PROJECT DESCRIPTION

Our coursework mainly focuses on using the software tools for building robot simulators to create and develop intelligent robot controls using the most advanced biologically-inspired techniques. Here we used a well-known robot simulator and also have created and implemented its environment configurations that assures consistency of its performance over various development stages. The behavior of robots were analyzed and some interesting conclusions were drawn once the bio inspired techniques and algorithms were used to develop the intelligent controllers that are implemented to control and simulate the robots.

**Behavior-based robotics** rely on adaptability rather than using computations to solve problems. This approach primarily relies on the inputs from the robot’s sensors and these inputs will be used to correct their actions, taking into consideration the changes in the environment. In BBR, intelligent behavior is built from simple behaviors, that can occur simultaneously and provide suggestions about what actions the robot should perform. Behavior is explained as a sequence of actions the robot should perform.

The method or goal of implementing **Evolutionary robotics** is helpful to design and simulate robots using the most remarkable Darwin’s principle, that elaborates the concept of natural methods of selection. Here, in our study the concept of robotics are assumed to be mannered, artificial and autonomous that aims to acquire skills by closely interacting with its environment. We have implemented certain algorithms like, the neural network, stochastic optimisation, evolutionary algorithms and dynamic systems to study the behaviour. First, we experimented with randomly generated design patterns and then following Darwin’s principle, used specific algorithms to replace the worst design with a mutation of the best design.

The task ahead is to design a simplified view of the test environment where we need to create an idea and design for the the planned navigation system of Mars rover, used in our coursework. The Mars rover we have taken into consideration, goes to specific areas that we have considered as sample areas, to collect some soil samples. The mars rover should reach this reward or collection region and quickly avoids all the obstacles that stands in its way. All the paths that are possible are highlighted by the lines on the surface of the arena.

As a part of this coursework, we experimented with an e-puck robot moving through 2 routes using the Behaviour-based robotics approach and the Evolutionary Robotics approach based on the given conditions of movement to test. The robot passed through the routes namely A and B, in the BBR approach based on the rules defined in a good record of time. Similarly, using the ER approach, the robot evolved automatically to survive in the environment in which it is placed and the best routes were recorded based on the time taken during the presence of light. Despite the fitness function and the reward criterion defined to assess the motion of the robot, it was difficult to predict the behaviour of the robot through the iterations run. Eventually, the robot learned to pass through the routes survived by avoiding the obstacles and reaching the target position. The evolution in each generation during the investigation helped in analyzing the behaviour of the robot and the modifications required to make it perform better. ER is based on investigations and continuous evaluation is required to reach the result. As far as BBR approach is concerned, the robot will face some restrictions and inefficiencies due to its nature of programming. Based on our experience through this coursework, we understand the different variations of task similar to those in real life can be solved by training robots to evolve using genetic algorithms.