

# Open Science Practices in BEE4EXP Project

<https://www.sps-bees4exp.com/>

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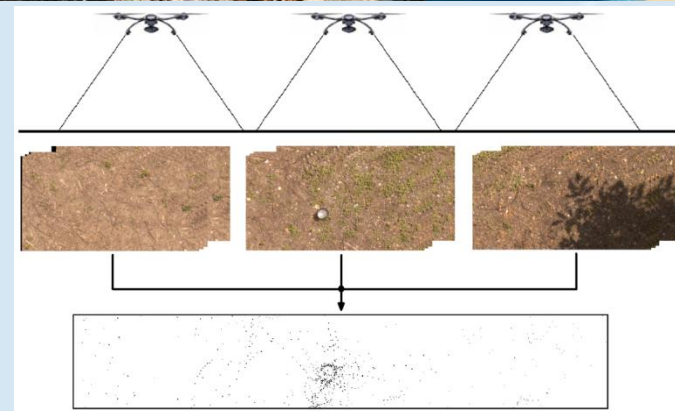
Graham Turnbull, University of St Andrews, UK

## Biological Method (Bees) for Explosive Detection – BEE4EXP

- Objective: develop innovative methods and technologies for detection of landmines
- Funding: NATO Science for Peace and Security (SPS) Programme
- Partners:
  1. Croatian Mine Action Centre – Centre for Testing, Development and Training, Croatia (HCR-CTRO d.o.o.)
  2. University of Banja Luka, Faculty of Electrical Engineering, Bosnia and Herzegovina (UNIBL)
  3. University of Zagreb, Faculty of Transport and Traffic Sciences, Croatia (UNIZG)
  4. University of St Andrews, UK (USTAN)

## Methods

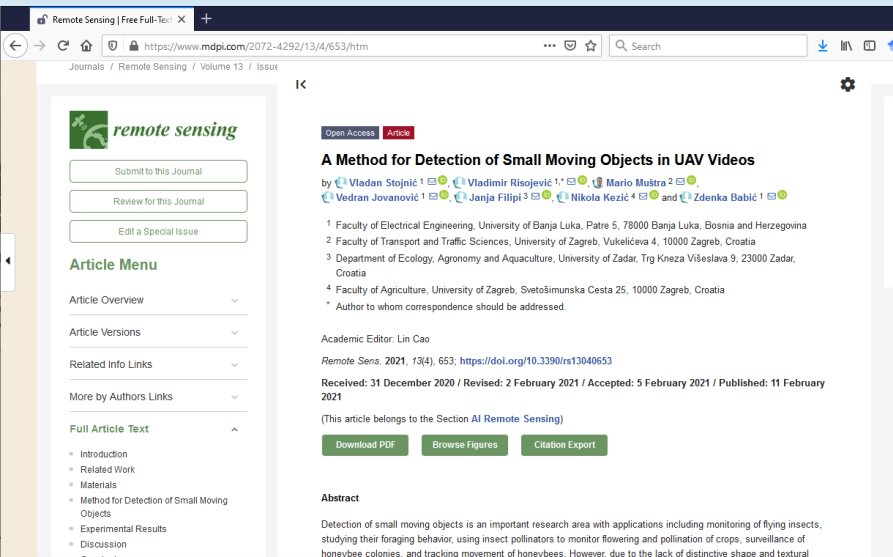
- Trained honeybee colonies
- Passive method
  - Honeybees serve as passive chemical biosensors
  - Organic semiconductor-based explosive vapor sensing films
- Active method
  - UAV high-definition and thermal imaging
  - Detection of honeybees over landmines using image processing and analysis



## Tools

- Free and open source software tools
- Programming language
  - Python
- Computer vision
  - OpenCV
  - Scikit-image
- Machine learning
  - TensorFlow
  - Keras
- We can concentrate on problem solving

## Publications



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- Experimental Results
- Discussion
- Conclusions

**Open Access Article**

### A Method for Detection of Small Moving Objects in UAV Videos

by [Vladan Stojnić](#) <sup>1</sup>, [Vladimir Risojević](#) <sup>1,\*</sup>, [Mario Muštra](#) <sup>2</sup>, [Vedran Jovanović](#) <sup>1</sup>, [Janja Filipi](#) <sup>3</sup>, [Nikola Kezić](#) <sup>4</sup> and [Zdenka Babić](#) <sup>1</sup> 

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(This article belongs to the Section AI Remote Sensing)

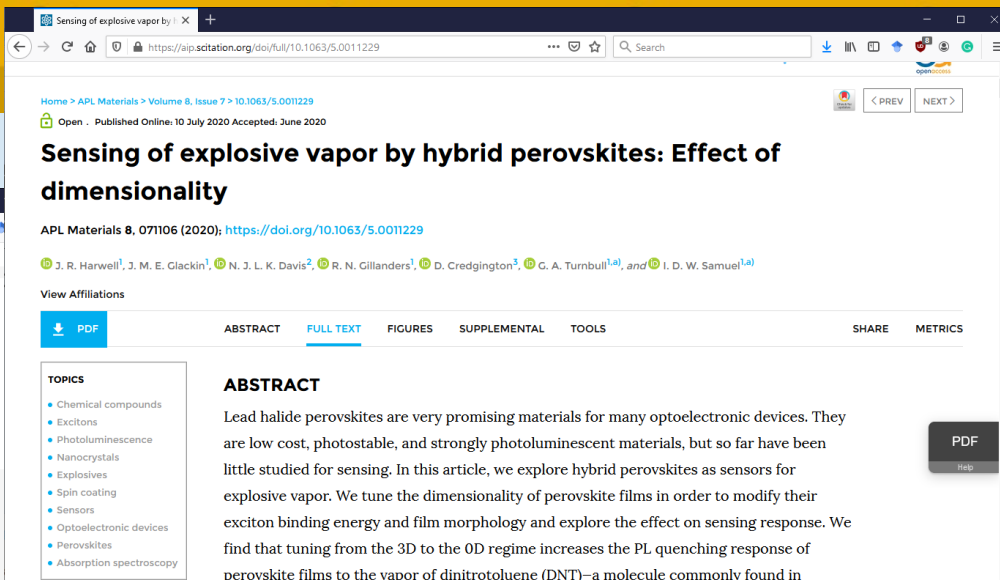
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**Abstract**

Detection of small moving objects is an important research area with applications including monitoring of flying insects, studying their foraging behavior, using insect pollinators to monitor flowering and pollination of crops, surveillance of honeybee colonies, and tracking movement of honeybees. However, due to the lack of distinctive shape and textural

### Data Availability Statement

The data presented in this study are openly available in Zenodo at <https://doi.org/10.5281/zenodo.4400650>. The code used for the experiments is openly available at <https://github.com/vladan-stojnic/Detection-of-Small-Flying-Objects-in-UAV-Videos>.



Sensing of explosive vapor by | X


<https://aip.scitation.org/doi/full/10.1063/5.0011229>

Home > APL Materials > Volume 8, Issue 7 > 10.1063/5.0011229

Open - Published Online: 10 July 2020 Accepted: June 2020

## Sensing of explosive vapor by hybrid perovskites: Effect of dimensionality

APL Materials **8**, 071106 (2020); <https://doi.org/10.1063/5.0011229>

[J. R. Harwell](#)<sup>1</sup>, [J. M. E. Glackin](#)<sup>1</sup>, [N. J. L. K. Davis](#)<sup>2</sup>, [R. N. Gillanders](#)<sup>1</sup>, [D. Credgington](#)<sup>3</sup>, [G. A. Turnbull](#)<sup>1,4</sup>, and [I. D. W. Samuel](#)<sup>1,4</sup> 

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**TOPICS**

- Chemical compounds
- Excitons
- Photoluminescence
- Nanocrystals
- Explosives
- Spin coating
- Sensors
- Optoelectronic devices
- Perovskites
- Absorption spectroscopy

**ABSTRACT**

Lead halide perovskites are very promising materials for many optoelectronic devices. They are low cost, photostable, and strongly photoluminescent materials, but so far have been little studied for sensing. In this article, we explore hybrid perovskites as sensors for explosive vapor. We tune the dimensionality of perovskite films in order to modify their exciton binding energy and film morphology and explore the effect on sensing response. We find that tuning from the 3D to the 0D regime increases the PL quenching response of perovskite films to the vapor of dinitrotoluene (DNT)—a molecule commonly found in

### DATA AVAILABILITY

The data that support the findings of this study are openly available in the University of St Andrews Repository at <https://doi.org/10.17630/934932a2-c721-4aff-9185-fc647ac20757>.<sup>52</sup>

## Data

BEE4EXP | Zenodo

December 30, 2020

**BEE4EXP**

Stojnić, Vladan; Risojević, Vladimir; Muštra, Mario; Jovanović, Vedran; Filipi, Janja; Kezić, Nikola; Babić, Zdenka

Supplementary data for paper:  
Vladan Stojnić, Vladimir Risojević, Mario Muštra, Vedran Jovanović, Janja Filipi, Nikola Kezić, and Zdenka Babić, "Detection of Flying Honeybees in UAV Videos", submitted to Remote Sensing.

Background sequences for generation of synthetic training videos:

- background\_seq1.mp4
- background\_seq2.mp4
- background\_seq3.mp4

Test videos for flying honeybee detection:

- test\_seq1.mp4
- test\_seq2.mp4
- test\_seq3.mp4

Ground truth honeybee detections for test videos:

- test\_seq1.npy
- test\_seq2.npy
- test\_seq3.npy

Name	Size	Download
background_seq1.mp4	23.1 MB	Download
md5:d8810d814e241663243f276963b34bc		
background_seq2.mp4	22.1 MB	Download
md5:f77828a80564c6a61eabf5495240337		
background_seq3.mp4	29.3 MB	Download

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Publication date: December 30, 2020

DOI: [10.5281/zenodo.4400651](https://doi.org/10.5281/zenodo.4400651)

Keyword(s): Small Object Detection, Synthetic Videos, Convolutional Neural Networks, UAVs, Honeybees

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Versions

Version 1 10.5281/zenodo.4400651 Dec 30, 2020

Cite all versions? You can cite all versions by using the DOI 10.5281/zenodo.4400650. This DOI represents all versions, and will always resolve to the latest one. Read more.

Sensing of explosive vapor by Hybrid Perovskites – Effect of Dimensionality (dataset)

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**Sensing of Explosive Vapor by Hybrid Perovskites – Effect of Dimensionality (dataset)**

Dataset

Overview Research publications Funded projects

**Associated persons**

Jonathon Robert Harwell (Creator)  
J.M.E. Glackin (Creator)  
N. J. L. K. Davis (Creator)  
R.N. Gillanders (Creator)  
D. Credgington (Creator)  
Graham Turnbull (Creator)  
Ifor David William Samuel (Creator)

**Electronic Data**

Sensing\_Paper.zip  
25.2 MB, ZIP  
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DOI  
<https://doi.org/10.17630/934952a2-c721-4aff-9185-fc647ac20757>

**Associated organisations**

School of Physics and Astronomy



## Code

https://github.com/vladan-stojnic/Detection-of-Small-Flying-Objects-in-UAV-Videos

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File	Description	Commit
vladan-stojnic Citation	85ba983 14 days ago 11 commits	
models	Changed model names.	2 months ago
.gitignore	Documentations for most of the code.	2 months ago
README.md	Citation	14 days ago
add_bees_to_video.py	Documentations for most of the code.	2 months ago
annotate.py	Documentations for most of the code.	2 months ago
bee4exp.yml	Documentations for most of the code.	2 months ago
bgsub.py	Documentations for most of the code.	2 months ago
chunked_dataset.py	Documentations for most of the code.	2 months ago
cut_video_into_blocks.py	Documentations for most of the code.	2 months ago
detection.py	Completed documentation.	2 months ago

About

Code for paper "Detection of Flying Honeybees in UAV Videos"

tensorflow keras dataset  
object-detection keras-tensorflow  
moving-object-detection  
small-object-detection uav-videos  
synthetic-honeybees flying-objects

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No releases published

Packages

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