Model Checking

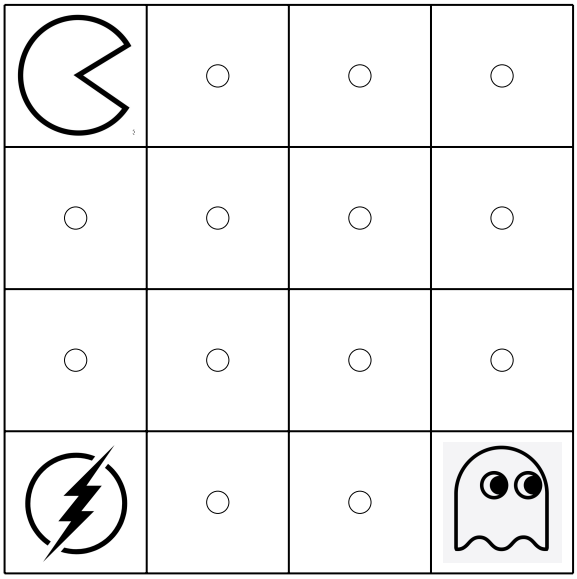
COS 741

Practical Assignment 3

You have until the end of the day to solve this practical assignment.

EXERCISE 1 (9 Marks)**:**

Consider the following Pac-Man game consisting of a 4x4 grid, one Pac-Man, one ghost and one 'energizer'. The initial positions of the Pac-Man the ghost and the energizer are depicted below. On all remaining fields of the grid there is initially a pellet. The Pac-Man and the ghost can make a step *right*, *left*, *up* or *down*, as long as they stay inside the grid. Pac-Man and the ghost repeatedly make a step, where the direction of the step is non-deterministically chosen. If Pac-Man enters the field with the energizer then the energizer disappears, and if Pac-Man and the ghost at some point afterwards reach the same field, then Pac-Man eats the ghost. If Pac-Man and the ghost reach the same field before Pac-Man has entered the field with the energizer, then the ghost eats Pac-Man and the ghost is the winner of the game. If Pac-Man enters a field with a pellet then he eats the pellet. If Pac-Man eats all pellets, then he is the winner of the game.



a) [5 Marks]:
Model the Pac-Man game in Promela. Use `printf` statements to output the moves and events.

b) [4 Marks]:
Verify the following two properties with Spin, give the corresponding LTL formulas and briefly explain if the properties hold or not: Eventually either Pac-Man or the ghost will win the game. If Pac-Man reaches the energizer before he and the ghost enter the same field, then he will eventually win the game.