2009 Paper 9 Question 1

Additional Topics

(*a*) "The future that ubicomp has been attempting to build is not our own future, but 1989's future—yesterday's tomorrows." (Bell & Dourish, 2007).

Explain what is meant by this quotation, using examples where appropriate.

[5 marks]

(*b*) A company wishes to have a camera in a video-conferencing suite to track the current speaker at any time. To do so they propose distributing a set of microphones around the room, each connected to a single computer via a set of sound cards. They intend to use a Time Difference of Arrival (TDOA) procedure to locate the speaker.

(*i*) What is the minimum number of microphones needed, and how would you distribute them spatially to get the best results? [2 marks]

(*ii*) Each microphone input is sampled simultaneously for a time window of length T. Give *two* factors that affect the choice of T. [3 marks]

(*iii*) Given matching windows of samples for two microphones, how would you compute the time differences of the signals? [2 marks]

(*iv*) How does the sampling rate for the signals affect the accuracy of each TDOA estimate? Assuming the audio signal of interest has a frequency of 22kHz, estimate the largest error that could be associated with a single TDOA estimate. [5 marks]

(*v*) Suggest *two* other error sources likely to contribute to the ultimate error in position. What would you expect to be the dominant error source?

[3 marks]