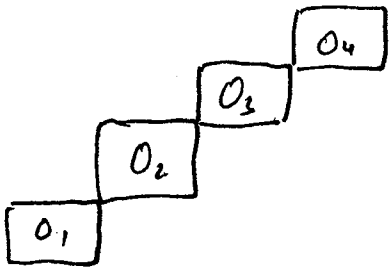
Midterm Exam

Multimedia Systems

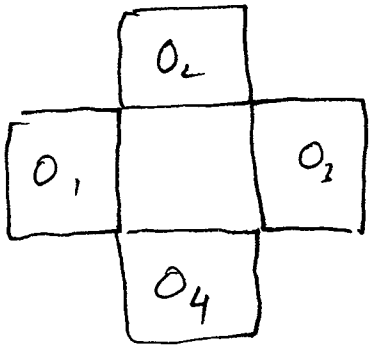
Q1 (25 pts) Suppose you have been hired as a consultant for Innovative Multimedia Technologies, in Studio City, California. As a first assignment, you are asked to investigate a set of feasible techniques for parsing video data into individual camera shots (a camera shot corresponds to a set of contiguous frames of a scene without any break in it). You are supposed to suggest a solution which can handle special effects such as panning, zooming, etc. The video data is black–and–white (256 grey levels) and is available ONLY in UNCOMPRESSED form. Which of the video parsing method(s) you would suggest as feasible. Outline the merits of your suggested method(s) and provide the asymptotic complexity of the method(s) in terms of total number of frames and in terms of (number of pixels in each frame or number of grey levels in the video).

Q2 (25 pts). In a geographical (image) database, the map of a campus consists of four buildings, identified by their bounding boxes as O1, O2, O3 and O4. Assume all the buildings are identical squares. Write logical expressions using n–ary spatial operators to specify the following spatial events.

a. All the four building are adjacent to each other (irrespective to their orientation with respect to the origin that you are selecting for the coordinates of an image)
b. All the building are diagonally arranged in a sequence in such a way that only their corners touch each other (as shown in the following figure)



c. The four buildings are arranged in a form of a quadrant as shown below



See over

Q3. (25 pts) Consider the three database relations given in the paper by T.D.C. Little et al ("Interval–Based Conceptual Models of Time–Dependent Multimedia Data", IEEE Trans. on Knowledge and Data Base, August 1993) for maintaining the temporal structure of an OCPN. Write an SQL (or relational algebraic) query to identify whether or not the following sub–document structure is present within the overall document structure, stored in these three relations:
The sub–document contains an image of "Mars" which is displayed concurrently with an audio segment. The duration of the image display is 5 units of time.

Q4 (25 pts) Refer to paper by S. Dagtas, W. Al–Khatib, A. Ghafoor and R.L. Kashyap, "Models for Motion–Based Video Indexing and Retrieval" IEEE Transactions on Image Processing, Vol. 9, No. 1, January 2000, pp: 88–101. Compare the trade–off involving computational complexity and precision yielded by the Fourier–based distance measure and the two–stage algorithm presented in this paper. Give a quantitative example of the breaking–point between the two techniques.