

## Software for Intelligent Robotics Homework #5 Competition (for extra credit points)

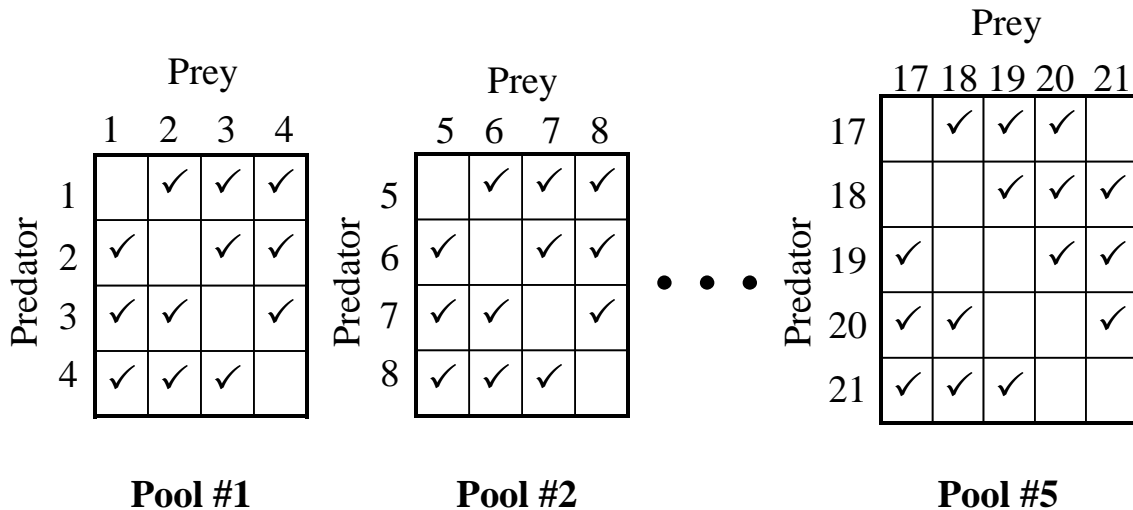
**We'll meet in the Hydra Lab for this competition on April 19, 11:10 AM!!!**

**Note: due to time constraints, we must start this competition promptly at 11:10. Thus, if you are late to class (in the Hydra Lab), then you forfeit your place in the competition.**

For homework assignment #5, we will have a head-to-head competition to determine the distribution of extra credit. Since we have 21 students in the class, if we assume that everyone gets their code working for the competition, a complete scenario where everyone's predator plays everyone's prey would take  $20 \times 21 = 420$  games. We could play some of these games in parallel, but it seems clear that one class period is not sufficient for a complete head-to-head playoff.

So, instead we're going to set up a "pool play", kind of like my nephew's little league baseball tournaments. Granted, the pool play approach injects some luck into the process, in that you may have a really strong pool (which is to your disadvantage), or a really weak pool (which is to your advantage). But, that's life.

Here's how it will work. We'll divide everyone into 5 separate pools of 4 players each (except one group will have 5, if everyone has working code). In each pool, everyone's predator will play everyone else's prey (except for the group of 5, which will play 3 of the 4 other players in the pool). All five pools will compete concurrently. This will be a total of  $3 \times 4 = 12$  games per pool. (If there are fewer students who are present to compete, then we'll adjust the pool sizes and/or number of pools accordingly.) Here's this setup of who plays who:



In each of these games, we'll keep track of the time it takes for the predator to catch the prey. The score for both the predator and prey in a particular game will be this time. Since we have limited time, we'll put a time cap on each of these games – a maximum of 4 minutes per game, or 240 seconds per game. As a result of this pool competition, we will end up with 3 scores for each predator and 3 scores for each prey, in each pool. (Or, for fewer students competing, we may have a different number of scores; we'll figure this out once the assignments are turned in the morning of the competition (at 6AM!)) We'll average these scores for each player, resulting in the following:

		<b>Pool #1</b>				<b>Pool #2</b>			
		Predator Scores (for 3 games)			Avg.	Prey Scores (for 3 games)			Avg.
1									
2									
3									
4									
		Predator Scores (for 3 games)			Avg.	Prey Scores (for 3 games)			Avg.
1									
2									
3									
4									

Now, for each pool, we'll rank order the predators, and we'll rank order the prey, according to the average score. For the case of the predators, the scores will be ordered in ascending order, so that small times are better. For the case of the prey, the scores will be ordered in descending order, so that large times are better. The top performing predator and the top performing prey in each pool will now advance to the final playoff round. This results in 5 predators and 5 prey (or maybe 4 predators and 4 prey, again depending upon exactly how many students end up competing), which we'll call  $P1_{pred}$ ,  $P1_{prey}$ ,  $P2_{pred}$ ,  $P2_{prey}$ , etc., where  $P1_{pred}$  is the winning predator from Pool 1, and so forth.

In the playoff round, because of time constraints, we will only have 1 game for each predator and for each prey (except again if a smaller number of students participate, in which case we may have 2 games per predator and prey in the playoff round). Again, there's some luck here in who you draw to play against. And, again, that's life.

Here, if time constraints dictate, we will limit the time of each round to 3 minutes = 180 seconds. The playoff round looks like this (in the case of 1 game per predator/prey):

		Prey				
		$P1_{prey}$	$P2_{prey}$	$P3_{prey}$	$P4_{prey}$	$P5_{prey}$
Predator	$P1_{pred}$		✓			
	$P2_{pred}$			✓		
	$P3_{pred}$				✓	
	$P4_{pred}$					✓
	$P5_{pred}$	✓				

Finally, we'll rank-order the predator and prey performances in this final playoff round, based on their time scores in this round, with predators in increasing order and prey in decreasing order.

### Logistics of running games

We'll use the .cfg and .world files as provided for HW #5, with the exception that we will select different starting robot positions (but still within the boundaries specified in the HW #5 writeup). For this competition, however, we will use the same robot starting positions for all games, to try to eliminate variation that will affect the outcome. Each pool will compete on a separate linux machine. We will have everyone's submitted code compiled and set up in an area accessible to all in advance of the class competition time. A neutral party will start up Player/Stage for each pool. Then, each player who is competing in a particular round will be responsible for entering the correct command line to execute their code, connecting to the correct robots (i.e., either predator or prey) for that competition. This will be the operation for both pool play and the final round play.

At the competition, a list giving the pool assignments and the order that the players will compete will be distributed. Each pool will also be given a score sheet to keep track of the scores. The pool as a whole is responsible for ensuring that the scores are recorded correctly. At the end of pool play, the instructor will gather all the scores and determine who the winner is of each pool, thus determining who advances to the final round.

### **Awarding extra credit points**

Extra credit points will be added to your HW#5 grade according to how your software performs in this competition. Your predator software and your prey software are evaluated separately. The points will be awarded as follows (assuming 5 pools):

- +16 points: Winning predator of playoff (final round)
  - +16 points: Winning prey of playoff (final round)
  - +14 points: Predator #2 of playoff (final round)
  - +14 points: Prey #2 of playoff (final round)
  - +12 points: Predator #3 of playoff (final round)
  - +12 points: Prey #3 of playoff (final round)
  - +10 points: Predator #4 of playoff (final round)
  - +10 points: Prey #4 of playoff (final round)
  - +8 points: Predator #5 of playoff (final round)
  - +8 points: Prey #5 of playoff (final round)
- 
- +5 points: Predator ranked #2 in pool play from 1<sup>st</sup> round (5 of these)
  - +5 points: Prey ranked #2 in pool play from 1<sup>st</sup> round (5 of these)

If there are fewer pools, due to fewer students participating, then we'll adjust accordingly. In the case of ties, we will add up the points available for each ranking and divide them equally among the tying players. For example, if 2 prey tie for 2<sup>nd</sup> place, then we'll take 14 points (for 2<sup>nd</sup> place) + 12 points (for 3<sup>rd</sup> place), divide by 2, giving each tying player 13 points.

Since each of you has 2 programs competing, you can win points twice – once for your predator code, and once for your prey code. So, it is possible for you to earn 32 extra credit points. It is also possible for 20 different people to win extra credit points. A total of 170 extra credit points will be awarded (again, assuming 5 pools; we'll have fewer points if there are fewer pools), which averages out to a little more than 8 points per person, if spread out evenly. So, your objective should be to get your fair share of these extra credit points.

***Good luck!!***