

Automatic camera selection and PTZ canvas steering for autonomous filming of reality TV

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Abstract

Reality TV shows that follow people in their day-to-day lives are not a new concept. However, the traditional methods used in the industry require a lot of manual labor and need the presence of at least one physical camera man. Because of this, the subjects tend to behave differently when they are aware of being recorded. This paper presents an approach to follow people in their day-to-day lives, for long periods of time (months to years), while being as unobtrusive as possible. To do this, we use unmanned cinematographically-aware cameras hidden in people's houses. Our contribution in this paper is twofold: First, we create a system to limit the amount of recorded data by intelligently controlling a video switch matrix, in combination with a multi-channel recorder. Second, we create a virtual camera man by controlling a PTZ camera to automatically make cinematographically pleasing shots. Throughout this paper, we worked closely with a real camera crew, enabling us to compare the results of our system to the work of trained professionals. This work was originally published in MVA 2017, as T. Callemein, W. Van Ranst and T. Goedemé, "The Autonomous hidden Camera Crew".

1. Camera Selection

A first step consists of the selection of which of the cameras are to record or stay idle. This depends on three factors. Firstly the room in which each camera is present. Secondly the **background subtraction (BGS)** activity in between these rooms that will trigger the recordings. Lastly the activity present inside the room that needs to sustain the triggered cameras recording state. Figure 1 illustrates four cameras spread throughout three rooms A, B and C with each a "bucket" that represents the **interest level (IL)** of the room. The combination of **BGS** and the knowledge of the room allows us to raise the **IL** of the rooms that we use to trigger the zone recording.

2. PTZ Canvas

Each high image quality **pan-tilt-zoom (PTZ)** camera has an additional overview camera on which a DPM upper-body detector (blue

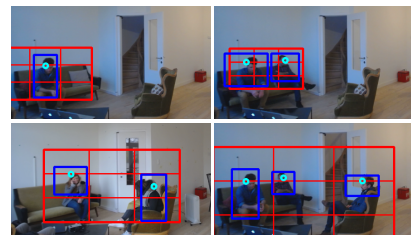


Figure 2: Proposed canvases (red) based on people detections (blue) that will control the PTZ. More video illustrations available on <http://goo.gl/WISOP4>.

in fig. 2) and face detector (light blue) allow to determine a cinematographically correct canvas (red), using the amount and position of people and their gaze direction. This enables controlling the pose of the PTZ according to cinematographical rules such as the *rule of thirds* and *head room*.

3. Results

Evaluated during a real reality TV recording, our camera selection system turned out to yield no **false negative (FN)** while only producing 8% **false positive (FP)**. Yet, the technique is able to trigger recording on time while not missing anything and recording too much dead moments. Also, human cinematographers approved that our canvas selector is able to control the camera correctly, within an acceptable time-frame.

[†] T. Callemein and W. Van Ranst contributed equally to this paper.

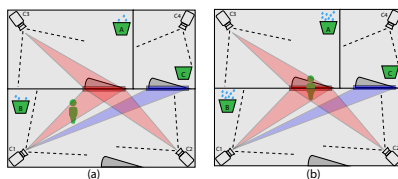


Figure 1: Top view with cameras, buckets and zones adding to the buckets.