Project Proposals due: March 11, 2010 at the Lab

Project Deliverables

Presentation (**10%**). 10 minute (5-10 slides) presentation to share your experience with the class.
Due: Thursday, March 25, 2010 at the Lab

Simulation Code (**20%**). Must be submitted online.
Due: Monday, April 12, 2010

Report (**15%**). Must be submitted online by **April 7, 2010**

15-20 page report with the following **headings**:

- **Problem Description**, in which you discuss the general problem you modelled, as well as your criteria for success;
- **Brahms Solution**, in which you discuss how you solved the problem. Discuss the environment, agents, objects, and interactions (using screenshots of timeline). Also, discuss and defend any pertinent modelling decisions that were made (i.e., why you chose your approach over alternatives). You may choose to cite research papers or to describe the pros and cons of the various options. In either case, defend why your decision produces the best result with respect to your project success criteria;
- **Reflections**, in which you highlight your experience using Brahms (e.g., Major challenges you faced, and how did you overcome them. Was the level of difficulty congruent with your expectations? What suggestions do you have for improving the student 'BRAHMS experience' the future?).
- **For team projects clearly outline what was the contribution of each member.**

Project Options

Projects may be completed individually or in teams of two. **For the projects proposed by us you will receive extra support and guidance.**

Project 1

This project aims to estimate the workload of people working in a hospital. In order to do that, you need to model the most relevant procedures performed by doctors and nurses and to test them against an increasing number of patients arriving at the hospital. Your model should contain at the minimum the following geography, actors, objects, and functionality, and should make use of all the Brahms concepts covered in the labs:

Geography:
Waiting Rooms, Emergency Room, X-ray Lab, Blood Clinic, Operating Room, Staff Room, Doctor Offices, Patient Rooms, Blood Lab, Cafeteria, Gift Shop

Actors:
Patients, Family, Visitors, Doctors, Nurses, Triage Nurse, Lab Technicians, Cafeteria Staff, Gift Shop

Staff

Objects:
MRI machine (free/in use), X-ray machine (free/in use), Medical Reports (information about the patient)

Functionality:
- Patients must get to the hospital and have a specific condition that can be addressed by the hospital; they must follow the orders of the technicians, nurses, and doctors; they must go to the emergency room first and be examined by the Triage Nurse

- Visitor enter the hospital after the patient and leave before the patient leaves; visitors only visit patients who are in a patient room; visitors may visit the gift shop or the cafeteria

- Triage Nurse is responsible for examining the Patients and filling out a Medical Report for the Patient; the nurse passes this Report to the appropriate department

- Lab Technician / Nurse may be in charge of a particular area (e.g., Blood clinic); they must read the Medical Reports received from the Triage Nurse, determine when they are able to see the patient, and then retrieve the patient from the Emergency Waiting Room

- Doctors are in charge of the Operating Room; they attend to patients who have serious injuries; they may also see patients in their office, if the patient is coming for a follow-up meeting

- Cafeteria and Gift Shop Staff engage in basic activities associated with buying an item; note that these items do not have to be modelled, only the browsing and buying activities by the Family or Visitor agent

Project 2

This project aims to model the traffic conditions in a particular section of Fredericton. This simulation could be used, for example, to allow decision makers to better understand traffic patterns, to learn how to improve traffic light coordination, and to maximize vehicle throughput. Your model should contain at the minimum the following actors, objects, and functionality, and should make use of all the Brahms concepts covered in the labs:

Geography:
The various sections of Regent St., Prospect St., Smythe St., Charlotte St., Dundonald St., Kings College Rd., Priestman St., York St., some Crosswalks

Actors:
Drivers, Police, Pedestrians

Objects:
Traffic Lights (red, yellow, green), Crosswalk Activation Button, Speed Signs, Crosswalk Lights

Functionality:
- Drivers must have different driving characteristics; they may continue through an intersection when

the light turns yellow, or stop; they may exceed the posted speed limit, or not; they may stop for pedestrians at crosswalks, or not; etc.; they must pull over when they hear a siren and slow down when they see flashing lights; they must also be able to engage with a police officer if they are stopped for speeding; Drivers must be able to detect crosswalk flashing lights

- Police will be on the streets and can detect in their current area any Drivers that are speeding; each Police agent will have a different threshold in terms of what constitutes speeding; there should be three severity of fines based on the exceeded speed amount; they must be able to pull a speeding Driver over by turning on their siren and lights; the siren must broadcast in the current area to notify all cars to pull over; once the speeder has pulled over, the police should turn off the siren, but keep the lights flashing; they must engage with the Driver that was pulled over for speeding

- Pedestrians will be walking along the roads, but when they wish to cross an intersection, they must activate the Crosswalk Activation Button

- Traffic Lights must be able to rotate their lights in a realistic manner (e.g., opposing lights at an intersection must never both be green; the yellow light should be shown for a few seconds before turning the light red; there should be a slight pause after the light turns red before the opposing light turns green)

- Crosswalk Activation Button will activate Crosswalk Flashing Lights when pressed by a Pedestrian

- Crosswalk Flashing Lights when activated will remain flashing for a realistic amount of time (e.g., 25-40 seconds)

You can define your own BRAHMS Customised Project

Write and submit a proposal similar in style to the ones above. The project proposal must be submitted (via the website) for approval by Wednesday, March 10.

Reinforcement Learning (RL) Project proposd by Nicola ('special status' project)

Robocode is a platform developed by IBM that allows virtual tanks to fight each other in a simulated arena. Each tank has sensors to get information about the environment (battle field). It also has actuators to perform actions. To program a tank in Robocode, players are likely to develop strategies or motion patterns. Since the environment in Robocode is dynamic and not fully observable, hand-coded methods are not always the best way. In this project, a robot with adaptive behaviours has to be implemented. The idea is to use Reinforcement Learning (RL) to allow the robot to learn policies that maximize a given performance measure.

http://robocode.sourceforge.net/
http://en.wikipedia.org/wiki/Reinforcement_learning

Mandatory requirement:

- Propose a way to tackle the problem by identifying the proper states, actions, reward scheme and RL technique to be used. These elements have to be implemented together. *Even if it is*

highly desirable, it is not mandatory that your robot will be actually able to beat other robots in a competition.

General Requirements:

- Motivate the critical choices you made both during the design and implementation stages;
- Test your robot against several opponents and compare the results with the number of training matches.