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10:30 - 11:15

DVA502

Human-robot interaction using reinforcement learning and convolutional neural network.

Edier Otalvaro; Yousuf Khan

Advisor: Elaine Åstrand, Miguel León Ortiz and Mirgita Frasheri

Examiner: Baran Cürüklü

Abstract:

Proper interaction is a crucial aspect of team collaborations for successfully achieving a common goal. In recent times, more technically advanced robots have been introduced into the industrial environments sharing the same workspace as other robots and humans which causes the need for human-robot interaction (HRI) to be greater than ever before. The purpose of this study is to enable a HRI by teaching a robot to classify different human facial expressions as either positive or negative using a convolutional neural network and respond to each of them with the help of the reinforcement learning algorithm Q-learning. The simulation showed that the robot could accurately classify and react to the facial expressions under the instructions given by the Q-learning algorithm. The simulated results proved to be consistent in every conducted experiment having low variances. These results are promising for future research to allow for the study to be conducted in real-life environments.

Opponent 1: Al-Mustafa Khafaji

Opponent 2: Daniel Stenekap

Opponent 3: Jacob Norman

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11:20 - 12:05

FLA500

Parallel Convolutional Neural Network Architectures for Improving Misclassifications of Perceptually Close Images

Al-Mustafa Khafaji

Advisor: Håkan Forsberg

Examiner: Masoud Daneshtalab

Abstract:

Deep Neural Networks (DNNs) have proven to be an alternative for object identification for multiple application areas. In fact, they are treated as a key component for autonomously operating systems and consequently important for many companies. Since DNNs do not behave in the same way as traditional deterministic systems there are several challenges to cope with before they can be used in safety-critical applications. In the avionics industry, both random and systematic failures must be taken care of including permanent and transient faults, design faults in both hardware and software and adversarial inputs. In this thesis we will be constructing an architecture that is robust and can detect misleading errors produced by a DNN to some extent. One way to cope with failures in DNNs are through architectural mitigation. By adding redundant and diverse architectures, image misclassification can be detected to a greater extent. A convolutional neural network architecture will be tested and trained using MATLAB and Simulink. The focus will be on fault tolerant architectures. The method that will be used in this thesis is experimental research. The results show that a fault tolerant architecture can detect misleading image classification.

Opponent: Edier Otalvaro