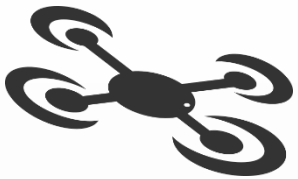
PROYECTO NANTI

Naves Aéreas No Tripuladas para Investigación y fotogrametría

Andrés Barahona Contreras

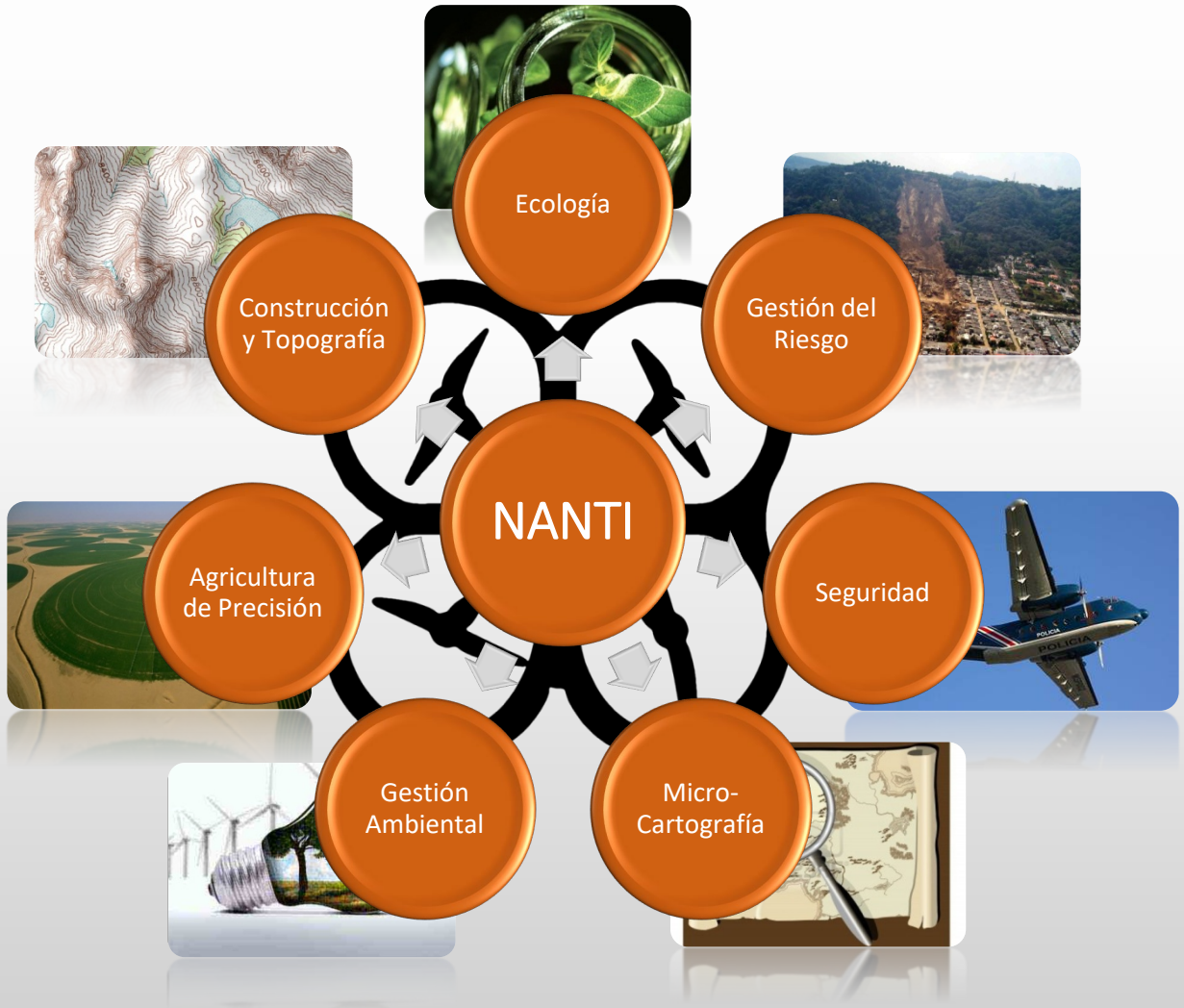
Objetivo



Generar datos para la investigación mediante el uso de VANT y fotogrametría

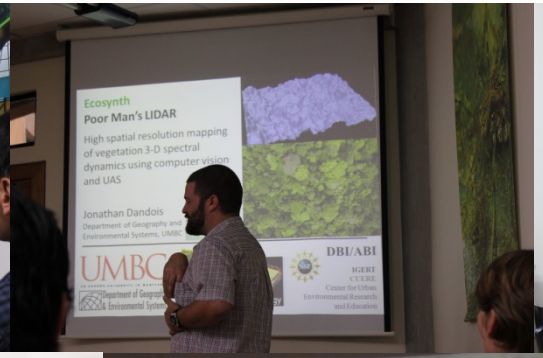
Interés del Laboratorios PRIAS

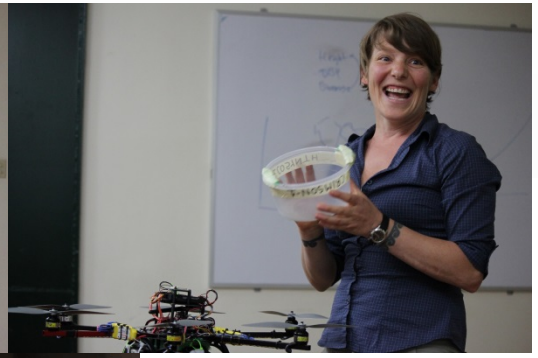
- Solución de toma de datos de bajo costo
- Fotografías puntuales de alta resolución
- Nubes de puntos homólogas a LiDAR

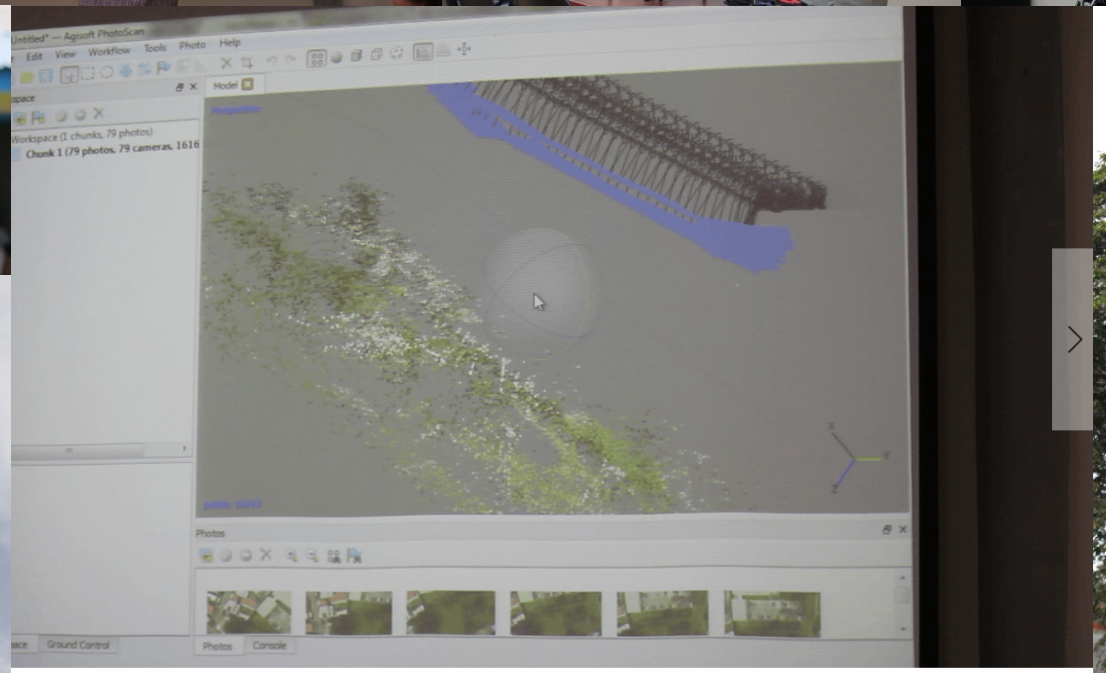


ORIGEN

Proyecto Ecosynth

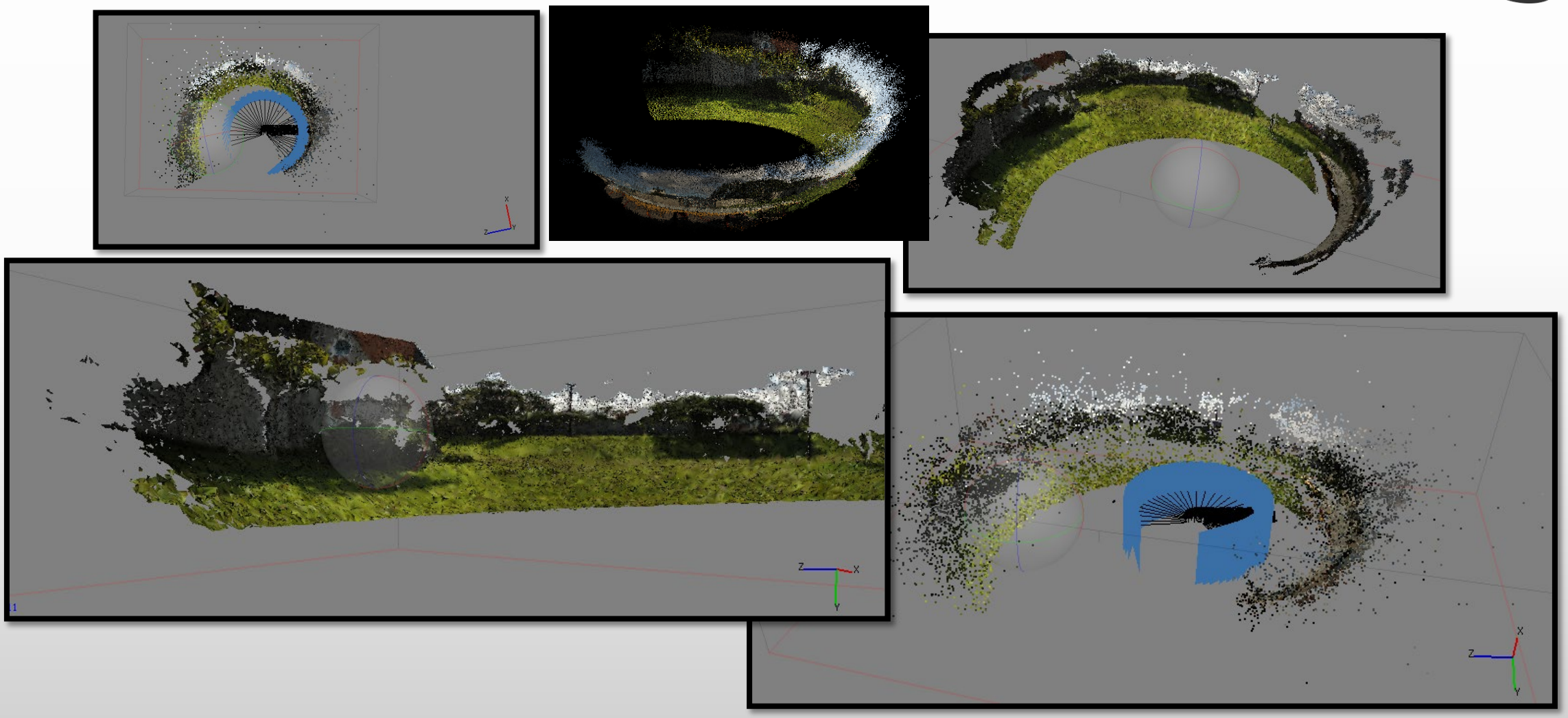



INTERÉS EN EL ÁREA

FOTOGRAMETRÍA

Pruebas en fotogrametría



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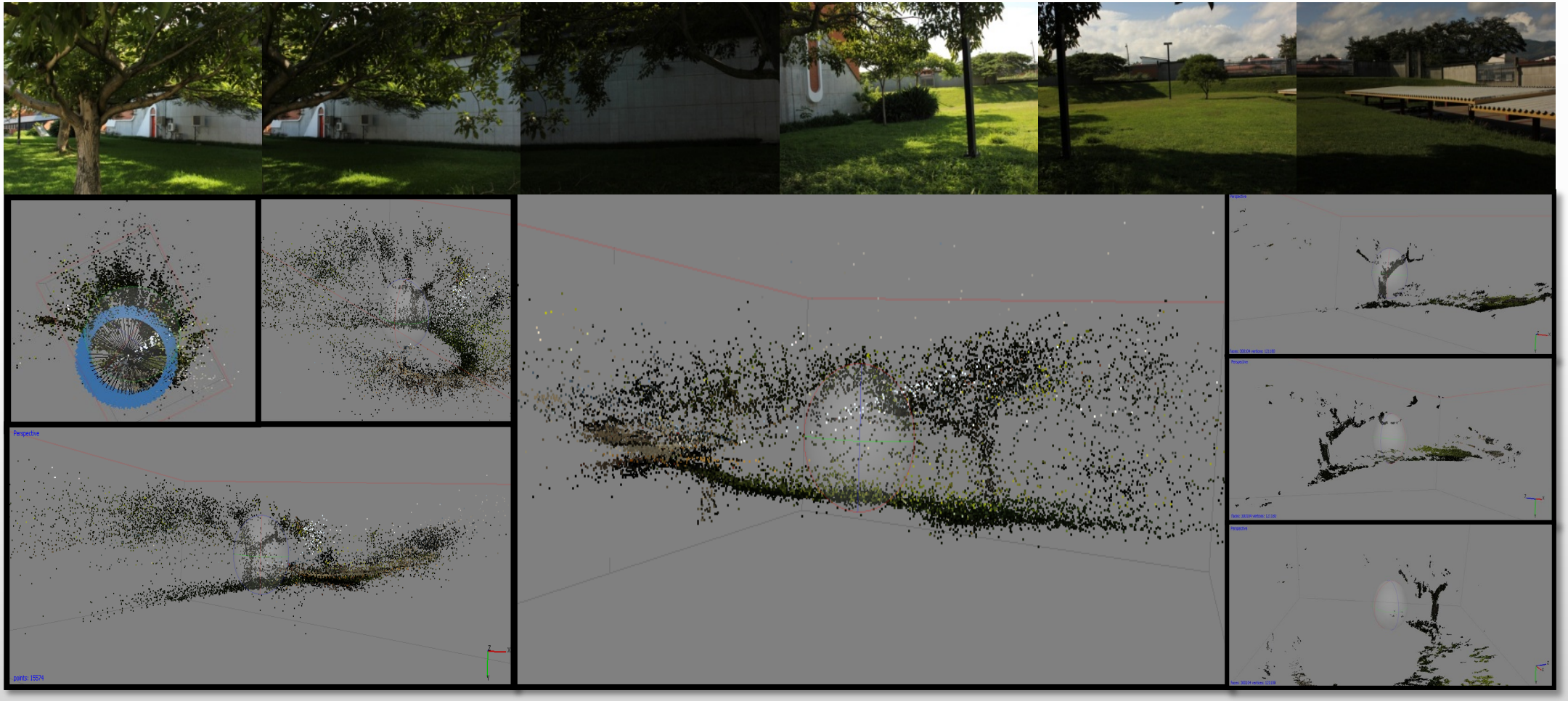

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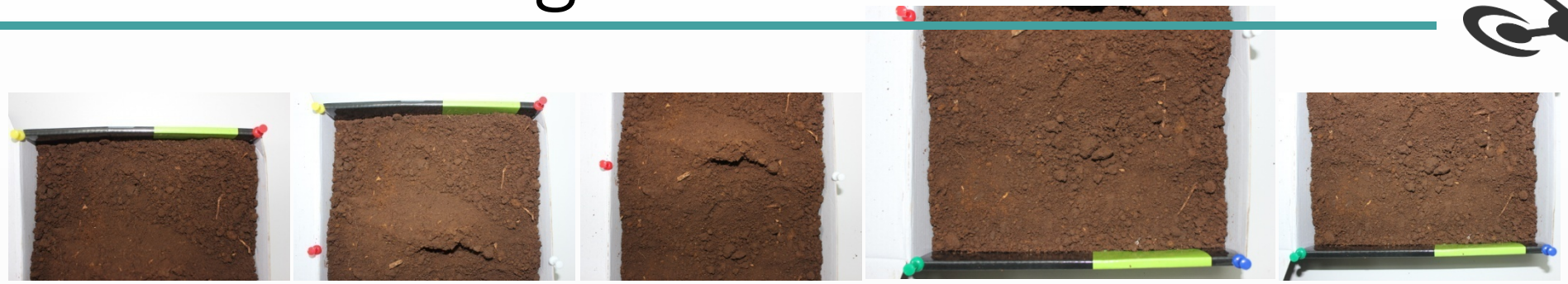

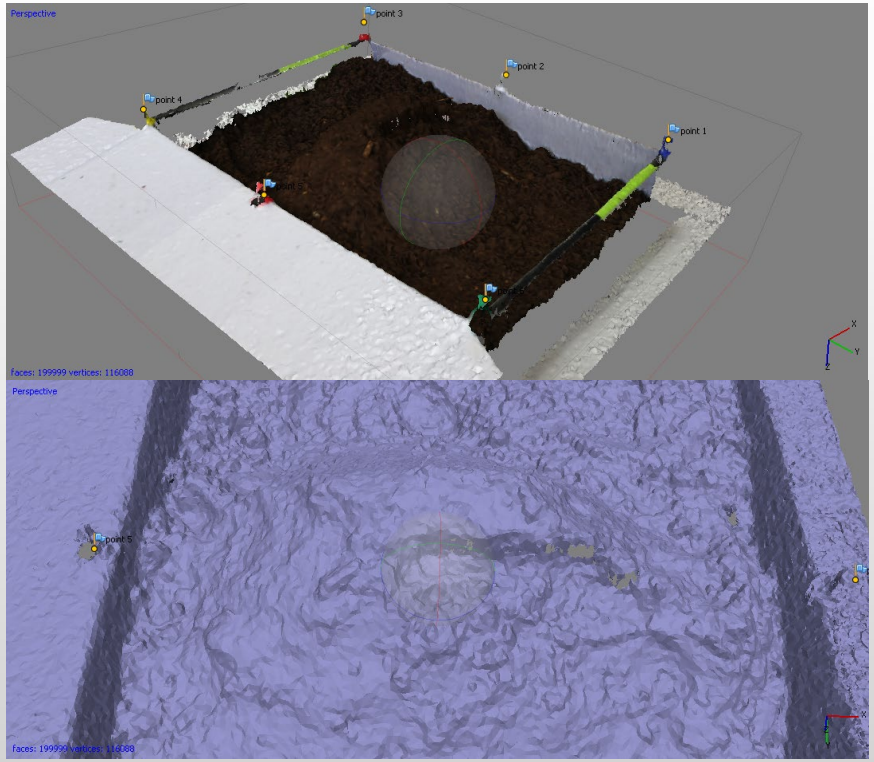

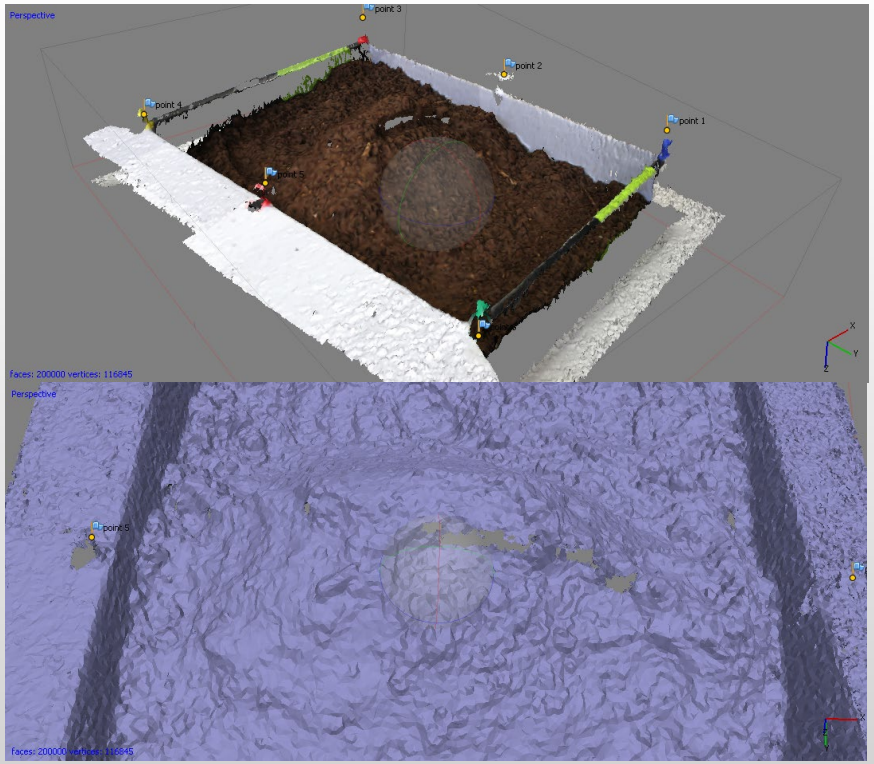

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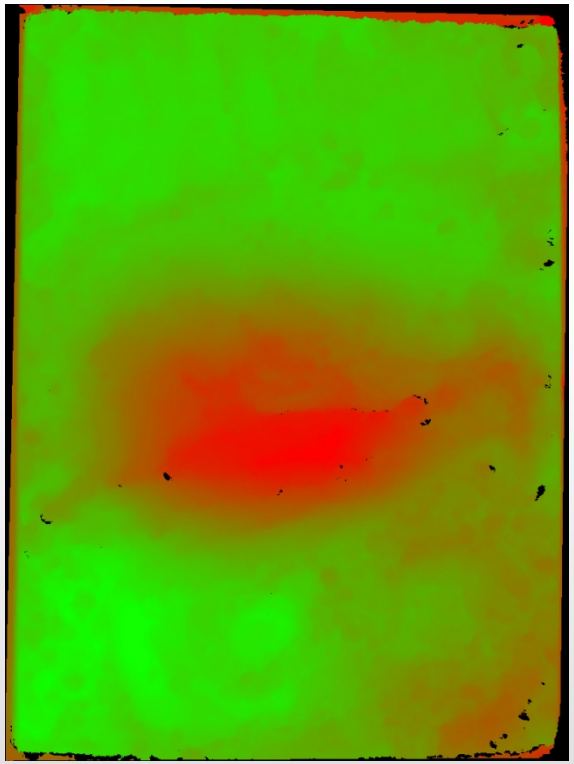
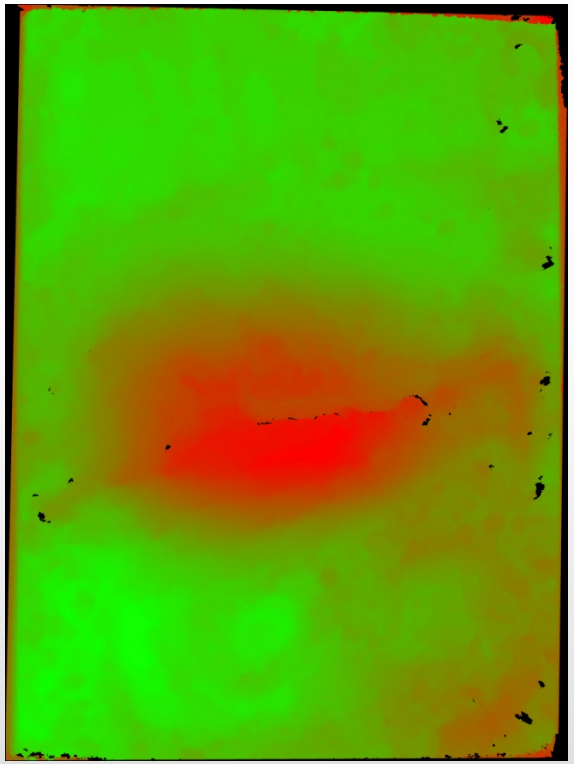
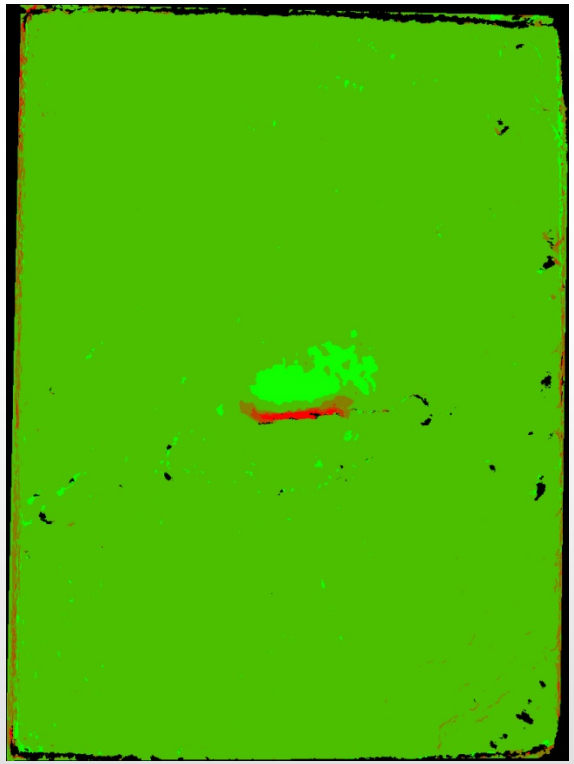


Modelo del 1er mes



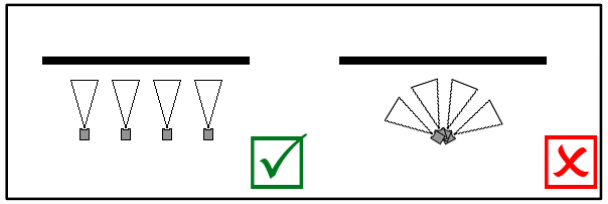
Modelo del 2do mes

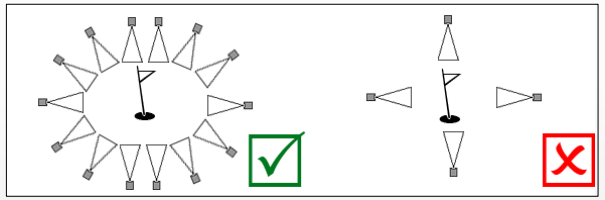


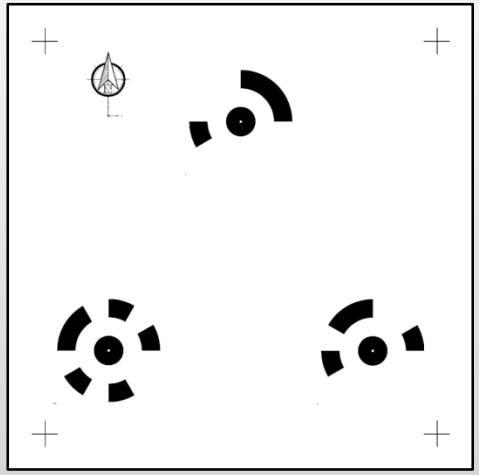
Mapa de diferencia

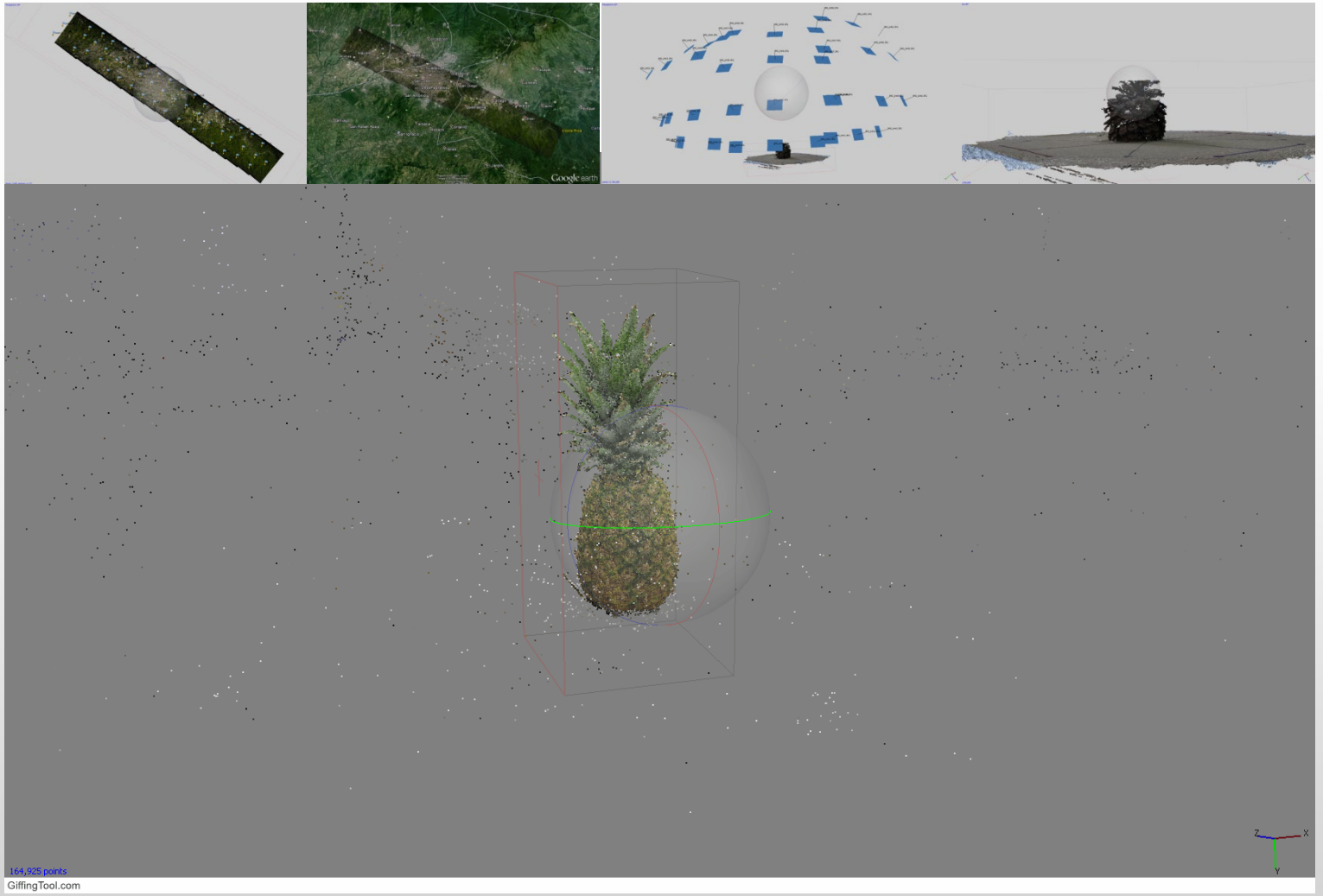
PRODUCTOS DESARROLLADOS

Metodología en toma de datos



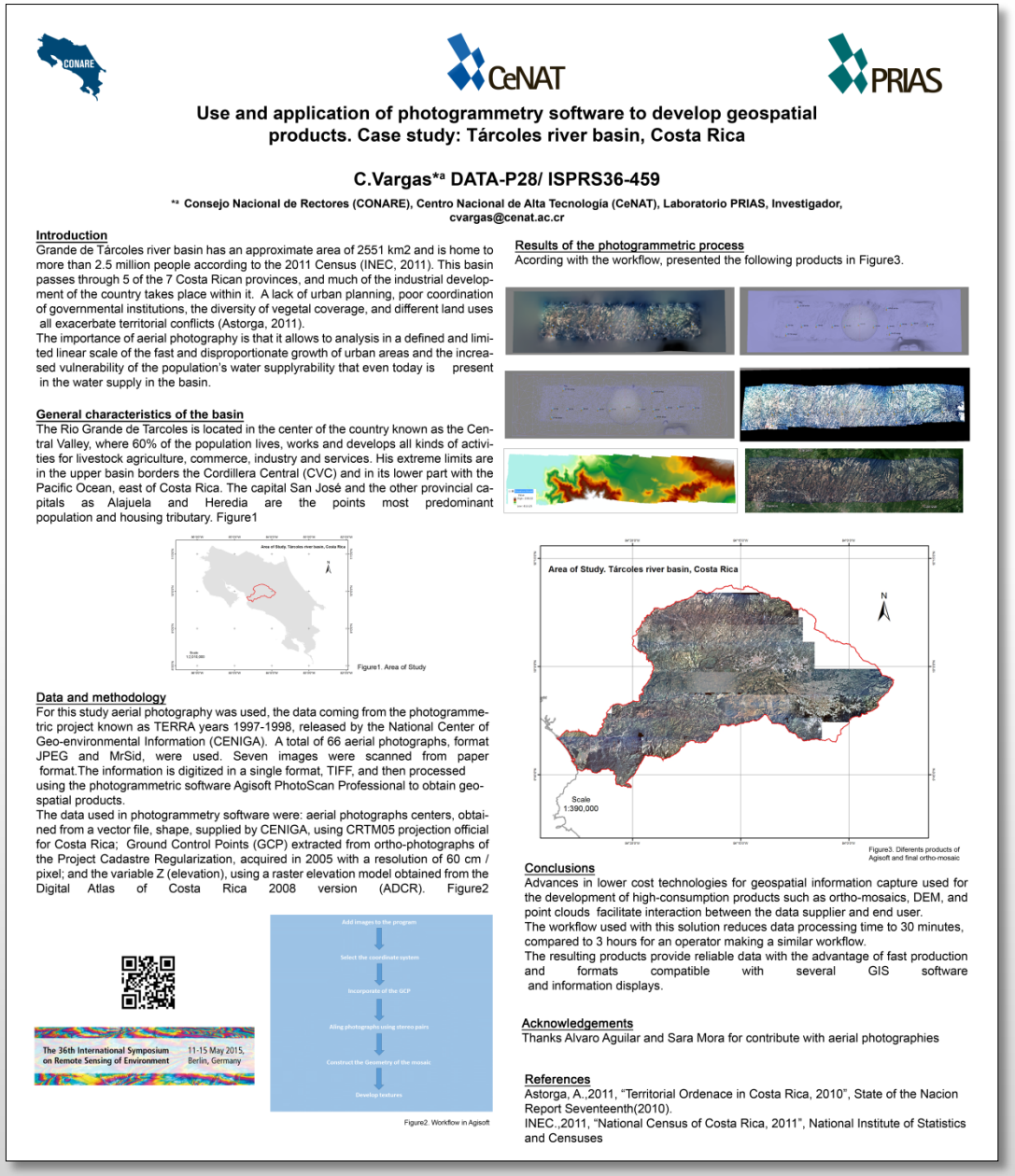






Presentación en ISRSE36

- Use and aplication of photogrammetry software to develop geospatial products. Case study: Tárcoles river basin, Costa Rica



Use and application of photogrammetry software to develop geospatial products. Case study: Tárcoles river basin, Costa Rica

C.Vargas*[a] DATA-P28/ ISPRS36-459

** Consejo Nacional de Rectores (CONARE), Centro Nacional de Alta Tecnologia (CeNAT), Laboratorio PRIAS, Investigador, cvargas@cenat.ac.cr

Introduction

Grande de Tárcoles river basin has an approximate area of 2551 km2 and is home to more than 2.5 million people according to the 2011 Census (INEC, 2011). This basin passes through 5 of the 7 Costa Rican provinces, and much of the industrial development of the country takes place within it. A lack of urban planning, poor coordination of governmental institutions, the diversity of vegetal coverage, and different land uses all exacerbate territorial conflicts (Astorga, 2011).
The importance of aerial photography is that it allows to analysis in a defined and limited linear scale of the fast and disproportionate growth of urban areas and the increased vulnerability of the population's water supplyrability that even today is present in the water supply in the basin.

General characteristics of the basin

The Rio Grande de Tarcoles is located in the center of the country known as the Central Valley, where 60% of the population lives, works and develops all kinds of activities for livestock agriculture, commerce, industry and services. His extreme limits are in the upper basin borders the Cordillera Central (CVC) and in its lower part with the Pacific Ocean, east of Costa Rica. The capital San José and the other provincial capitals as Alajuela and Heredia are the points most predominant population and housing tributary. Figure1

Figure1. Area of Study

Data and methodology

For this study aerial photography was used, the data coming from the photogrammetric project known as TERRA years 1997-1998, released by the National Center of Geo-environmental Information (CENIGA). A total of 66 aerial photographs, format JPEG and MrSid, were used. Seven images were scanned from paper format.The information is digitized in a single format, TIFF, and then processed using the photogrammetric software Agisoft PhotoScan Professional to obtain geospatial products.
The data used in photogrammetry software were: aerial photographs centers, obtained from a vector file, shape, supplied by CENIGA, using CRTM05 projection official for Costa Rica; Ground Control Points (GCP) extracted from ortho-photographs of the Project Cadastre Regularization, acquired in 2005 with a resolution of 60 cm / pixel; and the variable Z (elevation), using a raster elevation model obtained from the Digital Atlas of Costa Rica 2008 version (ADCR). Figure2

The 36th International Symposium on Remote Sensing of Environment 11-15 May 2015, Berlin, Germany

Figure2. Workflow in Agisoft

Results of the photogrammetric process

Acording with the workflow, presented the following products in Figure3.

Area of Study. Tárcoles river basin, Costa Rica

Scale 1:390,000

Figure3. Diferents products of Agisoft and final ortho-mosaic

Conclusions

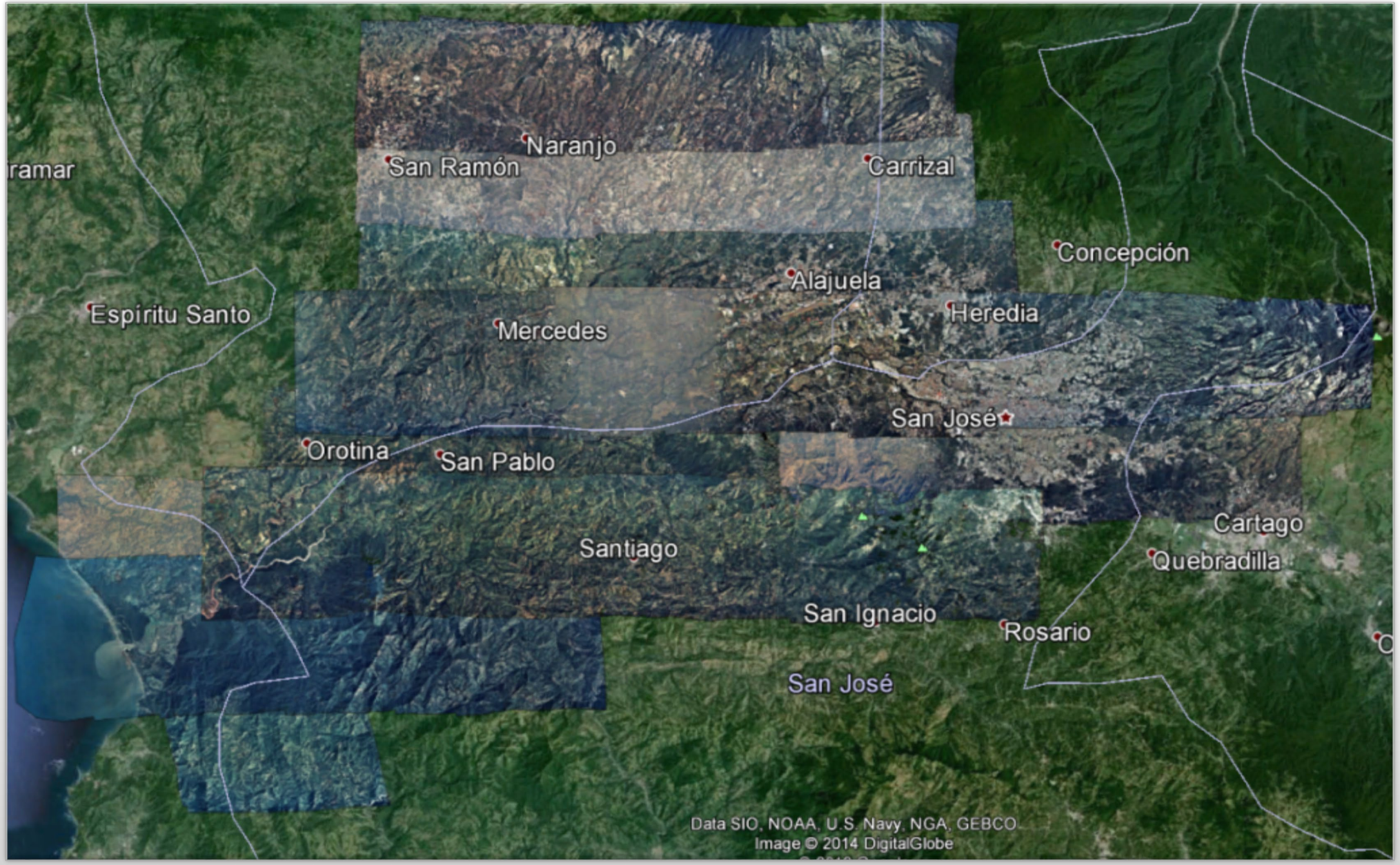
Advances in lower cost technologies for geospatial information capture used for the development of high-consumption products such as ortho-mosaics, DEM, and point clouds facilitate interaction between the data supplier and end user.
The workflow used with this solution reduces data processing time to 30 minutes, compared to 3 hours for an operator making a similar workflow.
The resulting products provide reliable data with the advantage of fast production and formats compatible with several GIS software and information displays.

Acknowledgements

Thanks Alvaro Aguilar and Sara Mora for contribute with aerial photographies

References

Astorga, A.,2011, "Territorial Ordenace in Costa Rica, 2010", State of the Nacion Report Seventeenth(2010).
INEC.,2011, "National Census of Costa Rica, 2011", National Institute of Statistics and Censuses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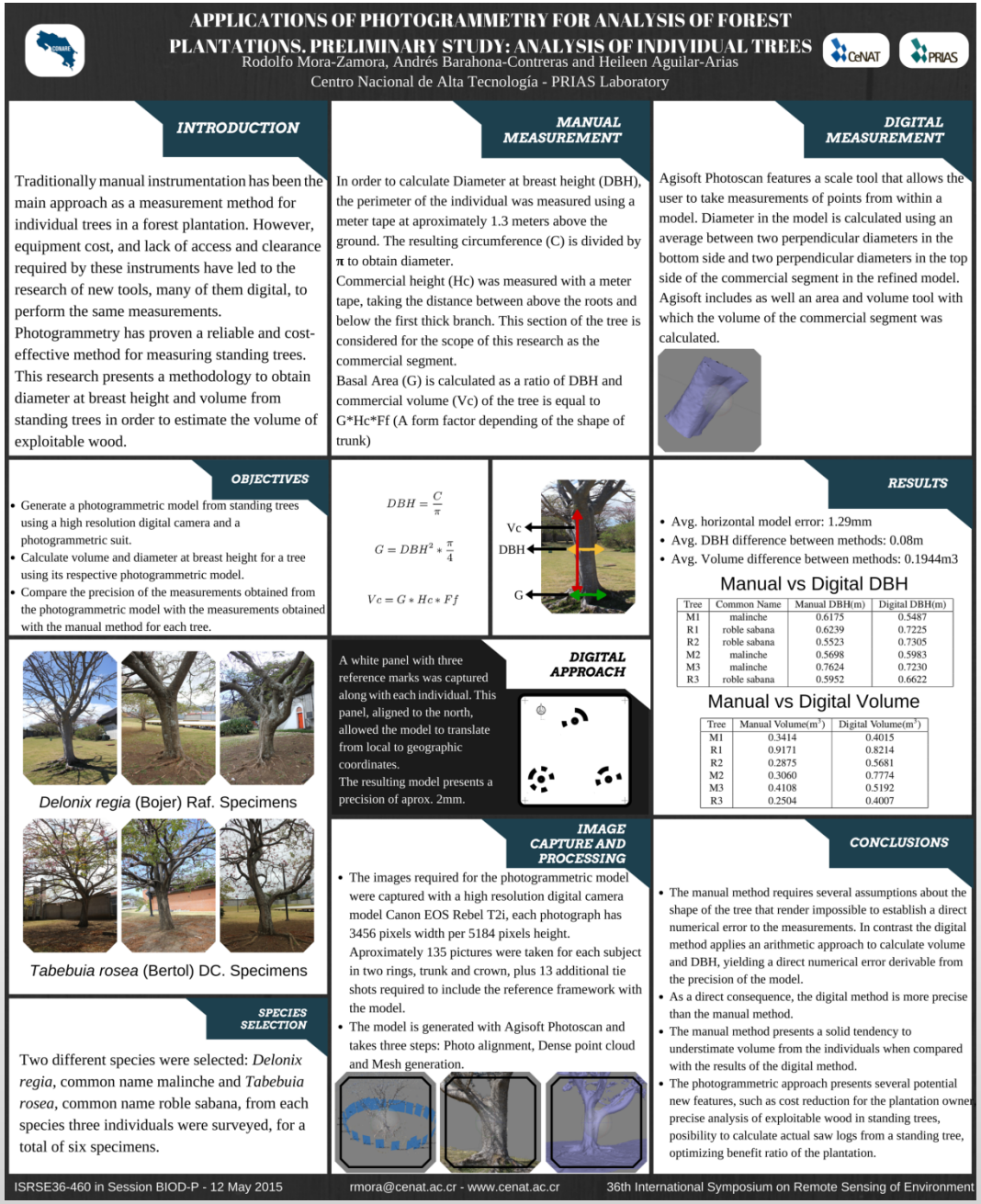
Carrizal
Concepción
Alajuela
Espiritu Santo
Heredia
Mercedes
San José
Orotina
San Pablo
Cartago
Santiago
Quebradilla
San Ignacio
Rosario
San José
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2014 DigitalGlobe

Presentación en ISRSE36

- Applications of photogrammetry for analysis of forest plantations. Preliminary study: analysis of individual trees



APPLICATIONS OF PHOTOGRAMMETRY FOR ANALYSIS OF FOREST PLANTATIONS. PRELIMINARY STUDY: ANALYSIS OF INDIVIDUAL TREES

Rodolfo Mora-Zamora, Andrés Barahona-Contreras and Heileen Aguilar-Arias
Centro Nacional de Alta Tecnología - PRIAS Laboratory

INTRODUCTION

Traditionally manual instrumentation has been the main approach as a measurement method for individual trees in a forest plantation. However, equipment cost, and lack of access and clearance required by these instruments have led to the research of new tools, many of them digital, to perform the same measurements.
Photogrammetry has proven a reliable and cost-effective method for measuring standing trees. This research presents a methodology to obtain diameter at breast height and volume from standing trees in order to estimate the volume of exploitable wood.

MANUAL MEASUREMENT

In order to calculate Diameter at breast height (DBH), the perimeter of the individual was measured using a meter tape at aproximately 1.3 meters above the ground. The resulting circumference (C) is divided by π to obtain diameter.
Commercial height (Hc) was measured with a meter tape, taking the distance between above the roots and below the first thick branch. This section of the tree is considered for the scope of this research as the commercial segment.
Basal Area (G) is calculated as a ratio of DBH and commercial volume (Vc) of the tree is equal to G*Hc*Ff (A form factor depending of the shape of trunk)

DIGITAL MEASUREMENT

Agisoft Photoscan features a scale tool that allows the user to take measurements of points from within a model. Diameter in the model is calculated using an average between two perpendicular diameters in the bottom side and two perpendicular diameters in the top side of the commercial segment in the refined model. Agisoft includes as well an area and volume tool with which the volume of the commercial segment was calculated.

OBJECTIVES

- Generate a photogrammetric model from standing trees using a high resolution digital camera and a photogrammetric suit.
- Calculate volume and diameter at breast height for a tree using its respective photogrammetric model.
- Compare the precision of the measurements obtained from the photogrammetric model with the measurements obtained with the manual method for each tree.

$$DBH = \frac{C}{\pi}$$

$$G = DBH^2 * \frac{\pi}{4}$$

$$Vc = G * Hc * Ff$$

Vc
DBH
G

RESULTS

- Avg. horizontal model error: 1.29mm
- Avg. DBH difference between methods: 0.08m
- Avg. Volume difference between methods: 0.1944m3

Manual vs Digital DBH

Tree	Common Name	Manual DBH(m)	Digital DBH(m)
M1	malinche	0.6175	0.5487
R1	roble sabana	0.6239	0.7225
R2	roble sabana	0.5523	0.7305
M2	malinche	0.5698	0.5983
M3	malinche	0.7624	0.7230
R3	roble sabana	0.5952	0.6622

Manual vs Digital Volume

Tree	Manual Volume(m^3)	Digital Volume(m^3)
M1	0.3414	0.4015
R1	0.9171	0.8214
R2	0.2875	0.5681
M2	0.3060	0.7774
M3	0.4108	0.5192
R3	0.2504	0.4007

Delonix regia (Bojer) Raf. Specimens

Tabebuia rosea (Bertol) DC. Specimens

DIGITAL APPROACH

A white panel with three reference marks was captured along with each individual. This panel, aligned to the north, allowed the model to translate from local to geographic coordinates.
The resulting model presents a precision of aprox. 2mm.

SPECIES SELECTION

Two different species were selected: *Delonix regia*, common name malinche and *Tabebuia rosea*, common name roble sabana, from each species three individuals were surveyed, for a total of six specimens.

IMAGE CAPTURE AND PROCESSING

- The images required for the photogrammetric model were captured with a high resolution digital camera model Canon EOS Rebel T2i, each photograph has 3456 pixels width per 5184 pixels height.
  Aproximately 135 pictures were taken for each subject in two rings, trunk and crown, plus 13 additional tie shots required to include the reference framework with the model.
- The model is generated with Agisoft Photoscan and takes three steps: Photo alignment, Dense point cloud and Mesh generation.

CONCLUSIONS

- The manual method requires several assumptions about the shape of the tree that render impossible to establish a direct numerical error to the measurements. In contrast the digital method applies an arithmetic approach to calculate volume and DBH, yielding a direct numerical error derivable from the precision of the model.
- As a direct consequence, the digital method is more precise than the manual method.
- The manual method presents a solid tendency to understimate volume from the individuals when compared with the results of the digital method.
- The photogrammetric approach presents several potential new features, such as cost reduction for the plantation owner precise analysis of exploitable wood in standing trees, posibility to calculate actual saw logs from a standing tree, optimizing benefit ratio of the plantation.

ISRSE36-460 in Session BIOD-P - 12 May 2015
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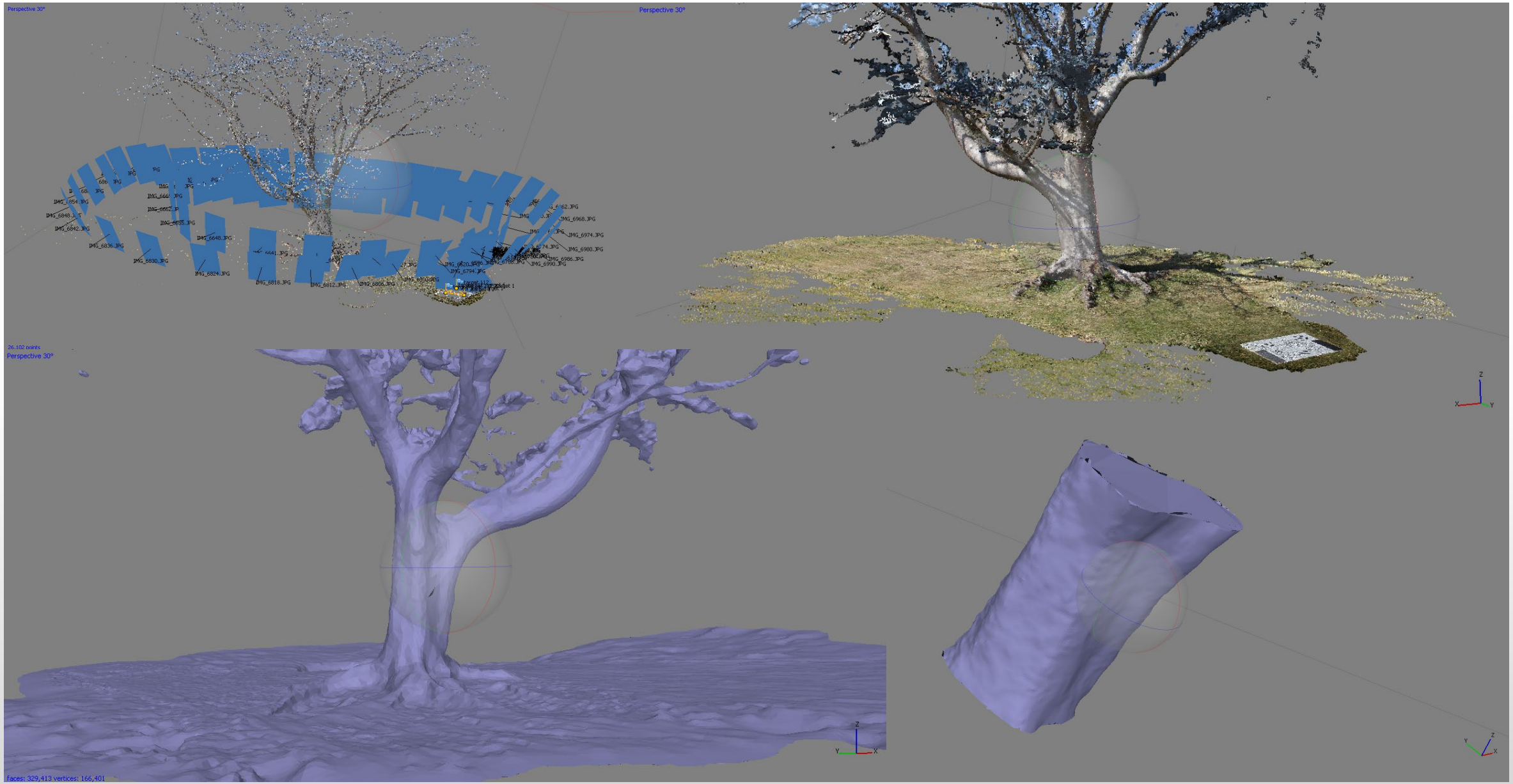
36th International Symposium on Remote Sensing of Environment


Perspective 30°
Perspective 30°
26,102 points
Perspective 30°
faces: 329,413 vertices: 166,401

VEHÍCULOS AÉREOS NO TRIPULADOS

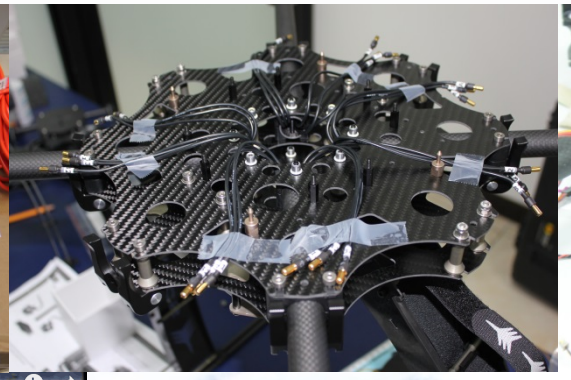
Vehículos aéreos no tripulados

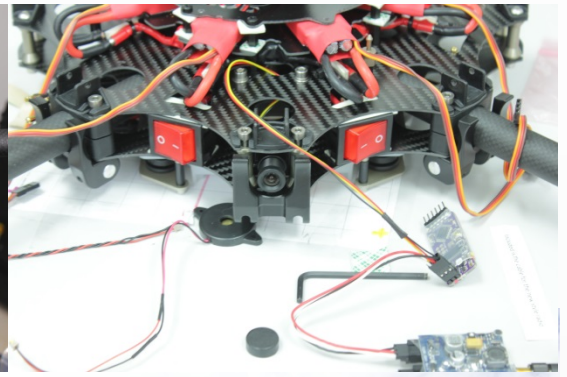
3DR X8

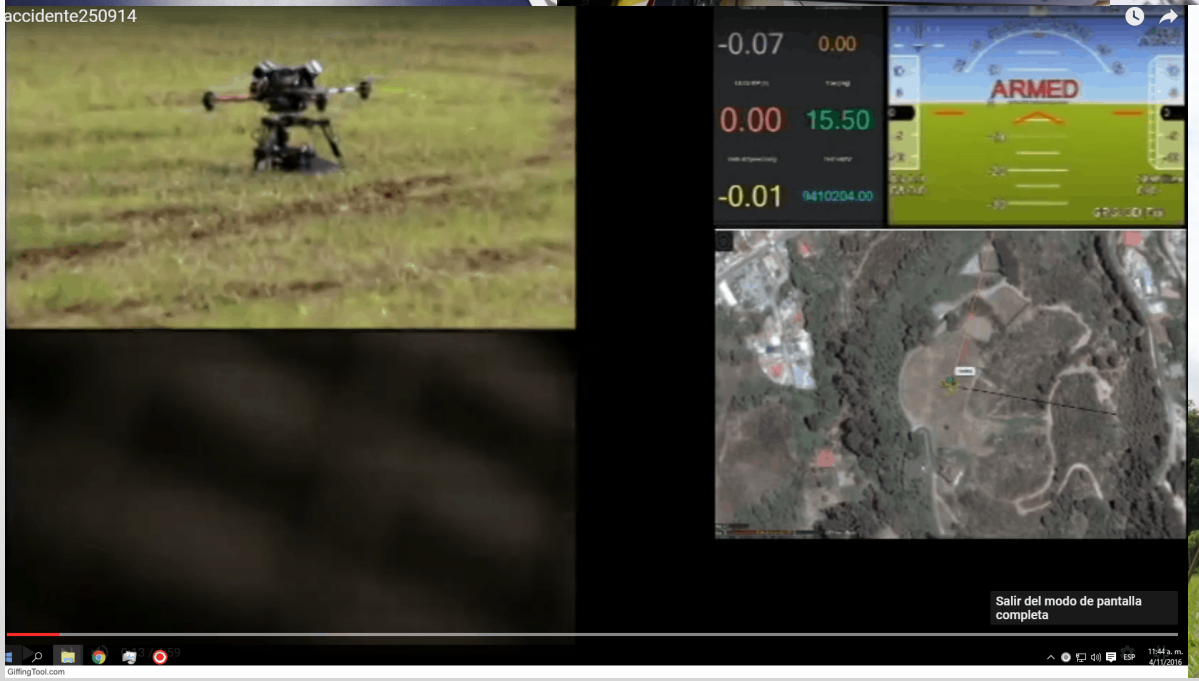




Ski Jib x4



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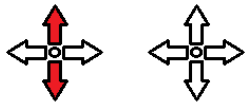
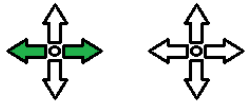
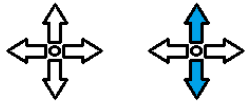
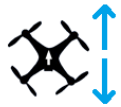
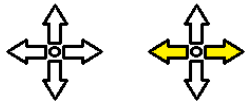
GiffingTool.com

Phantom 3

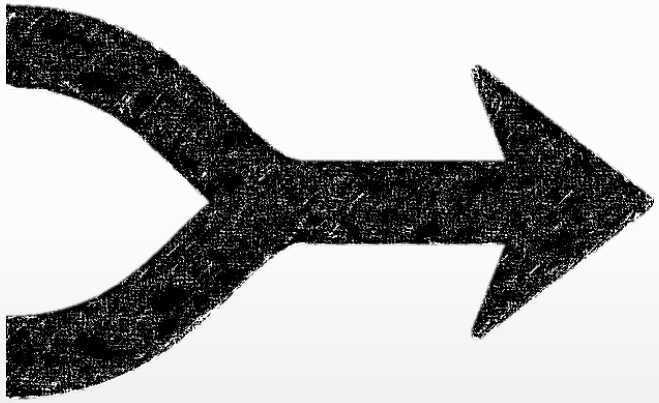
PRODUCTOS

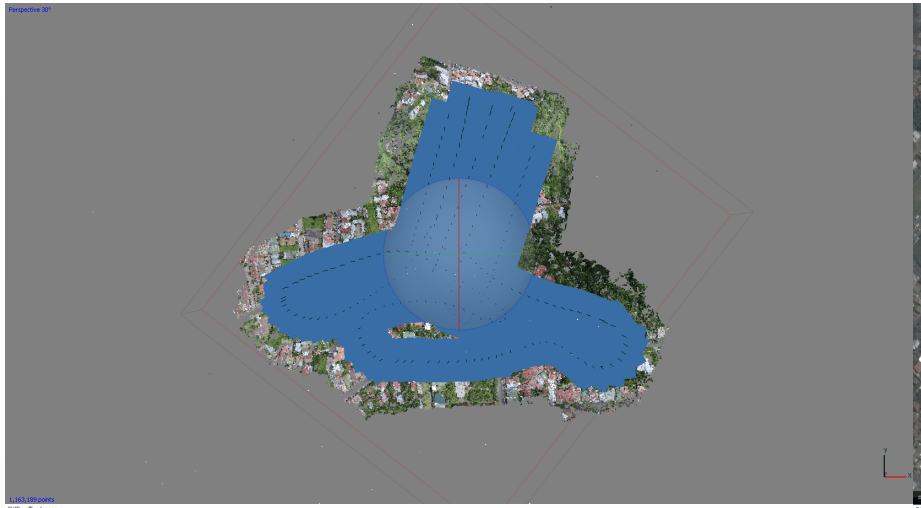
Capacitación de operación UAV

Mando			Movimiento
	Throttle	Aceleración	
	Yaw	Guiñada	
	Pitch	Cabeceo	
	Roll	Alabeo	

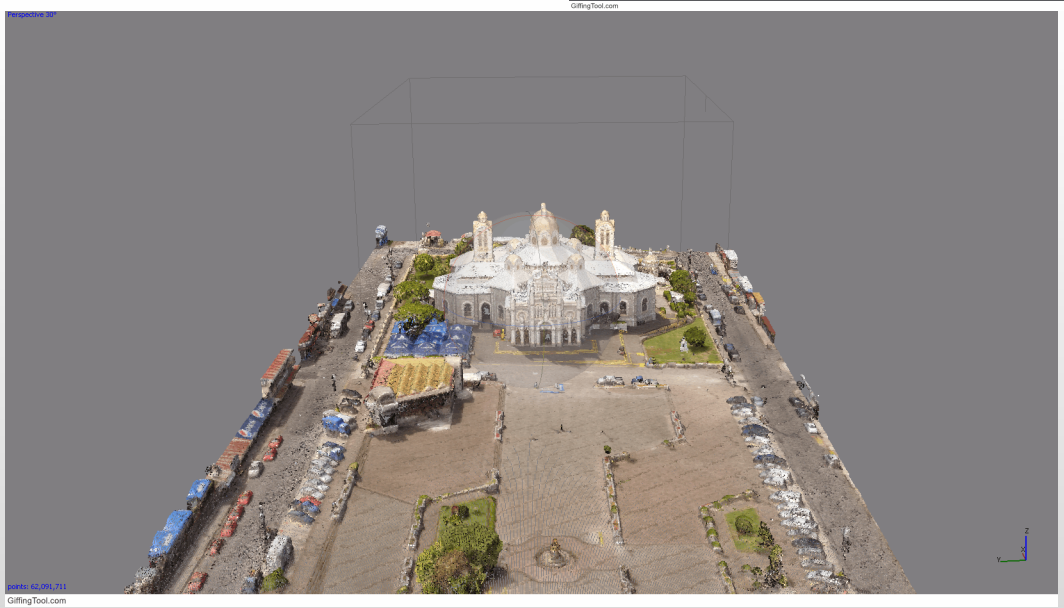
Protocolos de misiones UAV en el laboratorio PRIAS

- Misiones
- Pre operación
- Despegue
- Vuelo
- Aterrizaje
- Seguridad




Perspective 30°
GiffingTool.com


Google Earth
GiffingTool.com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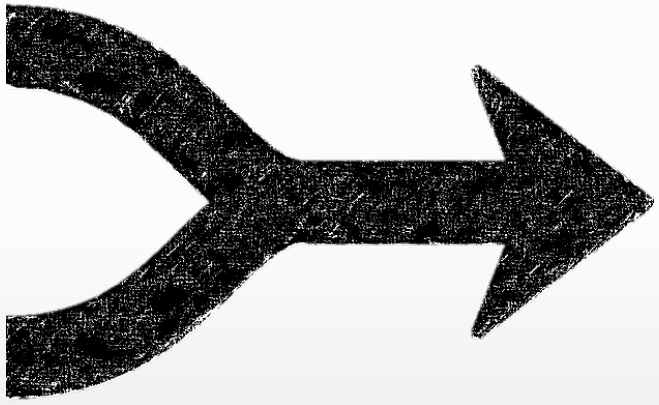
GiffingTool.com



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