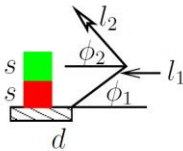# Motor Control Assignment

1. Computational problem

Consider a two-joint robot arm as shown in the diagram, operating with noisy actuators in a world with rewards and punishments.

$d = 1$, $s = 0.5$, $l_1 = l_2 = 1$; ϕ_1 and ϕ_2 can be set between $[0, \pi]$ with mean 0 additive Gaussian noise of variance $\sigma^2 = 0.1$ radians. The reward for getting into the green square is 10 points; the penalty for getting into the red square is -50 points.

Build a forward model from the *command* ϕ_1, ϕ_2 to the (possibly approximate) expected return for choose those values. Show this as an 2d image.

Backpropagate through your model to work out the best target.

Repeat with the penalty being -100.

2. Modelling oscillations in Matlab

The file CPGhomework.tar.gz contains the homework matlab code, run the code to see what happens, and I left instructions to show them how to edit the file to change things to observe how the CPG functions with different external inputs to control whether to swim (oscillate) or not, and to show that with different initial conditions to the network, the network always prefer to oscillate in the left-right out of phase mode. See also pdf "ZhaopingPRL2004.pdf", the homework is based on a simplified version of the circuit described in this paper.

3. Brief essay.

Given your new knowledge of motor control models and circuits, in your opinion what new directions should motor control research take in the next 5-10 years?
(1 page max.)