Computational Neuroscience: Neural Dynamics   Prof. Dr. Gregor Schöner

Exercise 1, hand in by October 17, 2024 (Thursday)   October 9, 2024

Consider a Braitenberg vehicle of type 2 (in Braitenberg's enumeration, also called "taxis" vehicle) as illustrated in the Figure. It has two sensors, which are connected to the effector on the same side (ipsilateral organization of the vehicle's "brain"). Assume the sensor characteristic is monotonically *decreasing* while the motor characteristic is monotonically *increasing* as shown in the figure.
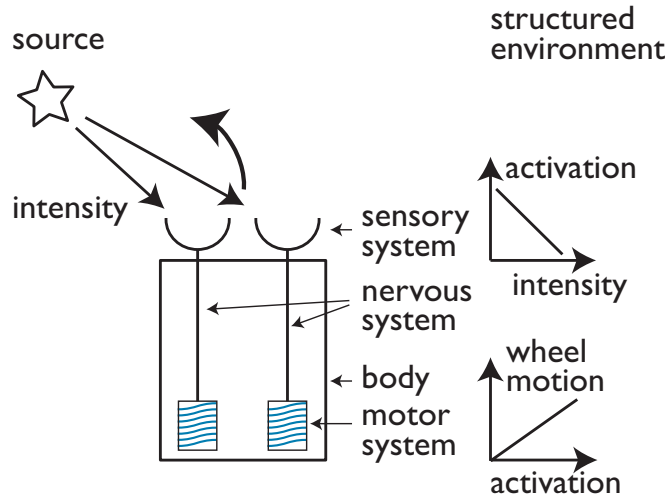
1. Analyze the behavior of the vehicle in the presence of a single source of stimulation by making a drawing and arguing qualitatively like in the lecture, a form of mental simulation. A few sentences of text that describes that argument are sufficient.

2. Think about what determines the forward speed of the vehicle. What would make the vehicle drive faster in the forward direction? Would it be possible to drive faster in the forward direction while not necessarily turning faster? [You may tinker with the sensory and motor characteristics and/or with the strength of the source/intensitly level and its decay when the angle relative to the source increases... there is no unique answer, qualitative argument is sufficient.]

3. If the foward speed was much higher, but the turning rate remained similar, how would that affect the behavior? Could *taxis*, that is, orientation behavior break down? Which implicit assumption was thus made in the lecture? Again, a few sentences or a drawing with an explanation are sufficient.

4. What would happen if the sensor characteristic had a zero crossing at a non-zero level of the sensed physical intensity? [This implies that negative activation could arise. Assume that negative activation goes into the motor characteristic by making the motor turn backwards.] A few sentences and a drawing...