Soccer Broadcast Video Summarization

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Shmuel Peleg's Papers

- Creates compact summarization of events, moving temporally-distinct actions into the same time-space
- Use single stationary cameras
- Group activities do not get well-represented by the synopsis
- Disregards temporal ordering of actions in summary
- Not good for edited videos



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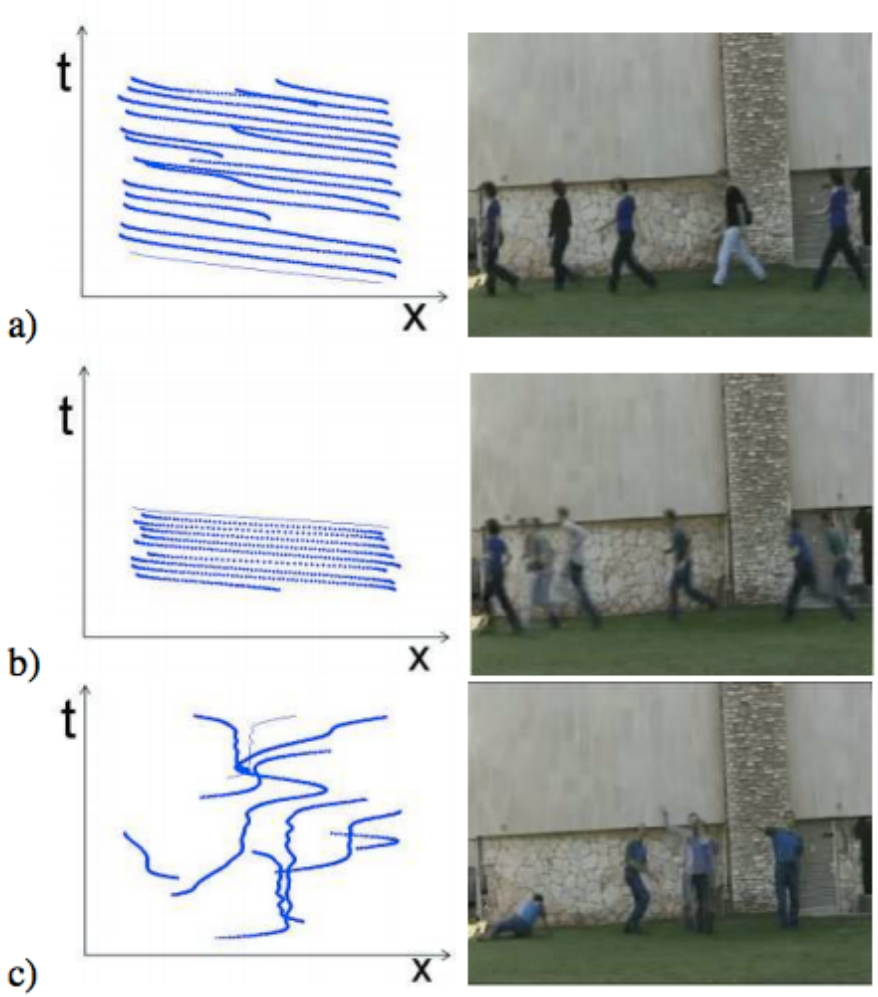
Summarization Papers

Action Occurrences

Causality Matrix

Directed Acyclic Graph

Currently



Other Sports' Summarization Papers

1. Summarize by detecting scene cuts/transitions and appearance of certain features
   - Not robust to different broadcasting styles
2. Summarize by detecting scenes which contain 'plays'
   - Not applicable to sports with continuous play such as soccer or hockey
3. Features include information such as camera angle or players on the field
   - Do not learn actions. Only learn to extract important frames.

Action Occurrences

Action	1	2	3	4	5	6	7	8	9	Totals
Arguing	4	0	1	3	6	3	5	4	9	35
Attempt_At_Goal	47	39	25	44	31	38	43	35	49	351
Card_Red_Yellow	5	1	5	1	5	0	7	0	4	28
Celebrating	5	20	10	13	12	9	7	13	10	99
Corner	13	7	11	11	7	11	12	15	10	97
Foul	36	20	21	29	59	17	42	28	36	288
Free_Kick	16	9	12	17	25	9	21	9	21	139
Goal	11	36	21	24	26	12	16	9	15	170
Goal_Kick	17	3	4	5	9	6	7	6	9	66
Injury	6	2	15	5	15	7	6	2	3	61
Offside	7	11	10	13	12	0	7	4	6	70
Penalty	0	0	0	0	0	0	0	0	0	0
Substitution	4	6	4	4	5	4	3	6	6	42
Throw_In	31	17	24	29	20	16	34	35	23	229
										1675

Causality Matrix

$$p(A|B) = \frac{|A \cap B|}{|B|}$$

- $|A \cap B|$ is defined as the number of times where A is the first event that occurs within t seconds of B.
- $|B|$ is defined as the number of times that action B occurred.

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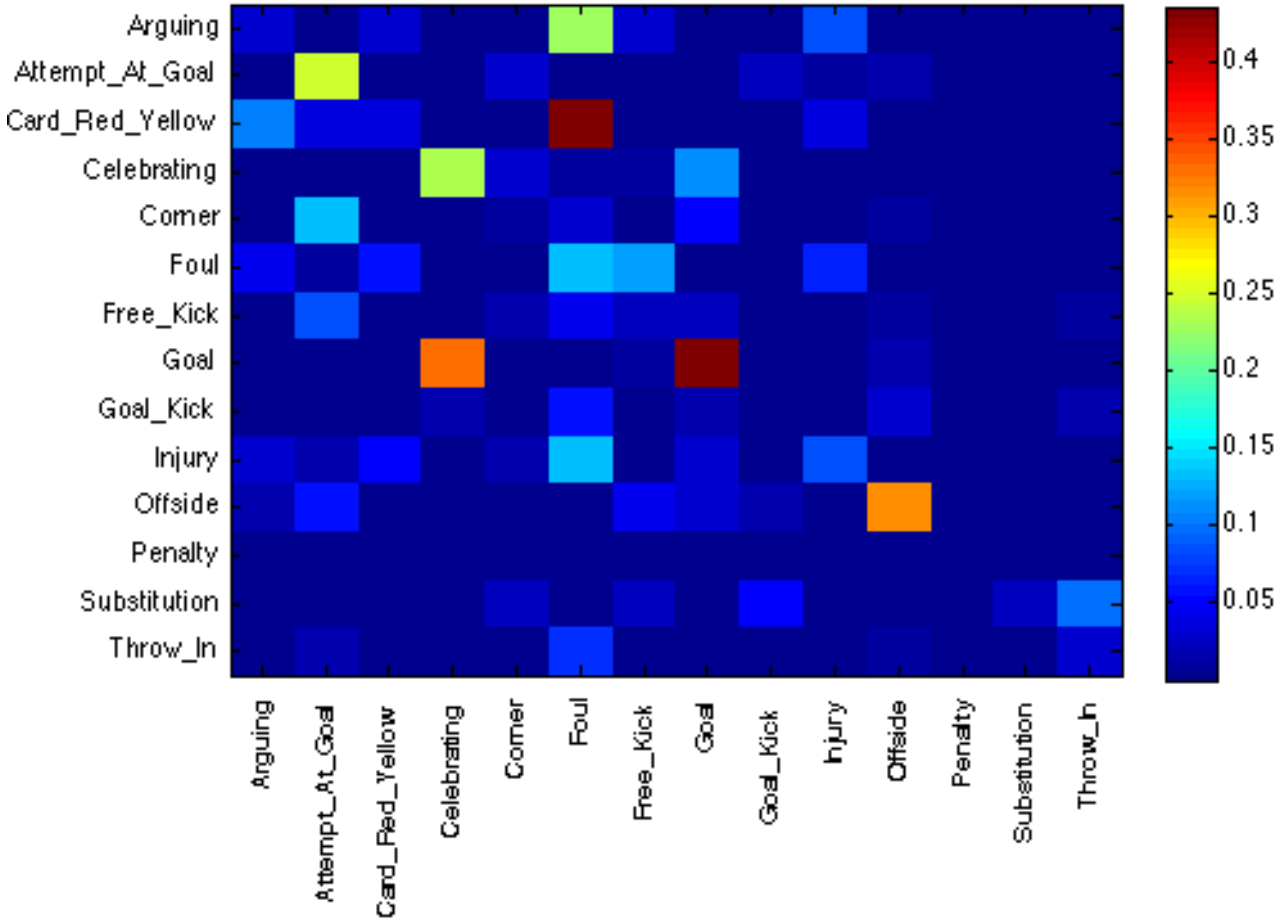
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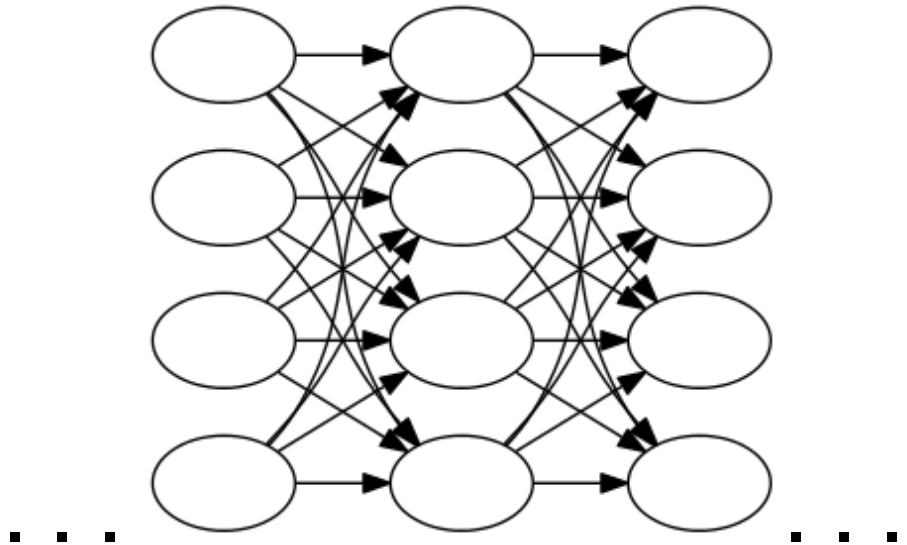
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Directed Acyclic Graph

Each node will be the predicted probability using SVM.
Use causality matrix as weights on edges.



Directed Acyclic Graph

- Use iterative approximation approach to find the path with max flow
- After determining labels, we will use graph clustering to find important segments of the game
- Use ground truth of highlights to learn significance priors for each event

Currently

- Calculated STIP and MBH features for each of the action clips
- Generating codebook for bag of words
- Look into other possible approaches such as HMM, CRF, etc.