Multimedia Analysis for Ecological Data

Concetto Spampinato
Dep. of Electrical, Electronics
and Computer Engineering
University of Catania
95125 Catania, Italy
cspampin@dieei.unict.it

Vasileios Mezaris
Centre for Research and
Technology Hellas
Informatics and Telematics
Institute
Thermi 57001, Greece
bmezaris@iti.gr

Jacco van Ossenbruggen
Centrum Wiskunde &
Informatica
Science Park 123
1098 XG Amsterdam, NL
Jacco.van.Ossenbruggen@cwi.nl

ABSTRACT

The ACM International Workshop on Multimedia Analysis for Ecological Data (MAED'12) is held as part of ACM Multimedia 2012.

MAED'12 is concerned with the processing, interpretation, and visualization of ecology-related multimedia content with the aim to support biologists in their investigations for analysing and monitoring natural environments, with particular attention to living organisms and pollution effects.

Categories and Subject Descriptors

H.1.0 [**Information Systems**]: Models and Principles

General Terms

Design, Human Factors, Management

Keywords

Multimedia Content Analysis, Animal and Plant Identification, Pollution Monitoring, Ecological Multimedia Data Retrieval

1. MOTIVATION

With the recent progress in digital cameras and sensors, as well as in network bandwidth and information storage capacities, the production of multimedia data has become an easy task. This has resulted in a huge amount of multimedia available on the web, in broadcast data streams, or in personal and professional databases. This explosion of multimedia data has created the urgent need for efficient organisation, browsing and retrieval tools. It has also generated new possibilities for exploiting multimedia data in diverse and specialized applications that can significantly gain from the analysis and understanding of such data. Whilst a large number of multimedia analysis and understanding techniques have been developed specifically for investigating events and behaviors in human-centered applications,

such as sports and surveillance, relatively little attention has been paid to the understanding of ecology-related multimedia content. On the other hand, ecology is nowadays being considered an interdisciplinary, collaborative and data-intensive science and as such discovering, integrating and analyzing heterogeneous data are of key important for researchers to address complex questions ranging from single particles to animals to the biosphere. This has led to a proliferation of multimedia data content in the last ten years: for instance, the EcoGrid project[1] has collected many Terabytes of data (videos, images and audio recordings) of monitoring forest animals as well as fish by the coral reefs in Taiwan. The wide range of cameras continuously capturing birds nests, wolf, badger, fox and also the continuous collection of multimedia data for pollution monitoring are yet other important examples. The automated analysis of such multimedia data poses new challenges, and the results of such analyses are of great interest to investigators such as biologists in their strive towards monitoring and analyzing the natural environment, promoting its preservation, and understanding the behavior and interactions of the living organisms (insects, animals, etc.) that are part of it.

The goal of the ACM Workshop on Multimedia Analysis for Ecological Data[2] is to bring together the research community and to discuss the most recent progresses in multimedia data analysis in relation to the above challenges.

2. DESCRIPTION

The ACM International Workshop on Multimedia Analysis for Ecological Data aims at bringing together practitioners and researchers, both in multimedia and in ecology, to share ideas and experiences in designing and implementing novel multimedia analysis techniques and tools for ecological multimedia content. It specifically presents and reports on the most recent methods for the processing, interpretation, and visualization of multimedia data recorded for monitoring ecological systems, with particular attention to animal and plant identification and classification and pollution monitoring.

The workshop's keynote, "Multimedia Challenges in Sensing the Environment" by Prof. Alan Smeaton, and the papers we selected for the MAED'12 program also reflect this aim by addressing the following topics:

- Animal identification and behaviour understanding by mining image and video data. Loos in [5] combines Ga-

---

[1] http://ecogrid.nchc.org.tw/
[2] http://maed2012.dieei.unict.it

bor Features to Locality Preserving Projections (LPP) with the aim of recognising automatically great apes faces. Similarly, Cannavò et al. in [2] exploit texture cues for frog identification by processing still images taken in a controlled lab. Palazzo et al. in [8], instead, proposes an approach for clustering fish trajectories, extracted from underwater video sequences, in order to detect possible anomalous behavioral events to be validated by marine biologists. Kavasidis et al. [4] performs a quantitative performance evaluation of state-of-the-art object algorithms for fish detection in real-life underwater environment.

- Plant identification and classification on still images. Amel et al. [1] applies the Shared-Nearest Neighbours (SNN) clustering algorithm to categorize automatically plant leaves. The hierarchical tree organization of the clusters produced by their SNN clustering method easily matches with the morphological tree built by expert botanists. Goeau et al. [3] propose, instead, an interactive web application for the visual identification of plants based on different views including habit, flowers, fruits, leaves and bark instead of only leaves as most of the existing approaches.

- Classification and characterization of habitats. Torres and Qui [10] build on a novel random-forest based method for annotating habitat photographs to be used for automatic habitat classification.

- Multimedia data processing for pollution monitoring. Graves in [7] measures light extinction, which is related to atmospheric pollution, by using regression trees and multivariate linear regression on images taken from static cameras. Moumtzidou et al. [6] proposes a framework for semi-automatic extraction of pollution information by applying image and text processing techniques on air quality and pollen forecasts images. Zhang et al. [12] propose a vision based approach for traffic ship monitoring in a port and demonstrate the efficacy of this approach as a low cost tool for building a smarter multi-modal marine monitoring network.

- Ecological Multimedia Data Retrieval. Pino et al. [9] propose a semantic image retrieval system specifically designed for arctic animals. The platform is based on an ontology describing the target environment, the user querying criteria, the algorithms applied for feature extraction and matching, and on a user interface designed to mirror and bind to the ontology concepts. Finally, Vrochidis et al. [11] propose an interactive domain-specific search engine for environmental data and measurements discovery. In detail, the search engine is able to discriminate between relevant and non relevant information and the output of its analysis is visualized on a interactive 2D plane.

3. CONCLUDING REMARKS

The ACM International Workshop on Multimedia Analysis for Ecological Data represents the first attempt to bring together practitioners and researchers, both in multimedia and in ecology, to share ideas and experiences for the analysis of multimedia content for natural environment monitoring. We hope that the selected papers will serve as valuable reference for the future research on this ground-breaking research area.

4. ACKNOWLEDGEMENTS

5. REFERENCES

[1] AMEL, H., JOLY, A., AND GOËAU, H. Plant leaves morphological categorization with shared nearest neighbours clustering. In *MAED 2012 @ ACM Multimedia 2012, Nara, Japan* (Oct.-Nov. 2012).

[2] CANNAVÒ, F., NUNNARI, G., KALE, I., AND BORAY TEK, F. Texture recognition for frog identification. In *MAED 2012 @ ACM Multimedia 2012, Nara, Japan* (Oct.-Nov. 2012).

[3] GOEAU, H., JOLY, A., AND BONNER, P. Multi-organ plant identification. In *MAED 2012 @ ACM Multimedia 2012, Nara, Japan* (Oct.-Nov. 2012).

[4] KAVASIDIS, I., PALAZZO, S., AND GIORDANO, D. Quantitative performance analysis of object detection algorithms on underwater video footage. In *MAED 2012 @ ACM Multimedia 2012, Nara, Japan* (Oct.-Nov. 2012).

[5] LOOS, A. Identification of great apes using gabor features and locality preserving projections. In *MAED 2012 @ ACM Multimedia 2012, Nara, Japan* (Oct.-Nov. 2012).

[6] MOUMTZIDOU, A., EPITROPOU, V., VROCHIDIS, S., VOTH, S., BASSOUKOS, A.AND KARATZAS, K., MOSSGRABER, J., KOMPATSIARIS, Y., KARPPINEN, A., AND KUKKONEN, J. Environmental data extraction from multimedia resources. In *MAED 2012 @ ACM Multimedia 2012, Nara, Japan* (Oct.-Nov. 2012).

[7] NATHAN, G., AND NEWSAM, S. Visibility cameras: Where and how to look. In *MAED 2012 @ ACM Multimedia 2012, Nara, Japan* (Oct.-Nov. 2012).

[8] PALAZZO, S., AND SPAMPINATO, C. Event detection in underwater domain by exploiting fish trajectory clustering. In *MAED 2012 @ ACM Multimedia 2012, Nara, Japan* (Oct.-Nov. 2012).

[9] PINO, C., GIORDANO, D., AND SANTORO, G. A semantic based retrieval system of arctic animal images. In *MAED 2012 @ ACM Multimedia 2012, Nara, Japan* (Oct.-Nov. 2012).

[10] TORRES, M., AND QIU, G. Grass, scrub, trees and random forest. In *MAED 2012 @ ACM Multimedia 2012, Nara, Japan* (Oct.-Nov. 2012).

[11] VROCHIDIS, S., BOSCH, H., MOUMTZIDOU, A., HEIMERL, F., ERTL, T., AND KOMPATSIARIS, Y. An environmental search engine based on interactive visual classification. In *MAED 2012 @ ACM Multimedia 2012, Nara, Japan* (Oct.-Nov. 2012).

[12] ZHANG, D. O'CONNOR, E., MCGUINNESS, K., O'CONNOR, N., SMEATON, A., AND REGAN, F. Visual sensing platform for creating a smarter multi-model marine monitoring network. In *MAED 2012 @ ACM Multimedia 2012, Nara, Japan* (Oct.-Nov. 2012).

---

[3]www.fish4knowledge.eu