In Video Veritas – Verification of Social Media Video Content for the News Industry

Fake news based on video reuse and how to deal with it: video fragmentation and reverse image search

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www.invid-project.eu

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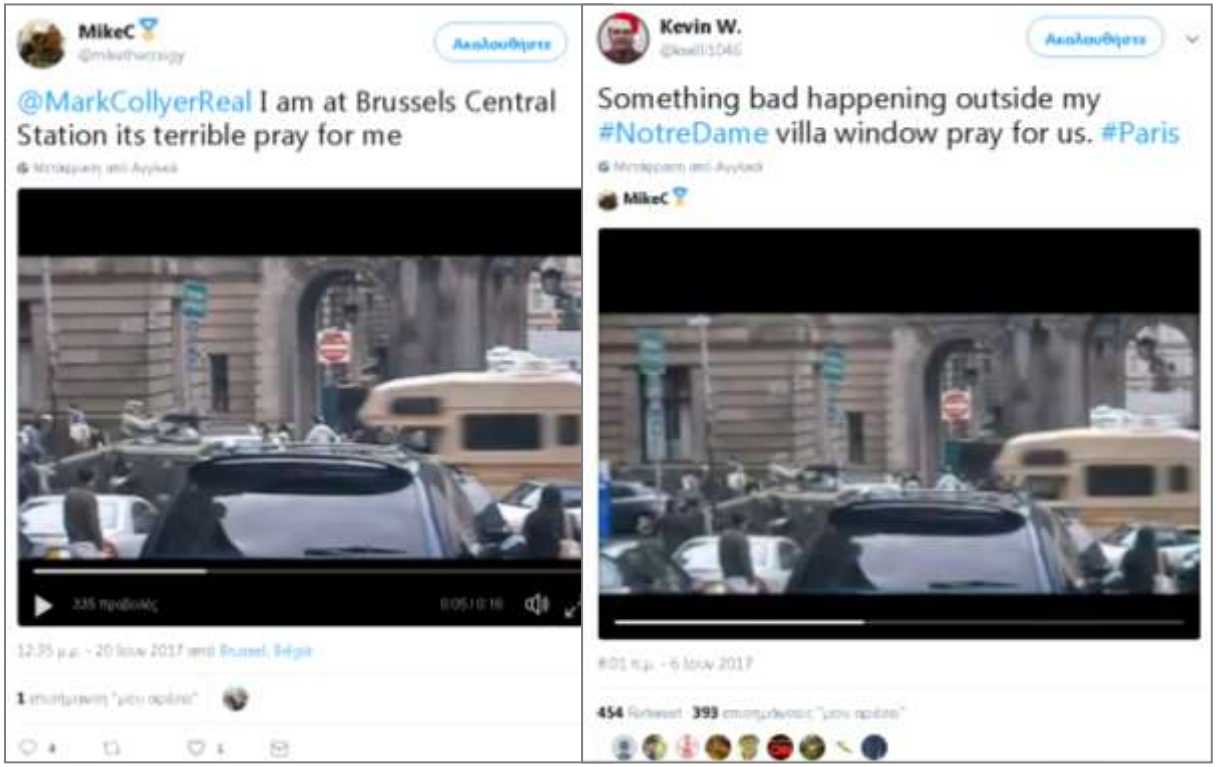

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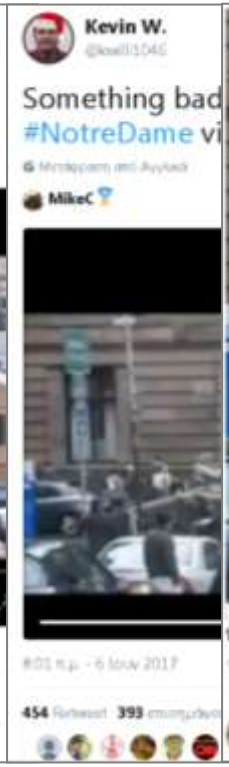

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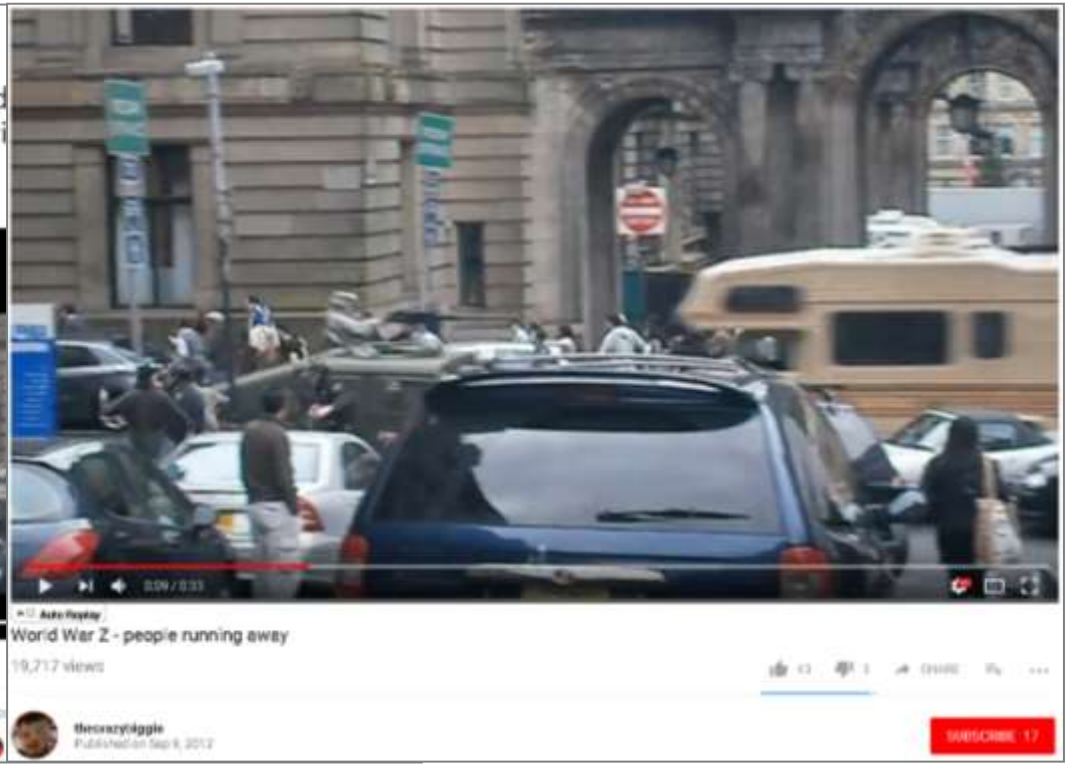

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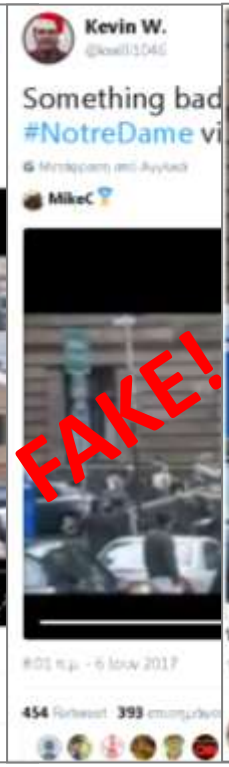

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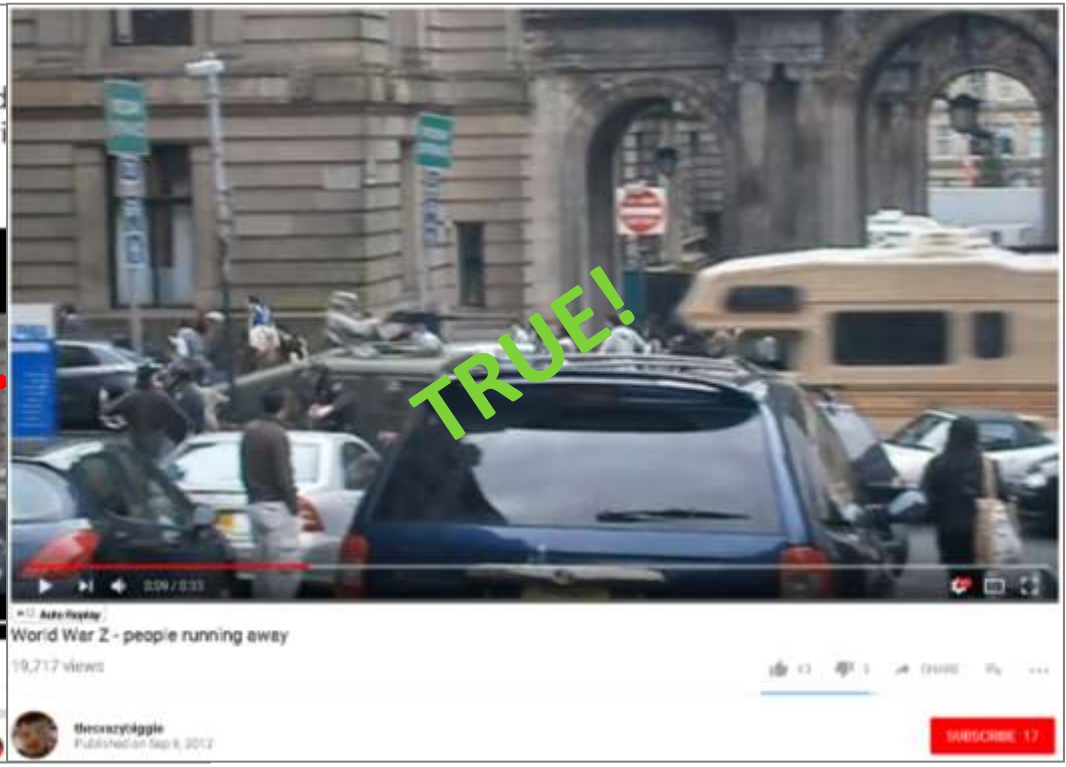

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  - Using search-engine-based plug-ins, such as RevEye[1] and TinEye[2], that allow reverse image search of Web images related to a video

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  - Time-consuming and cumbersome processes that:
    - either involve manual generation and uploading of video screenshots
    - or rely on the use of a limited set of video thumbnails

The InVID solution

- Interactive tool for reverse video search on the Web
- Time-efficient process that requires minimum manual intervention
- Fine-grained search at the video-fragment-level, through:
  - segmentation of the video into visually coherent fragments
  - extraction of representative keyframes for each video fragment
  - reverse search of these keyframes via the Google search engine

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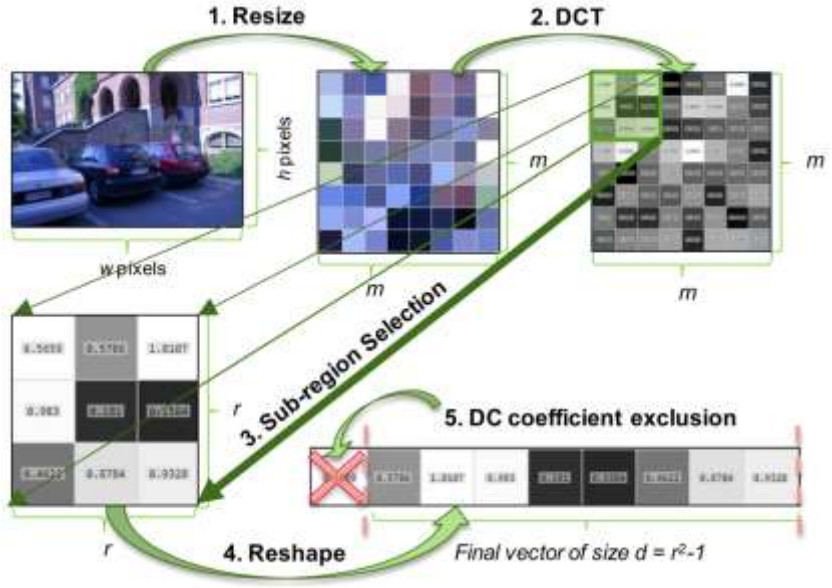
Video fragmentation & keyframe selection

- User-generated videos (UGVs) are captured without interruption using a single camera, thus, being single-shot videos
- Algorithms for shot boundary detection (e.g. [1]) fail to reveal information about the structure of these videos
- A more fine-grained segmentation into sub-shots, is needed!
- Proposed approaches define video sub-shots, as:
  - sequences of frames with a small variation in their visual content, based mainly on pair-wise evaluation of frames' visual similarity/dissimilarity [3-7]
  - sequences of frames corresponding to different video recording actions (e.g. camera pan/tilt, camera zoom in/out), relying on motion extraction and classification using pre-defined motion models [8-10] or pre-trained systems [11-13]

Video fragmentation & keyframe selection

- The InVID approach [2]
  - The visual content of each frame is represented with the help of a 2D Discrete Cosine Transform (see figure)
  - Video fragmentation into sub-shots is performed by assessing the visual resemblance of neighboring frames using the cosine similarity
  - The algorithm indicates both sub-shots with minor or no activity, and sub-shots with gradually, but consistently, changing visual content
  - As representative keyframe:
    - for the former type of sub-shots the middle frame is selected
    - for the latter type of sub-shots the frame with the most pronounced change of visual content is selected
  - The analysis takes approx. 3% of the video's duration (being more than 30 times faster than real-time processing)



The reverse video search tool

- Available at: http://multimedia3.iti.gr/videofragmentation_v5/service/start.html
- Allows the analysis of both online and locally stored videos
  - Supported platforms: YouTube, DailyMotion, Facebook, Twitter, Dropbox
  - Supported video formats: mp4, webm, avi, mov, wmv, ogv, mpg, flv, mkv

- The user can monitor the progress of the analysis, or close the browser and be notified (by e-mail) when the results are ready
- After the analysis ends, s/he gets the set of extracted keyframes and can perform reverse search by left clicking on any of them

Case study

- Debunking a fake video about hurricane Irma

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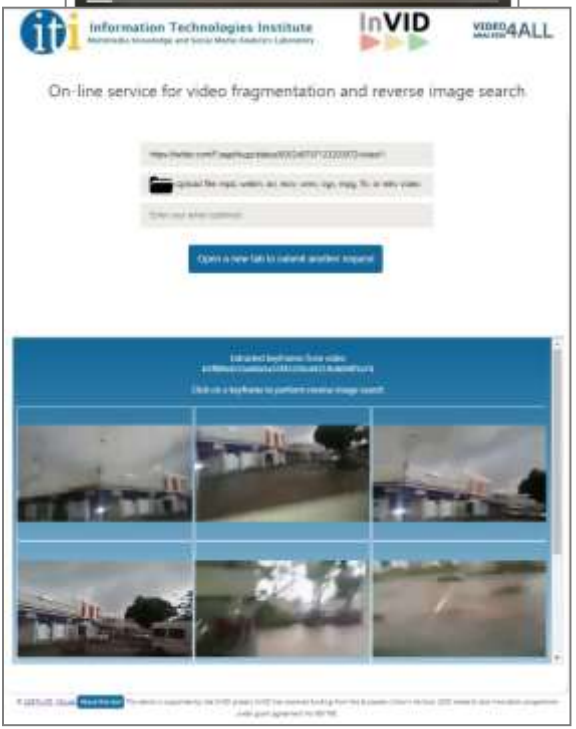

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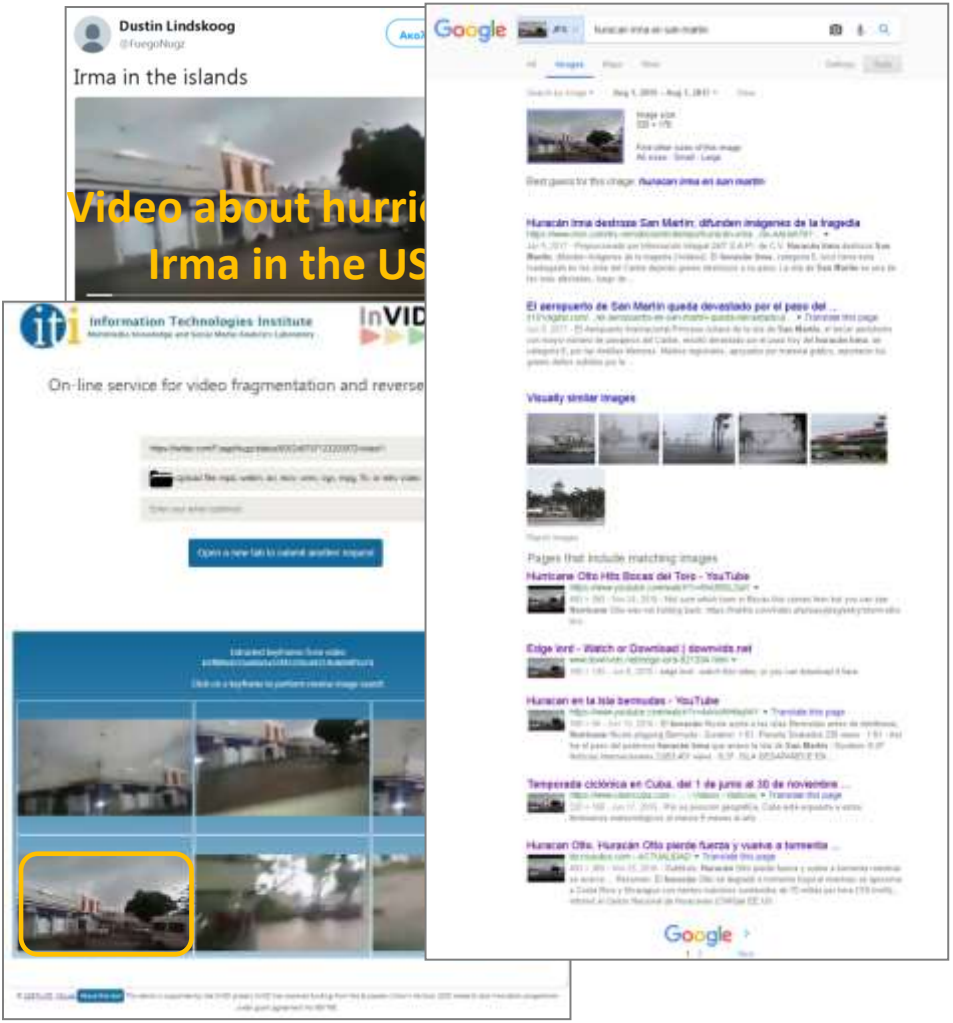

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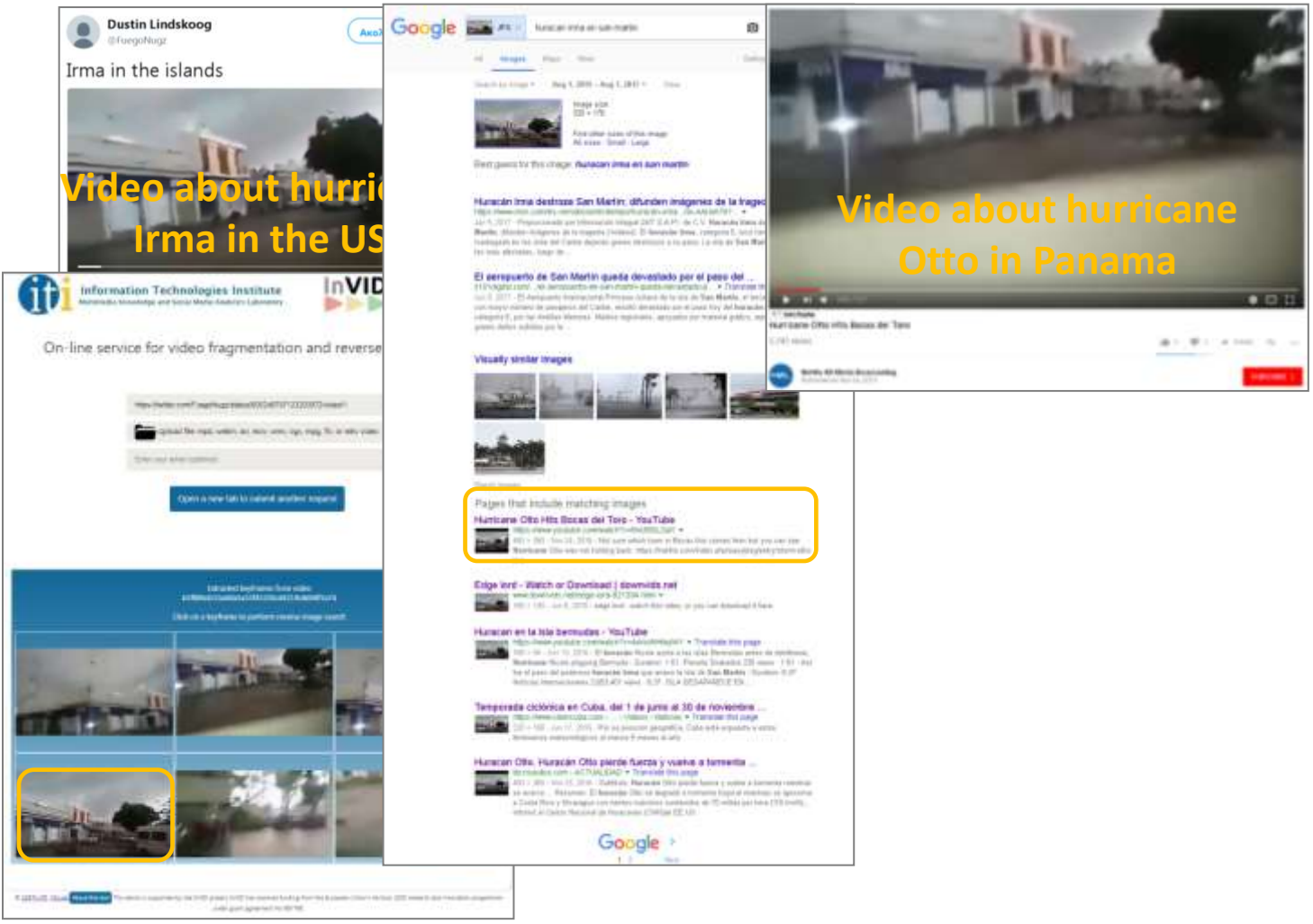

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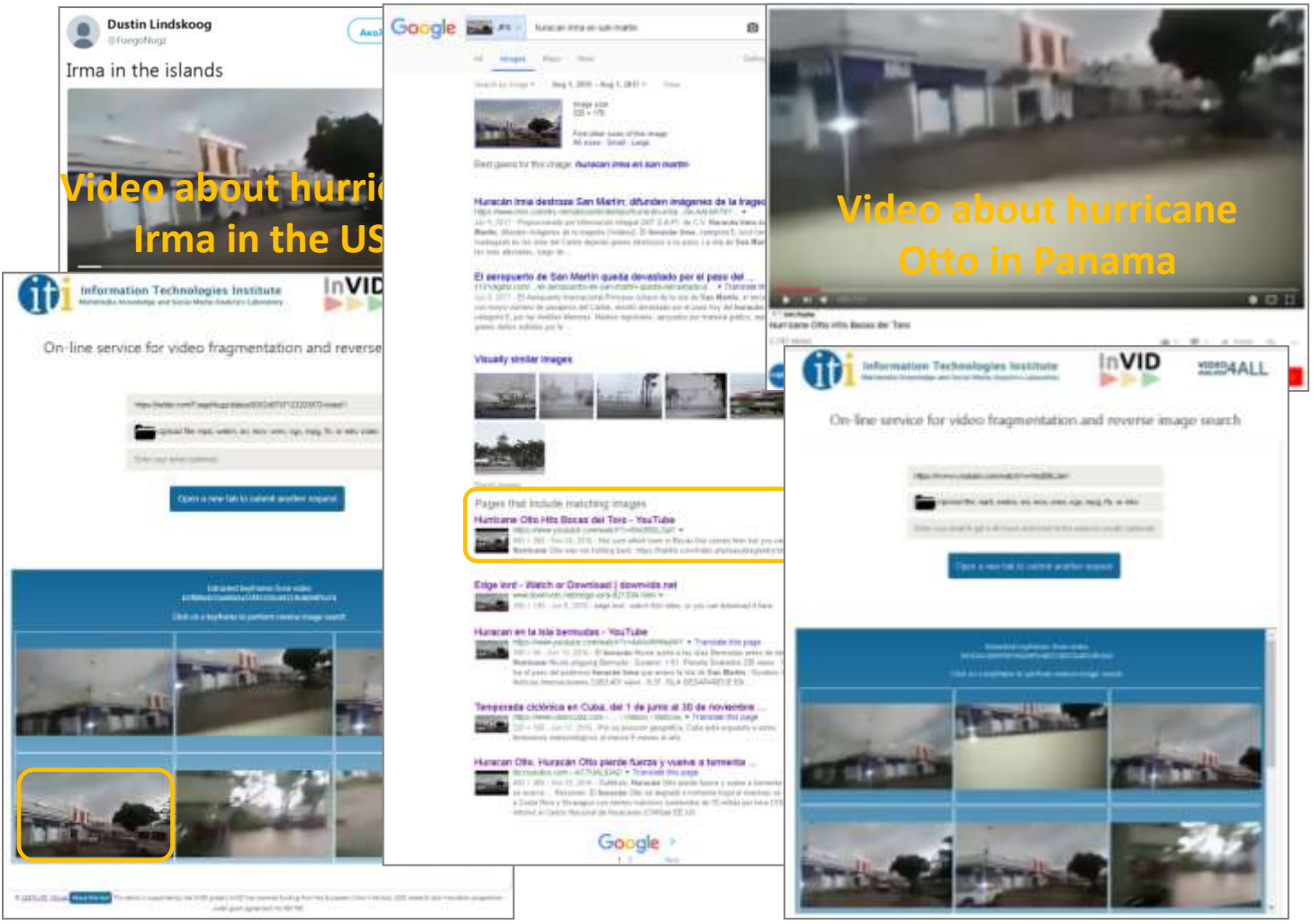

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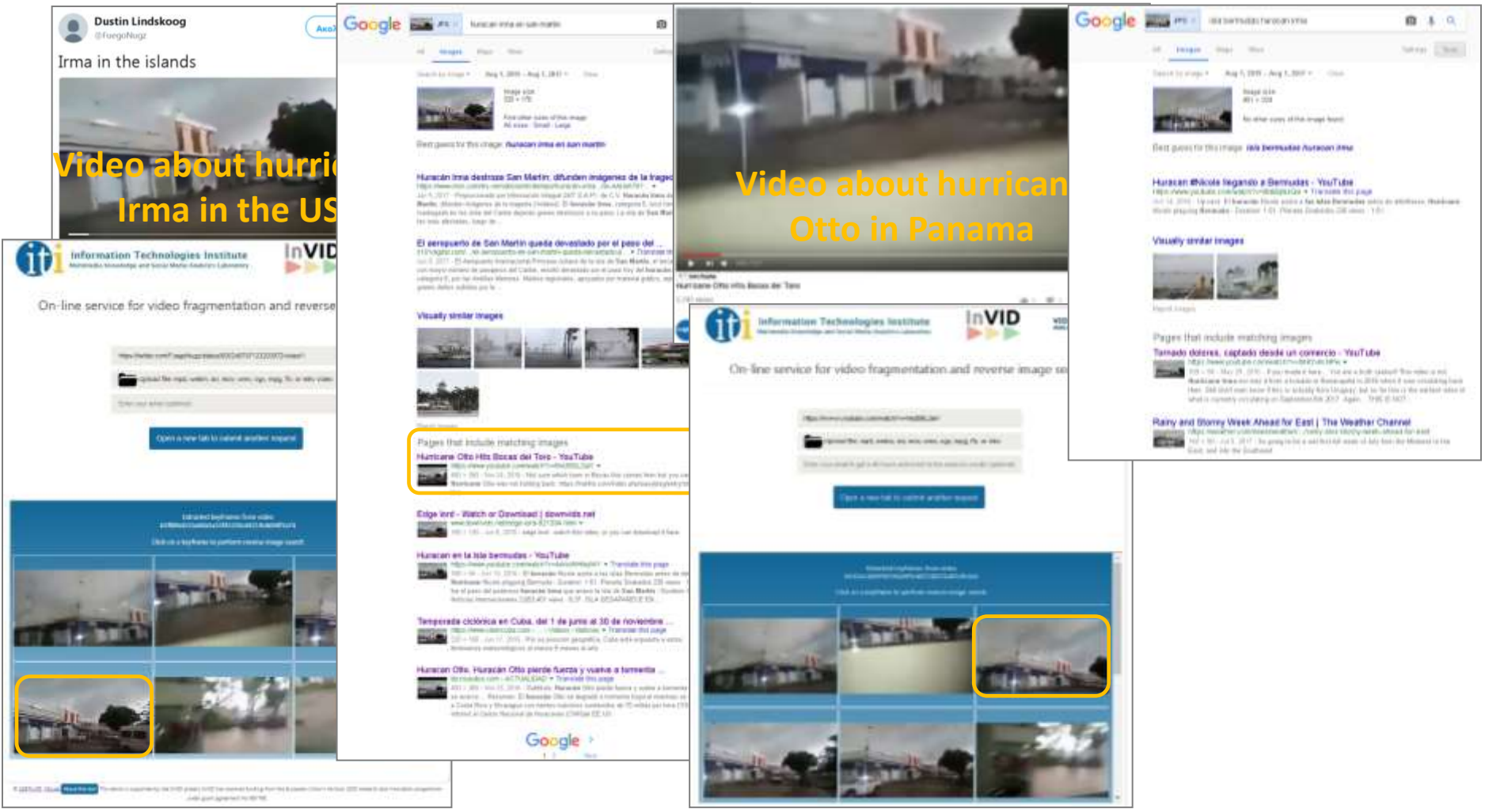

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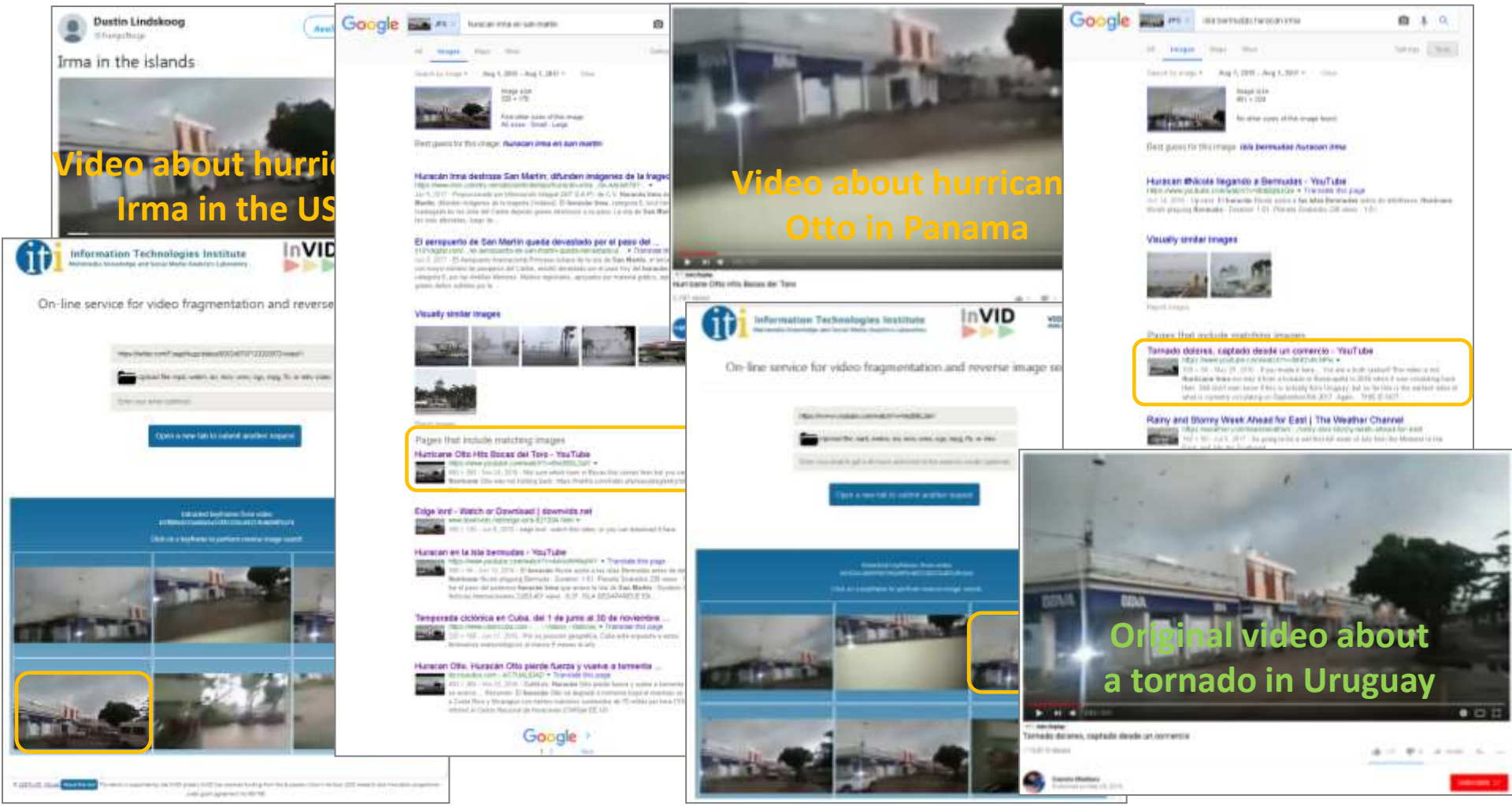

Summary and outlook

- The developed tool for video fragmentation and reverse image search facilitates the detection of previously existing occurrences of a published video on the Web
- Its interactive UI makes the detection of such videos a “few-clicks” process that requires minimum manual intervention
- The gathered feedback from journalists and media verification experts (through its integration into the InVID Verification Plugin) is very positive and encouraging
- Improvements are foreseen regarding:
  - the keyframe selection process
  - the compatibility with online video platforms
  - the detection of mirrored videos

Publications

1. Apostolidis, E., et al.: Fast shot segmentation combining global and local visual descriptors. In: Proc. of the IEEE Int. Conf. on Acoustics, Speech and Signal Processing. pp. 6583-6587 (2014), software available at http://mklab.iti.gr/project/video-shot-segm
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In Video Veritas!

Thank you for your attention!

Any questions?