USE OF UAV PLATFORM AS AN AUTONOMOUS TOOL FOR ESTIMATING EXPANSION ON INVADED AGRICULTURAL LAND

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1 - INTRODUCTION

Land conflicts have always been part of the country`s history and often motivated by disputes over property and land use (Brumer and Santos, 2012). Over the decades, it can be seen efforts made by both governmental and non-governmental entities to minimize occurrences involving land issues across the country. Undeniably, it can be pointed out the importance of having any geoformation about the areas where such phenomenon occurs.

This reinforces the need for information that several institutions have to support actions in their competence, requiring methodologies capable of accomplishing such demands.

Discussions involving the use of Unmanned Aerial Vehicles - UAV's as remote sensing platforms have given many research groups the opportunity to acquire data with enough low cost to justify its use in remote sensing (Everaerts, 2008).

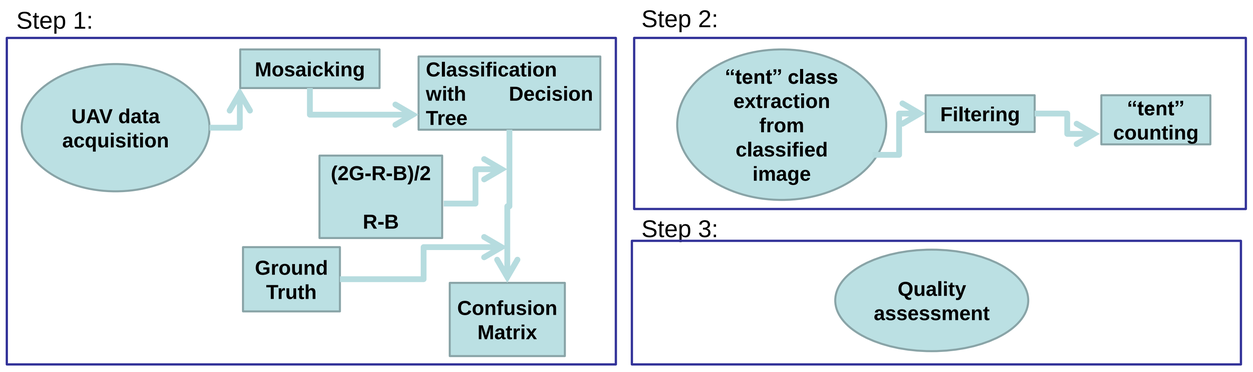
1.1 - OBJECTIVES

Within this context, the goal of this study is to test an approach to infer the expansion occurred in a conflictive area of land invasion, using UAV images. The focus is to identify and quantify temporary housing ("tents ") analyzing the same area in two different seasons. The use of a UAV platform, in this case offers as the major advantage, compared to traditional methods, the reduction of cost and time for obtaining images without risk to field staff. Due to eminent armed conflict the staff needed to be escorted by police officers and the platform launched 4km from the target area.

1.2 - UAV SYSTEM

The used platform was built with balsa wood and transformed into an UAV through the integration of the Micropilot MP2128g2 navigation system. This system uses GPS and magnetometers for spatial orientation, pressure sensors and accelerometers for determining flying height and speed as well as the flight attitude. The aircraft has a wingspan of 2.2m and is 1.47m long. It is equipped with combustion engine of 20cc that uses aviation gasoline resulting in about 90 minutes of flying time The platform carries a digital camera model Sony Alpha NEX 6 with nominal focal length of 16-50mm, 4912 x 3264 pixel image sensor and 23.4 x 15.6mm.

2 - METHODOLOGY



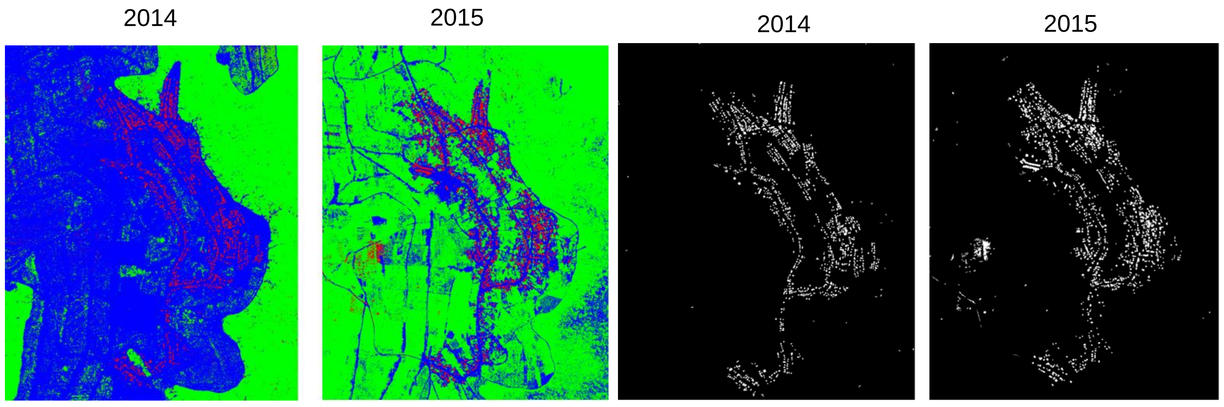
3 - RESULTS

Data were collected according to flight plans implemented in August 2014 and April 2015. Both flights were done at a height of 500m , 71% of longitudinal coverage , side coverage 20% .

Epoch	Area (ha)	Distance (km)	GSD (cm)	nº pictures	nº strips	Distance between strips (m)	Spent flight time (hh:mm:ss)
2014	1482	41.32	14.94	176	8	390	0:41:00
2015	6045	155	14.94	700	15	390	2:34:00

3.1 - Mosaics

3.2 - Classification



3.3 – Quality Assessment

2014	
True Positive	383
True Negative	0
False Positive	43
False Negative	43
G.Truth (nº tents)	1176
Detected	1027
Global Acuracy	87%
Completnss	90%
Correctnes	90%
Quality	82%

2015	
True Positive	347
True Negative	0
False Positive	77
False Negative	88
G.Truth (Nº tents)	1295
Detected	1108
Global Acuracy	86%
Completnss	80%
Correctnes	82%
Quality	68%

4 - CONCLUSION

This study aimed to investigate the use of images taken from an UAV platform to estimate the expansion of an area of land invasion, identifying and quantifying tents. This could help as a source of information for researchers and institutions over epochs and improve decision making. To test this approach, mosaics were generated using the UAV images and then they classified using decision tree. The result of the classification was used in an algorithm implemented in Matlab to identify and extract the class: “tents”. The use of pixel as unit of measurement was satisfactory however it is interesting to perform the same tests using a classification oriented to the object. The proposed approach allowed to infer an expansion of 7.3% of the studied phenomenon. Knowing the ground truth a priori, the obtained result turned to be about 1.9% less than the true value. The use of other source of information, for example, a DSM could contribute to improve the extraction of building class. The use of an UAV platform offered flexibility and agility for image acquisition turning viable the study of the mentioned phenomenon in the existing conditions

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