ECE 172A Homework #1
Solutions

Questions:

Wikipedia Articles

1. Who coined the term “artificial intelligence” and when?

   *John McCarthy, 1956.*

2. Briefly list and discuss some of the problems inherent in artificial intelligence, and some of the tools used.

   **Problems:** Deduction, reasoning, problem solving, knowledge representation, planning, learning, natural language processing, motion and manipulation, perception, contextualization.

   **Tools:** Search and optimization, logic, probabilistic methods, classifiers and statistical learning, neural networks.

3. What is the difference between telepresence and telerobotics?

   *Telerobotics refers to the remote manipulation and control of robots. Telepresence refers to various technologies for making a person “feel” as though he is in a different location, for example “smart” teleconferencing. It is of note that there is space for overlap between these two.*

4. Briefly discuss how artificial intelligence and sensing interact in robotics.

   *A robotic system may have any number of sensory modalities, designed to take measurements of the operating environment. Artificial intelligence approaches provide a framework for the robotic system to perceive, understand, or make decisions, based on sensor data. Perception can then be used for decision-making, motion, or control.*

Military Robots and the Laws of War

1. How many robots were utilized during the invasion of Iraq? How many were being used in Iraq in 2004? 2008?

   *During the invasion of Iraq, there were no robots. By 2004, there were 150. By 2008, there were some 12,000.*
2. What major breakthrough in 1995 significantly expanded abilities of unmanned systems? 

*GPS systems for precise localization and navigation.*

3. What are UAV’s? What are UGV’s? 
Unmanned aerial vehicles. Unmanned ground vehicles.

**Chen and Trivedi**

1. What is an intelligent robot?

*Intelligent robots interact with the real world by perceiving the environment with sensors and change the state of the environment using effectors.*

2. What are the three parts to an intelligent robot?

*Perception, motor, and intelligence.*

3. What are the six modules of the SASIR?

*Perception, Motor, Task Planner, Knowledge Base, User Interface and Supervisor,*

4. What are the desirable characteristics that the planning and control functions of a sensor-based intelligent robot should posses?

*Integration of sensing and action*

*Hierarchical planning*

*Replanning*

*Automatic error recovery*

*Ability to service interrupts*

*Conditional and iterative planning,*

*Ability to support learning,* and

*Integration of planning and simulation.*

5. Dynamics cause planning issues. What are the three issues cited?

*The three issues from dynamics are plan execution, re-planning, and plan error recovery.*

6. What is the basic system architecture model? Describe it, what type of information is at the top and bottom of the abstract data structure?

*The system is implemented using Frames which is a network of nodes and relations. At the top is the static information and the bottom has dynamic information.*

7. What are three areas of task planning research?

*Mobile platforms, manipulators, and mobile manipulators.*
8. What are the main components of the knowledge base module?

   Knowledge Acquisition, Short Term Memory, Long Term Memory and Knowledge Maintenance.

9. Name the two real world systems described and the purpose.

   Autonomous spill cleaning (ASC) robotic system – detects chemical spill and uses a vacuum to clean the spill.
   ROBOSIGHT – this robotic system did inspection and manipulation of control panels useful for the nuclear industry.

10. Can you imagine any reasons to view intelligent robots negatively? If yes, what are they? If no, explain why they can’t be viewed negatively.

    People may fear robotic systems for a variety of reasons, including reliability, safety, or “feel.” Human comfort, satisfaction, and trust are huge issues in the development and deployment of intelligent robotic systems, and great research effort is being expended in the field of Human Machine Interfaces.