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Video Based Color Commentary in Sports based on Automated Story Selection

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ABSTRACT: Sports Commentary can keep the viewers entertained and makes them always updated about game. Automated Sports Commentary is a type of automated narrative. Color commentary is the way of informing additional aspects of the game. It can add more entertainment to the broadcast and gives viewers extra information than he/she can see. Color Commentators may also add personal information of players. Sports Commentary Recommendation System (SCoReS) is proposed to automatically suggest stories for the commentators. It can be applied to video based color commentary in which a video of the game and a set of stories will be given as input to the system. The system compares each of the features in the video (game state) to the features of stories and the top ranked list of stories are given as output by the ranker. The evaluator scores the ranked list of stories and the fine grained commentary will be given to the broadcast team or viewer.

KEYWORDS: Automated narrative, Information retrieval, Color commentary

I. INTRODUCTION

Data mining is the process of analysing, finding correlations or patterns among dozens of data from different perspectives, make them into categories and summarizing it into useful information. The computational intelligence in games is an area that comes under Data mining. The CI methods have the potential to improve the design and development of computer games and non-digital games. Sport broadcasting is an important and valuable industry. Through sports broadcasting many professional sports like cricket, baseballs etc are broadcast to the public on television, reaching millions of homes. But the live viewing experience and the television experience differs because of commentary. Nowadays researches have been done into the area of commentary in sports broadcasting. A good commentary can entertain viewers and can draw their attention.

One method for adding entertainment is to tell interesting and relevant stories from past. The baseball game is commonly suited for storytelling. Since the commentators combine games with the previous stories, they are commonly known as storytellers.Vin Scully is one of such commentator who has been commentating for Brooklyn/Los Angeles Dodgers games since 1950.The ability to match statistics from current game state to a past situation increases commentators ability to entertain the viewer.

As an illustration, suppose assume that one baseball team is trailing by four runs in the ninth inning. This is not an interesting situation. Now a story can change the mindset of the viewers. An appropriate story might be that, on September 18, 2006, the Los Angeles Dodgers were also trailing by four runs in the bottom of the ninth inning. The Dodgers hit four consecutive home runs to tie the game.

Sports storytelling is a form of narrative discourse. Automating the narrative discourse is an important problem in AI.A lot of researches has been done in this area. Most of the existing methods do not deliver story-based color commentary. For example, The MLB: The Show [8] is popular among baseball games. It analyses what was happening on the field and give indirect suggestions to the player for improving their play. But there is no storytelling here. So the work here focuses to develop a method that efficiently map game state to relevant stories so that the audience becomes more entertained.

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To achieve this, here a Video based Sports Commentary Recommendation System has been proposed. It converts the story-based sports as a mathematical problem first. Then, the system use machine learning algorithms and information retrieval techniques to make the computer learn about the game state and retrieve appropriate story.

The goal of the proposed system is to retrieve an appropriate and most suitable story for a particular video of game. For this purpose, first the video is uploaded to the system. After uploading, the frames are extracted from the video. Then the visual features are extracted from frames. For comparing stories with the game state many features has to be extracted from both like teams involved, scores, the type of action on the field etc. Then the game state and the stories are given as input to the ranker. The ranker uses a listwise algorithm to rank the stories. Then it is given as input to the evaluator. The evaluator uses the point wise algorithm to evaluate the stories and give the top ranked story as the output.

The rest of the paper is organized as follows. Section 2 formulates the motivation and overview. Section 3 shows the system architecture. Section 4 concludes the work.

II. MOTIVATION & OVERVIEW

Generating an efficient narrative is very important in many applications, such as entertainment, training, education etc.The area has been studied over 20 years. Statsheet[6] and Narrative Science[7] are two existing system in which automatically write previews for sports games that have not yet happened, and write summaries about sports games that have already happened. To write summaries they provide statistics from a completed game. To write previews they provide statistics from past games. But none of them can operate with live game data and can provide live stories during a game. None of the existing system delivers story-based color commentary in a live game.

Generally two people are involved in commentating: play-by-play commentator and a color commentator. The play-by-play commentators mention the factors such as scores, upcoming batters etc, whereas the color commentary is much more broad which adds entertainment to the viewers. Story telling is an important aspect of color commentary. Effective storytelling explains what is actually happening in the field in a way that is actually interesting to the audience. Generally play-by-play commentators are trained journalists but color commentators are former coaches or athletes etc. But unfortunately they do not have a deep knowledge about the past history. Also they cannot connect the stories they know with the current game state and there is limitation in the availability of stories.

To solve this problem, the story selection is automated because the computer can store more stories than human brain. The proposed technique tries to solve the problem of delivering story-based color commentary to a live game. The problem can be considered as an information retrieval problem. The game state is treated as the query while the candidate stories returned by the system are the documents. So the ultimate aim of the system is given a game state, the system should return a ranked list of stories. The video of a particular game is considered as the game state. There is a database of stories that has previously been collected.

After obtaining the story database, the system must learn to match the stories to game states. If the story database contains more stories, the more likely an appropriate story can be found that matches any given game state. In the proposed system the game state is the features extracted from the video of the game. First, the video has been uploaded to the system. Then the frames are extracted from the video using an efficient algorithm. From the frames, the visual features are extracted. These features are considered as the game state. These game states and the set of stories are given to the ranker. The ranker ranks the appropriate stories and given it to the evaluator. The evaluator evaluates the story and gives the most appropriate story as the output.

Here, by giving a video of the game, the system should learn the game states like the players,scores,what has been happening in the field etc from the features of the video. For this machine learning algorithm is used.

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III. SYSTEM ARCHITECTURE

The Fig 1 depicts the system architecture of the proposed system. The main components of the system is ranker and the evaluator which should efficiently retrieve a story that is appropriate for the uploaded video

Here first the video has been uploaded to the system. Then by using SIFT algorithm the frames are extracted from the video. Then from the frames visual features are extracted. The visual features may contain the scores of the game, players, what has happening on the field etc.The system should learn these features. For this purpose machine learning algorithms are used. Then the features extracted from the video which is considered as the game state and the set of stories are given as input to the ranker. The ranker ranks the most appropriate story and give the top ranked story to the evaluator. The evaluator evaluates the story and gives the appropriate and most suitable story as the output to the audience.

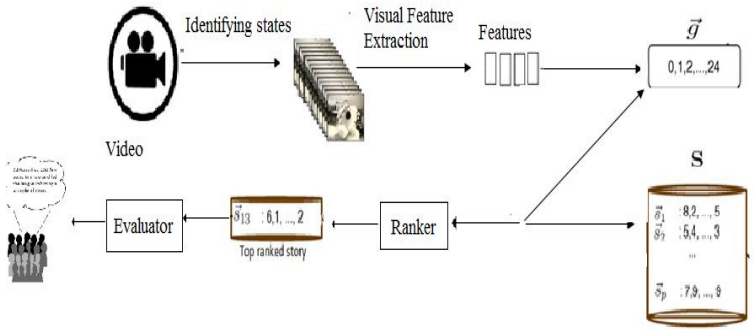

Fig 1: System Architecture

For selecting stories for the game states, the system uses listwise algorithm to rank the stories and point wise algorithm to evaluate the stories. These two has happened in ranker and evaluator. The system uses AdaRank, a listwise algorithm (Algorithm 1) which forms a strong ranker by iteratively combining weak rankers. The output of the AdaRank is a ranker. Then the game state and stories is given as input to the ranker which will give a ranked list of stories. Then the evaluator evaluates the stories and scored them. If the story passes a particular threshold value it will be given as Top Ranked Story to the viewers. The process is explained in Algorithm 2. To match the game state with stories a similarity vector $\vec{c}$ is computed for a game state feature vector $\vec{g}$ and for the story feature vector $\vec{s}$.The vector $\vec{c}$ is calculated by comparing one or more features of $\vec{g}$ with one or more features of$\vec{s}$.

The match quality D($\vec{g}$, $\vec{s}$) between the game state and story is calculated on a five point integer scale ranging from 0 to 4.The 0 shows inappropriate match and 4 shows appropriate match

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IV. ALGORITHMS

Algorithm 1: SCoReS AdaRank.
Input: training data-T, number of game states-m, IR scoring function-F, number of iterations-k and number of tie-breaking features-y
Output: ranker-R
Step1: partition T by game state: $T=T_1UT_2U\ldots U\ T_m$
Step2: sort each T_i by D values, yielding ground truths T_i
Step3: initialize weights w (G) to 1
Step 4: initialize ranker R and weak ranker confidences A to ϕ
Step 5: get all combinations B of length y+1 from T
Step 6: for each iteration up to k do
Step 7: μ =0
Step 8: for each combination b in B do
Step 9: if b(1) not an element of R then
Step 10: for i=1… m do
Step 11: sort T_i by b, yielding T_i'
Step 12: v (i) =w (i)*F (θ_i,…)
Step 13: if mean (v)> μ then
Step 14: μ= mean (v)
Step 15: r=b
Step 16: add r to R
Step 17: calculate α
Step 18: add α to A
Step 19: update w

Algorithm 2: SCoReS Online
Input: game states for a live game-G', story library-S, ranker from SCoReS AdaRank-R, weak ranker confidences for R-A, evaluator-E, threshold for evaluator-t
Output: Top Ranked Story
Step 1: for each game state $\vec{g}$ in G' do
Step 2: if should tell a story in $\vec{g}$ then
Step 3: create $\{\vec{c}\}$, comparing $\vec{g}$ to $\vec{s}\ \epsilon$ S
Step 4: rank $\{\vec{c}\}$ with R and A
Step 5: $\vec{s}_0$ = top ranked story
Step 6: if E ($\vec{s}_0$) $\geq$= t
Step 7: output $\vec{s}_0$ to broadcast team or viewer

V. CONCLUSION

Storytelling can be considered as a rich and creative task. The humans should give efficient training for excel in storytelling. The proposed work (SCoReS) tries to automate the task of storytelling to make the color commentary more entertaining and interesting. It can also be used to write personalized color commentary. Here input to the system will be the features describing the viewer and the appropriate stories are retrieved using the basic method.StatSheet and Narrative science can automatically add stories during automatic recaps of their games using the system. Besides the fully automated color commentary, SCoReS has many future applications.

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