Programming Assignment 2

**Part 1**

Q1:

1. The global consistency problem is that the association of metric coordinates to place cell activation involves using self-motion, which is inherently relative to an origin point. However, changes in the origin position would mean that the coordinates learnt are relative to different positions and thus inconsistent in the environment.

Q2:

1. The distal reward problem is that in most cases the reward is far away from the origin of the task, and thus the origin and its vicinity will not be associated to the reward like the configurations closer to the goal.

Q3:

1. The role of the actor is to determine how the agent should act. That is, it encodes the policy that the agent uses to select the direction in which it should move next based on the activation pattern of the place cells.
2. The role of the critic is to criticize and instruct the agent whether the action taken by it was good or bad relative to the task at hand. It does so by encoding the estimated value of where the agent is based on the activation pattern of the place cells.
3. The error signal is

where is the reward perceived by the agent at time *t*, is the constant discounting factor, and and are the values estimated by the critic of the positions of the agent at time *t+1* and *t* respectively.

1. The place cells encode the position of the agent, forming a basis function representation of location. Their encoding of location is then used to inform the critic and actor of the location so that they may calculate their values.
2. The place cells do not encode any information about distance, direction or any other spatial or navigational information that could be used by the agent to know how to act.