# EGN 4060c: Introduction to Robotics

## Midterm Exam Review

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# Exam Format

- Questions: T/F, multiple choice, short answer, simple problems (no calculator needed)
- Can bring into the exam:
  - 1 sheet of notes (front and back covered)
- Studying is essential otherwise you won't know the material in sufficient detail to give a good answer.

# Topics

- Overview on Robotics
- Architecture
- Planning*
- Machine Learning
- Lab Material and Homework Questions

# Overview on Robotics

- Perception/cognition/action
- Representation/world model/frame problem
- Map representations
- General concepts related to autonomy and teleoperation but not the specific paradigms
- Interaction between planning/vision/localization
- Don't need to know: example robotic or vision applications described in class
- This is less important than the other topics

# Architectures

- Types of architectures
  - Deliberative, reactive, behavior-based, hybrid
- STRIPS planning
- Reactive:
  - Subsumption
  - Potential fields
- Hybrid: example module types
- Know the strengths and weaknesses of the different paradigms
- Be able to draw a finite state automata

# Example Questions

True or false: Reactive architectures need to maintain a persistent model of the world state (the state of entities in the world) to function effectively.

Vector summation is used as the basis for combining behaviors in which type of architecture:

a) deliberative

b) potential fields

c) hybrid

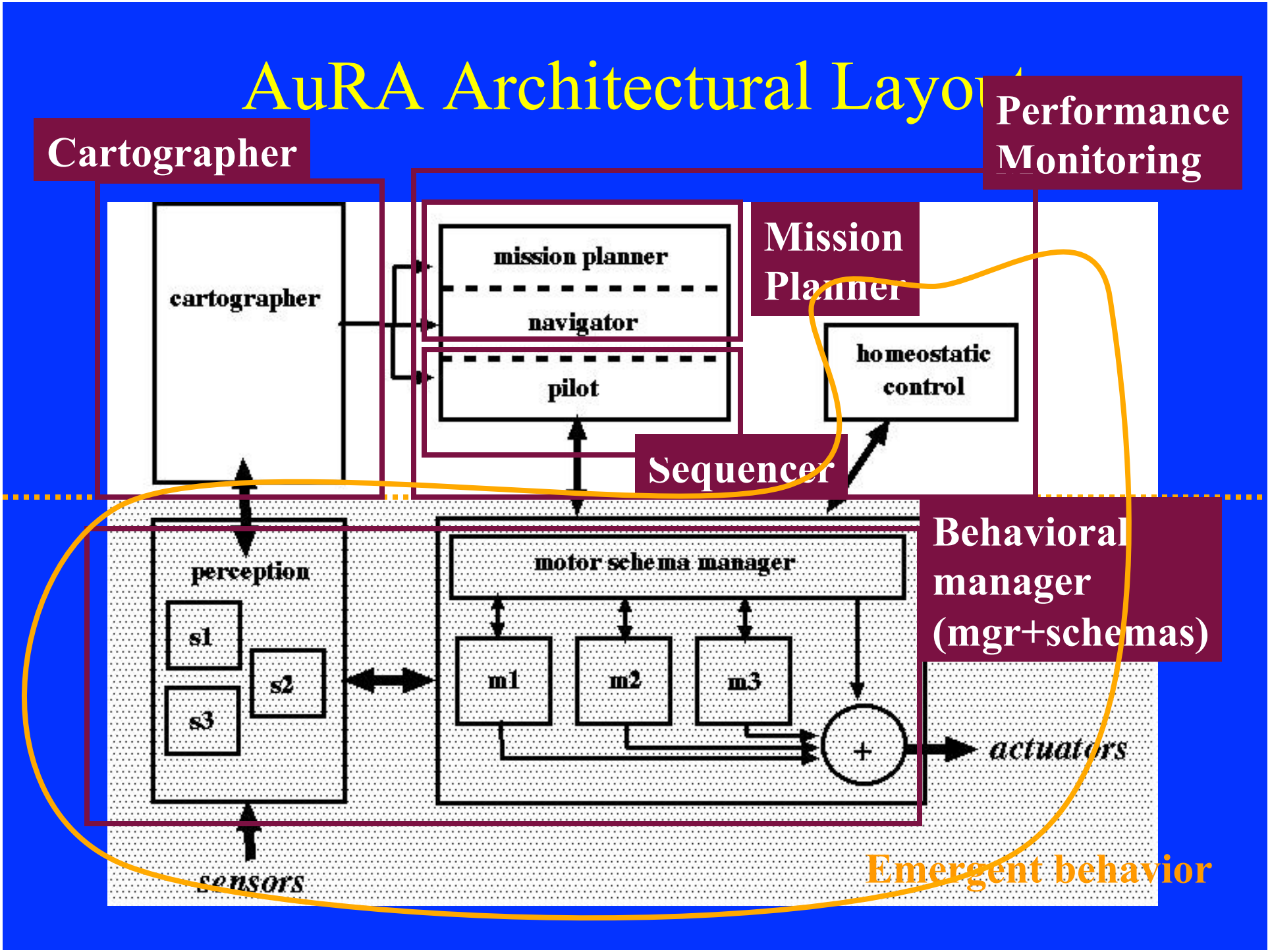
d) subsumption

e) all of the above

# Example Question

Hybrid architectures often contain the following modules: mission planner, cartographer, sequencer agent, behavioral manager, performance monitor. Describe and provide an example of tasks handled by three of the modules.

# AuRA Architectural Layout



# Planning

- Dockworker robot example
- General operation of the state-space planners (ideas like the Sussman anomaly)
- Search-based planning: A*
- Wavefront planning
- Visibility and Voronoi graphs
- Spatial decompositions
- Sampling-based planners
- Understand ideas behind: Graphplan, hierarchical task network planners, plan repair (D*), sensor-based planning
- Don't need to know: configuration space, complexity results for planning

# Learning

- Reinforcement learning: Q-learning and value iteration
- Understand the Markov Decision Process framework
- General understanding of: supervised classifiers and regression
  - Decision trees
  - Neural networks
- Specific understanding of:
  - Naïve Bayes
  - Bayes rule and conditional probability
  - k-nearest neighbor