AUTOMATIC SUMMARIZATION OF CYCLOCROSS RACES

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Traditional broadcasters of sports events are experiencing hard times as the numbers of spectators are decreasing each year, i.e., younger fans shift to digital platforms or drop out [1]. There is an increased interest in short-term digital interactions such as team/rider stories and highlights (~automatic summaries) that can be shared and viewed on different platforms. Most sports reporting, however, is still old fashioned and does not fully exploit the technology and digital platforms/tools that exists today. We need more personalized, interactive experiences to keep the end user happy and to get back the youngsters.

More and more data is captured during sports events, for example using sensors attached to bikes, or athlete wearables. However, its full potential has not yet been exploited. The missing gap is the adequate translation of the sensor data into useful narrative elements and the selection of the correct video fragments that tell this story. Our DAIQUIRI project [2] focuses on this translation and investigates different methodologies for sensor-driven storytelling. Within this paper we will discuss one of these methodologies - a novel automatic summarization method based on engagement scoring - and demonstrate it on cyclocross races (the third-most-popular televised sport in Flanders, behind soccer and road cycling). The proposed methodology is shown in Fig. 1. Both peloton data and segment data are used to generate a score that tells us how important a particular segment was and what were the most important moments during the race.
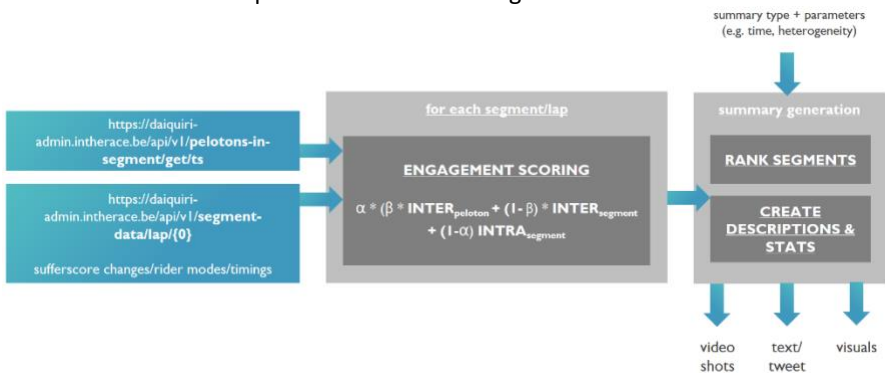

Fig. 1: Engagement scoring methodology.

The peloton changes detection collects peloton data (i.e., grouped location info retrieved by clustering raw GPS longitude/latitutue data that is collected using Quarq sensors) from the DAIQUIRI platform and compares the composition of current peloton(s) to the list of pelotons detected before. If no similar peloton can be found, we label it as a change and increment the peloton score by one. Next, we group all scores based on time and generate a vector that shows in which segments the changes happened. This info can be used for video shot selection afterwards (=> automatic summarization). Subsequently, we analyze/group peloton changes for each lap/segment and calculate the `INTERpeloton` score for each segment based on the absolute z-score sum of the peloton scores.

The segment scoring also collects its segment sensor data (i.e., accelerometer and computer vision based detections of rider modes, and heartrate and power based estimation of suffer scores) and segment metadata from the DAIQUIRI platform. Based on the lap stats we can generate `INTERsegment` (between different segments in the same lap) and `INTRAsegment` (between the same segment in different laps) scores in a similar way as we did for the `INTERpeloton` score (using the absolute z-score sum of the scores). In order to make a fair comparison, however, we decided to first normalize the stats based on the segment metadata (length and elevation profile). By combining the INTER/INTRA segment scores and the INTER peloton score and weighting them with their corresponding weight factors we get the final `ENGAGEMENT` score.

In order to find most important laps/segments to generate an automatic summary, we can easily query the highest engagements scores and use lap/segment timings to generate the video crops. The proposed methodology has been tested multiple times on the Sven Nys Cycling Center in Belgium (where each lap had 10 segments). Engagement scoring results of one of these tests are shown in Fig. 2. Segment 6 (a steep hill) and 8 (a technical descent) were found the most interesting segments.
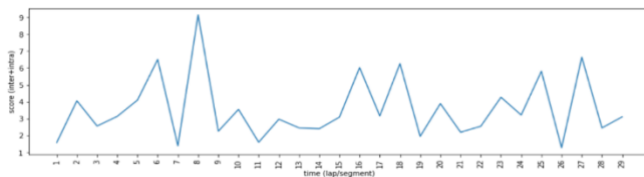

Fig. 1: Results of engagement scoring – Sven Nys Cycling Center demo 2021.

1. J. Lombardo and D. Broughton (2017). Going gray: Sports TV viewers skew older. In: Sports Business Journal (June 5th).
2. DAIQUIRI project - https://www.imec-int.com/en/what-we-offer/research-portfolio/daiquiri

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