Compress-then-analyze VS analyze-then-compress. Two paradigms for image analysis in visual sensor networks.

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***Abstract*—This interactive demo presents and compares two different paradigms for image analysis in visual sensor networks (VSN), using a testbed based on battery-operated BeagleBone platforms with sight and wireless communication capabilities.**

I. Description of the Demonstrator

We compare two paradigms for image analysis in visual sensor networks (VSN) [1]. In the traditionally adopted *compress-then-analyze* (CTA) paradigm, images acquired from camera nodes are JPEG compressed and sent to a central controller for further analysis. Conversely, we propose an *analyze-then-compress* (ATC) approach, where camera nodes perform visual features extraction and transmit a compressed version of the extracted features and the relative keypoints information (location and scale) to a central controller. At the central controller, the received features (or the features extracted from the received JPEG image) are matched against a database of labeled features, so that object recognition or image retrieval can be performed [2]. We focus on state-of-the-art low complexity visual features [3] and we show that, for bandwidth constrained networks such as VSNs, the ATC approach enables to improve the application frame rate, with respect to the CTA paradigm. With this demonstration, we aim to show an interactive system to perform object recognition. The demonstrator is implemented on top of a visual sensor network composed by a sight-capable battery-operated wireless node, which communicates with a central controller in order to recognize objects in its field of view. The interactivity with the audience lies in two main features of the system, namely (i) the possibility of choosing the object to recognize and (ii) the possibility of remotely controlling the operation of the system through a graphical user interface (e.g., changing between CTA/ATC paradigm, or changing ATC parameters such as number of features to send or encoding parameters). With reference to Figure 1, the demonstration is based on the following equipment, which is entirely provided by the authors and not required at the place of the demo:

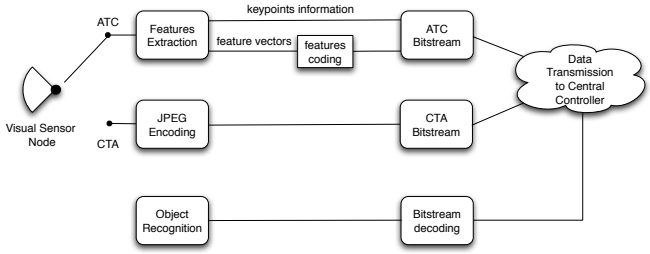

Fig. 1. Visual sensor node operational modes. Switching between ATC and CTA is remotely controlled by the user. The compressed multimedia data from the ATC or CTA paradigm is sent to a central controller where it is decoded and used to perform object recognition.

A. Visual Sensor Node:

- **CPU:** battery operated 720MHz ARM BeagleBone Linux computer.
- **RADIO:** IEEE 802.15.4-compliant sensor node (TelosB platform or similar).
- **CAMERA:** Logitech USB camera.

B. Central Controller:

- Laptop with IEEE 802.15.4 communication capabilities.

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References

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