CSCI444/944 - Revision Questions

(1) Describe how odometry errors on a mobile robot might occur and explain two methods how they could be corrected.

(2 marks)

(2) With respect to mobile robots:
   (a) Explain why IR sensors might be used in preference to sonar sensors.
   (b) Explain why sonar sensors might be used in preference to IR sensors.

(2 marks)

(3) Name 4 sensors discussed in this course that can resolve the range of objects? For each sensor named briefly explain how it works.

(2 marks)

(4) Briefly explain the levels 1 to 4 of automation attributed to autonomous vehicles.

(2 marks)

(5) ~~Name three sensors available for LEGO Mindstorms robots. For each sensor explain its operation and comment on its capabilities and limitations.~~

~~*(4 marks)*~~

(6) Two methods for acquiring a map of the environment using odometry are outline segments and an occupancy grid. Explain these mapping methods.

(2 marks)

(7) State one advantage an outdoor mobile robot has over an indoor mobile robot when navigating the environment? State one disadvantage an outdoor mobile robot has over an indoor mobile robot when navigating the environment?

(2 marks)

(8) Briefly explain how a robot pool cleaner might go about navigating its environment.

(2 marks)

(9) Explain the difference between a mobile robot control systems that reacts to the environment and one that works by planning a path through the environment. List one advantage and one disadvantage of each of these controllers.

(4 marks)

(10) In terms of sensing and control, explain how a bookmobile robot could navigate the inside of a library building.

(5 marks)

(11) What is meant by the piano mover problem? What type of robots does this apply to? Describe two ways how this problem can be overcome.

(2 marks)

(12) What is meant by supervised learning, unsupervised learning and learning by demonstration? Give an example for each learning paradigm.

(3 marks)

(13) Briefly explain the difference between reactive control systems and deliberative control systems.

(2 marks)

(14) In terms of localisation and mapping explain how a mobile robot could navigation the environment with the use of:
   (a) continuous landmarks
   (b) non continuous landmarks

(4 marks)

(15) What is the credit assignment problem with respect to mobile robots?

(2 marks)

(16) Name 4 sensors discussed in this course and discuss their function and limitations?

(4 marks)

(17) What is an occupancy grid? How might you devise an occupancy grid that can cope with odometry errors?

(2 marks)

(18) In terms of sensing and control briefly explain how an indoor mobile could be devised to find its charging bay.

(2 marks)

(19) What is sensor fusion? Give an example of sensor fusion and explain how the example given works.

(3 marks)

(20) Why might a simulator be used to assist with the development of a mobile robot control system? What special considerations need to be taken into account when devising a mobile robot simulator.

(3 marks)

(21) In Labview what is a cluster? How would you access the data in a cluster?

(2 marks)

(22) What is a feedback node used for in Labview? How does this differ to a shift register?

(2 marks)

(23) ~~Assume that you are to design a nanorobot for drug delivery in large mammals such as cows, elephants, …). List and discuss the advantages and disadvantages of passive sensors versus active sensors for such nanorobots.~~

~~(3 marks)~~