, a tool developed to update the SIGPAC graphic database.



These modifications can affect the graphic limits of the existing LPIS reference parcel in SIGPAC, or be only alphanumeric changes.

Processing the information I

Modification of LPIS reference parcel of vineyard use.



Initial situation of the LPIS reference parcel in SIGPAC

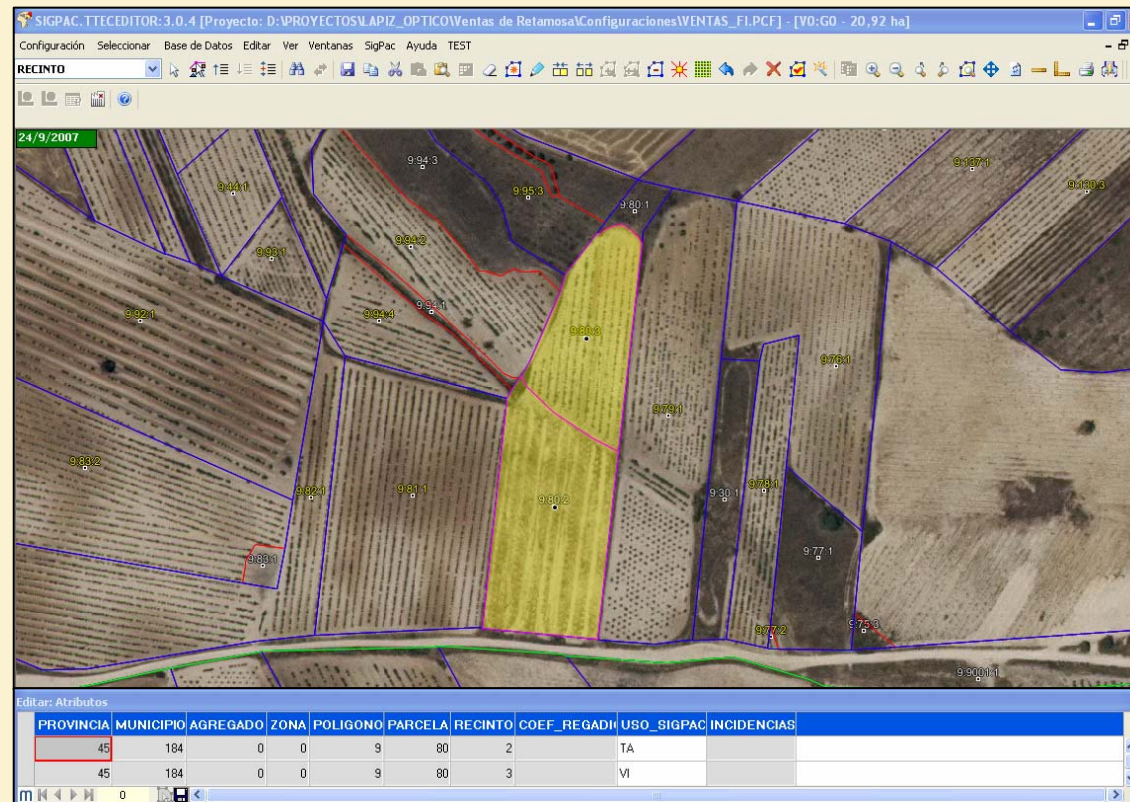


Modification indicated by the Shape layer.
Division of an LPIS reference parcel with two different SIGPAC land uses.



Processing the information II

Final situation in SIGPAC after modification: 2 LPIS reference parcels





Pros (+) and cons (-) of the Digital Pen

Pen vs standard paper graphic outputs

- (-) The Pen implies investment in equipment and has additional cost due to the use of patent-protected patterns.
- (-) The graphic outputs used with the Pen demand higher quality printers.
- (=) The field work is similar with both systems.
- (+) Information transfer between the field team and the edition site is much quicker.
- (+) The documents generated with the Pen can be stored as digital data.
- (+) The Pen ensures a better interpretation of the field data, so that a better LPIS reference parcel definition can be obtained.
- (+) With the Pen a reduction of the data process time for edition is achieved (reduction of 10-30%).

Pen vs PDA or TABLET PC equipment

- (+) The investment is lower than in portable equipments (1 Tablet PC \approx 10 Pens).
- (-) The Pen requires printing a big number of high quality graphic outputs.
- (-) The PDA or TABLET PC equipments enable detail zooms, while the paper output used with the Pen has a fixed scale.
- (-) The PDA or TABLET PC equipments with GPS, can be used for navigation and precision land survey.
- (+) The Pen has longer working autonomy and is more robust.
- (+) The Pen allows to optimize field times, delaying edition to the office
- (=) The Pen needs a production process, meanwhile the PDA or TABLET PC equipments require download and uploading of working files.



Conclusions

1. The use of the digital Pen is feasible.
2. The Pen can be used as a complement to portable equipments.
3. When working in dispersed parcels or quality control jobs, better results are obtained with PDA and Tablet with GPS.
4. In systematic work on contiguous parcels, the Pen is more effective.
5. The Pen requires establishing a production process (reception - post-processing - integration) that is worthwhile only for big workloads.
6. The automation in field data downloading and its processing is the key point. The possibilities of integration improvements make the Pen potentially very interesting.

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