Solutions for the 2 questions in the ppt file

1. Motion compensation:

There are a number of reasons why a given macroblock might get coded some other way. These include:

(a) **Homogeneous region:** If a large area is very homogeneous (say there is a large wall that is completely white) then there might be any number of equivalently good macroblocks in the past that match the current one. The “real” block from the past (that is, the one corresponding to the panning vector), might perhaps not get chosen just because there are several others equally good.

(b) **Object motion:** If some object in the scene is moving, whether it is translating, rotating, or whatever, then the movement of the camera is not the sole movement dictating the best-match macroblock.

(c) **Leading edge of the pan:** If the camera view is moving to the right, then the stuff on the right edge of the picture is new and doesn’t have a reference in the past.

(d) **Depth issues:** Suppose that nothing in the scene is moving, and that the camera is rolling along horizontally on a cart in a direction perpendicular to the direction that the camera is pointing. Unless the scene is an artificial two-dimensional backdrop, the current pixels will not just be translates of earlier pixels. For example, consider a box that is placed at an angle to the camera. Initially two faces of the box may be in view, but after the camera translates for a bit, one of those faces cannot be seen any more. This is stuff we didn’t talk about in class, and you were not expected to mention this.

(e) **Illumination changes:** If the illumination is changing over time (say someone has turned off the light) then all kinds of changes might happen in the matching process.

(f) **Rate control:** I briefly discussed that one communications scenario involves a constant-bit-rate (CBR) communications channel for which the encoder has to meet an average rate budget. The encoder has to ensure that the buffers of a standard-compliant decoder never overflow or underflow. For example, if the scene has been not very complex to describe, and few bits have been sent, then the encoder may need to increase the rate. So, a macroblock might get sent intra-coded, or might get sent with motion vector plus difference block, perhaps providing higher quality than just referencing the past macroblock, and providing the higher bit rate necessary to prevent an underflow.

(g) **Noise:** If the video is noisy, this might have an affect on the match.
2. Motion compensation: Best match

(a) For MAE, any block in the shaded region will result in the same error:

There are 25 best-match positions for the block (9 along the top edge, and an additional 16 along the left edge).

(b) With the MSE, any overlap with the region of value 200 is ruled out. The top section with 9 valid positions are still all equivalent under MSE.