FIG WORKING WEEK 2017

Surveying the world of tomorrow –
From digitalisation to augmented reality

May 29 - June 2 **Helsinki Finland**
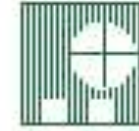
Object Based Land Cover Classification with Orthophoto Data After Natural Disaster
-Aslı Sabuncu-

BOĞAZİÇİ UNIVERSITY
KANDiLLi
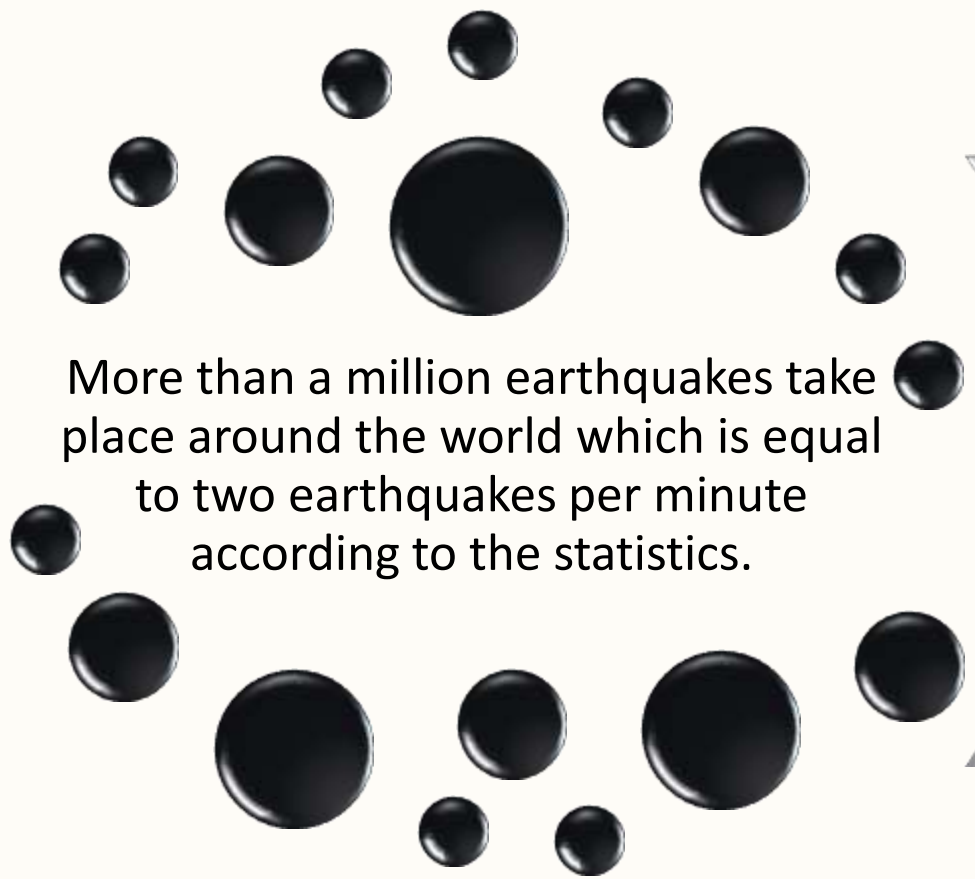OBSERVATORY AND
EARTHQUAKE RESEARCH INSTITUTE

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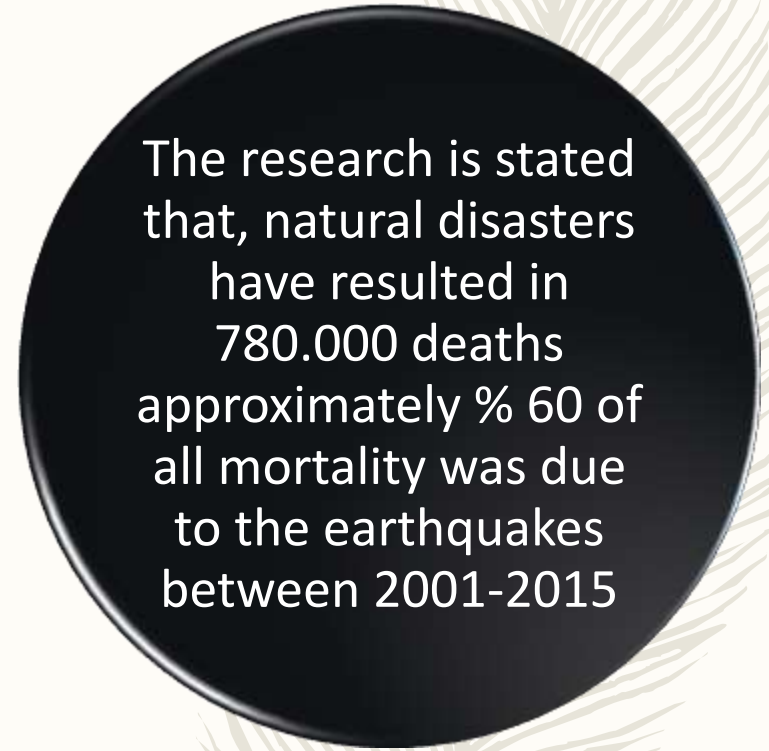ISTANBUL TECHNICAL UNIVERSITY
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Outline

INTRODUCTION

More than a million earthquakes take place around the world which is equal to two earthquakes per minute according to the statistics.

The research is stated that, natural disasters have resulted in 780.000 deaths approximately % 60 of all mortality was due to the earthquakes between 2001-2015

MOTIVATION

The motivation of this study is to evaluate the remote sensing technology performance in detecting collapsed buildings after natural disaster using orthophotos.

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Van-Ercis Earthquake
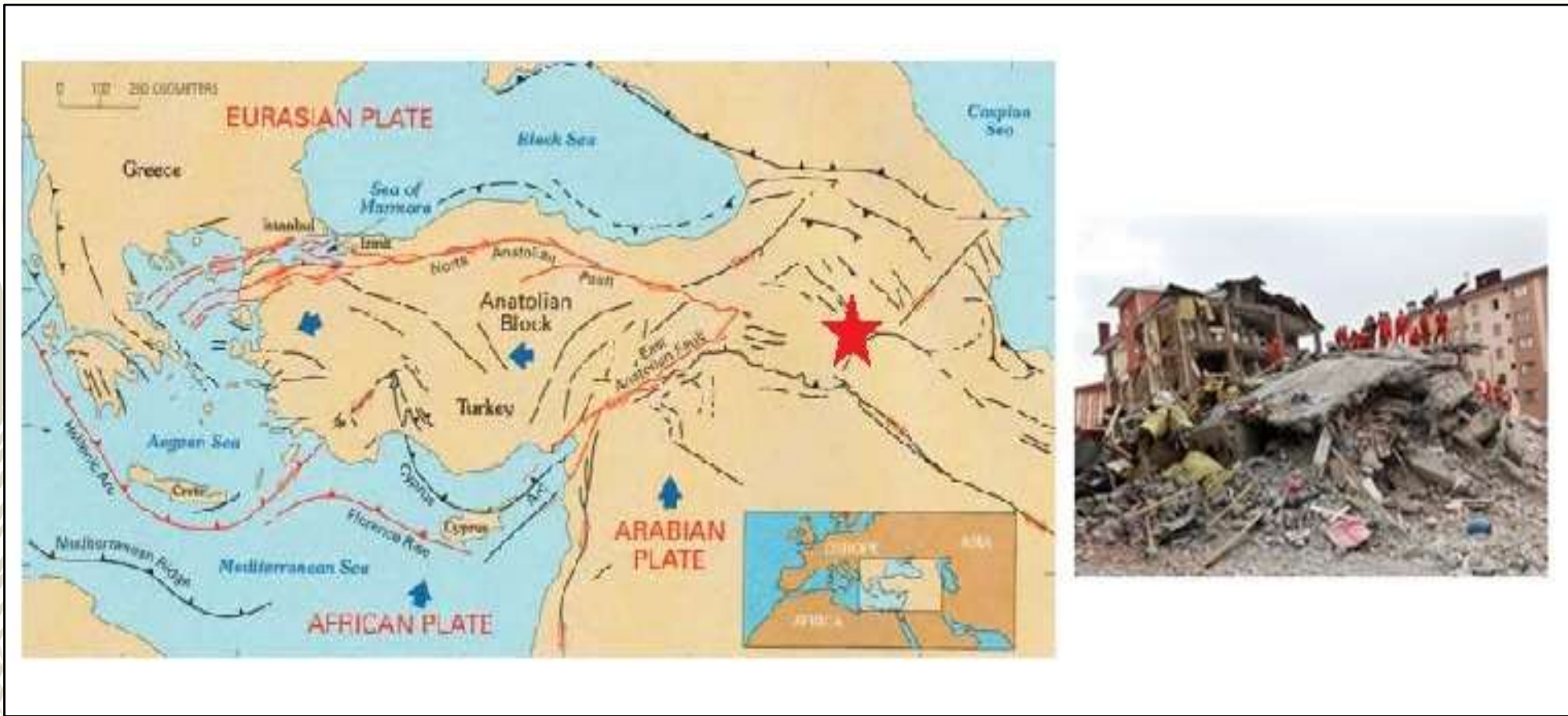
– An enormous earthquake (Mw=7.1) struck Van city center and its vicinity towns in the eastern part of Turkey on October 23th 2011 at 13:41 local time (10:41 GMT).

– Van-Ercis earthquake caused 604 loss of life and 2608 wounded according to the information provided by Prime Ministry Disaster and Emergency Management Presidency.

Data

Orthophoto
24 October 2011

Streetview
9 November 2011

– Segmentation is the initial step in the object based analysis. The motivation of the segmentation is to create meaningful objects from the target images by dividing images into different domains in terms of a homogeneity criterion.

Segmentation

Used Parameters & Criteria					
Study Area	Scale	Color	Shape	Smoothness	Compactness
OP-Homogenous	100	0.4	0.6	0.3	0.7
OP-Heterogeneous	120	0.6	0.4	0.3	0.7

Classes	Homogoneous region	Heterogenous region
Agricultural area	Aritmetic mean	-
Vegetation	Area + Aritmetic mean	Area + Area
Buildings	Rectangular fit + Elliptic fit	Rectangular fit +Elliptic fit
Tentcity	-	Area+Shape index
Collapsed buildings	Based on skeloton	Brigthness + Based on skeloton
Debris area	-	Texture after Haralick
Open land	Unclassified segments	Brightness
Shadow	Brightness	Brightness
Mixed areas	-	Unclassified segments
Road	Length/width	Length

Selected criteria and classes during the process in e-cognition software for both area.

The image objects are allocated to the most suitable class which are described by conditions in unsupervised classification. Conditions are outlined the criteria of the collection in terms of textural, spectral and contextual properties

At total, 10 main classes were defined in the both case study areas.

The used classes are; agricultural area, vegetation, buildings, tent city, collapsed buildings, debris areas, open land, shadow, mixed areas and road.

Unsupervised Classification

Unsupervised classification results (a) Homogenous area (b) Heterogeneous area and all classes

Supervised Classification –Training data

– In supervised classification, in the first step, training objects for each land cover class should be selected.
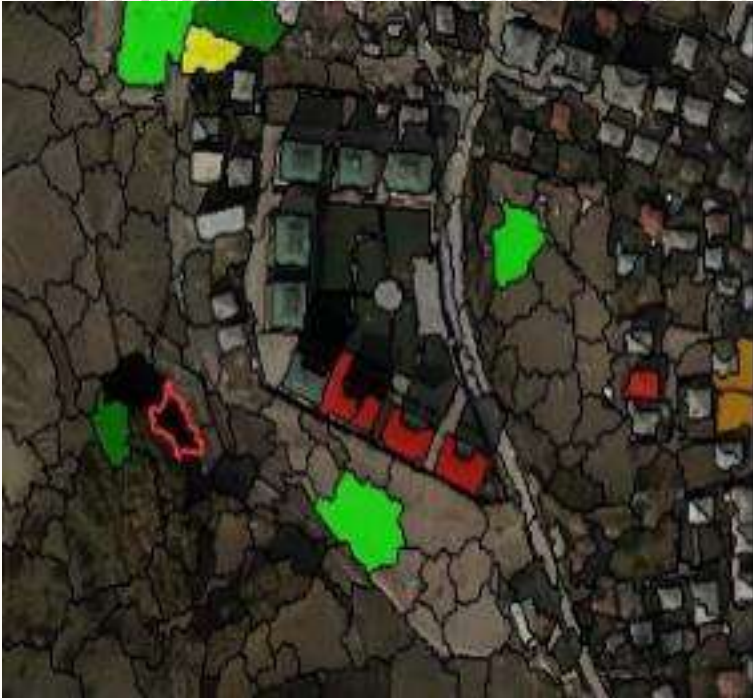
a

b

Training image objects selected for (a) Homogenous area. (b) Heterogeneous area.

Supervised Classification

ACCURACY ASSESSMENT

❏ In this study, error matrices and the Kappa index of agreement (KIA) were selected as measures for accuracy evaluation.

❏ In the first step of accuracy assessment, control segments were selected for two different case study areas.

❏ The overall accuracy for unsupervised classification was found as for homogenous region 81 % with Kappa Index as 0.77 and as 66 % for the heterogeneous area with Kappa Index as 0.61.

❏ The overall accuracy for the supervised classification was 92 % for the homogeneous area with Kappa Index as 0.90 and it was 71 % for the heterogeneous region with KIA as 0.66.

RESULTS & DISCUSSION

– In this study, the condition-based and nearest neighborhood classification approaches were applied using total 10 main classes in the both case study areas. Some points to note are outlined as below:

❑*Van city centre and Ercis town have complex urban patterns. Regular settlement plan is not used in developing countries in general. In the case study area, Ercis town also did not have a regular settlement plan so the classification results affected negatively. Besides, in Ercis, using different types of roof also have a negative effect in order to determine the buildings.*

❑*The most common problem in extraction of building and distuighing between collapsed and uncollapsed buildings is that both class had a spectral similarity of reflectance. In order to overcome this issue, special parameters (elliptic fit and rectangular fit) were used to distinguish uncollapsed buildings.*

Acknowledgements

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Thank you for attendance