

# Something about Robots and Emotions

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Day Month Year

## Abstract

This is where I will write something *engaging* and possibly even funny.

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# 1 Background

This Bachelor's thesis is to a large extent based on a previous Msc Thesis written by Vidullan Surendran. What I hope to add in this work is to try out the model in a more neurally plausible framework, i.e. using Nengo, a neural modelling tool for cognitive modelling.

## 1.1 Emotions in Robots

Hudlicka

### 1.1.1 Reward Prediction Error?

Vad är bakgrunden på det här?

## 1.2 Nengo

Eliasmith,

### 1.2.1 Neural Engineering Framework

Charles H. Anderson 2003

John miller suggests is a "neural compiler" (Eliasmith, p. 41)

Core principles of NEF (Eliasmith, p. 42):

1. Neural representations are defined by the combinations of nonlinear encoding (exemplified by neuron tuning curves and neural spiking) and weighted linear decoding (over populations of neurons and over time).
2. Transformations of neural representations are functions of the variables represented by neural populations. Transformations are determined using an alternately weighted linear decoding.
3. Neural dynamics are characterized by considering neural representations as state variables of dynamic systems. Thus, the dynamics of neurobiological systems can be analyzed using control or dynamics systems) theory.

## **2 Research Question**

Can I recreate Surendran's results?

## **3 Method?**

I am going to model a small autonomous robot with the neuron-based computation models of Nengo.

### **3.1 Simulation**

The robot and its environment is simulated using Python and especially the package `graphics.py` created by (THE PERSON). The simulation contains:

- A blue circle representing the Robot
- Green circles representing Food
- Red circles representing Threats
- Purple circles representing Safe Zones
- Walls

#### **3.1.1 Sensing/Events**

The physical robot in Surendran's thesis has an IR sensor and a camera. In the simulation this will be represented as a distance measure and object detection. I will have to make a choice about sensing ranges.

Interacting with the objects in the environment generates events, that affect the emotional state of the robot.

### **3.2 Robot internal model**

#### **3.2.1 Emotion Model**

#### **3.2.2 Prediction Error**

Is this even going to be implemented with Nengo? Possibly.

### 3.2.3 Action Selection

- Goals
- Subgoals
- Interrupts

## 3.3 Nengo

How will the computation be implemented with Nengo? Some neural clusters and connections between them. I will have to ask Terry about that.

## 4 Resultat

Mm, hur kommer det att gå egentligen?

## 5 Diskussion

## 6 Källor

Frågor:

- Vad ska jag skriva i Bakgrund?
- Vad ska jag skriva i Metod?
- Frågeställning, ”Can I recreate Surendran’s result?”
- Hur kan mitt resultat se ut? Ska själva Nengo-modellen också räknas som resultat?
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