Behavioural Dynamics – Repeated examination

Monday April 18, 2005, 13.30-16.30.

This exam consists of three assignments, which count with equal weight. Hand in your answers to each exercise on a separate sheet. Always motivate your answers.

Good luck!

Assignment 1

In this assignment the case of *motivation-based behaviour* is analysed:

> Person A has the following typical pattern of mental activity and behaviour. Every week he receives the offers from different tour agencies to go skiing. If he receives an offer for the acceptable place and price, then he desires to take this offer. Moreover, given the desire to go skiing, he calls his friends to invite them to participate. Then, if he also believes that his friends are available (because they told him), he intends to go skiing with them. If he intends to go skiing and he observes that the offer is still available, A will actually go skiing.

Assume the following relevant state properties for the example:

External state properties

offer_for_acceptable_place_and_price	the offer for the acceptable place and price is valid
offer_valid	the offer is still valid
friends_available	A's friends are available to go skiing
group_is_skiing	A and friends are skiing

Input state properties

obs(offer_for_acceptable_place_and_price)	A observes that the offer for the acceptable place and price is valid
obs(offer_valid)	A observes that the offer is still valid
obs(friends_available)	A observes that his friends are available to go skiing

Output state properties

call_friends	A calls his friends to invite them to go skiing
go_skiing	A and his friends go skiing

Internal state properties

b	A believes that his friends are available
d	A desires to go skiing
i	A intends to go skiing

a) Give two example traces (showing external, input, output and internal state properties), one leading to skiing and one not leading to skiing.
b) Show the dynamics of the example in graphical form. Do not forget to indicate which state properties are persistent.
c) Write down at least 4 executable dynamic properties that characterise these dynamics. Which ones are step properties and which ones are persistence properties?
d) For one of the internal state properties, indicate by which of the dynamic properties its functional role is defined.
e) Give a set of dynamic properties that specifies the input-output correlation from an **external** perspective.
f) Is it possible to attribute representational content to the desire to go skiing, according to the *causal/correlational approach* (address both forward and backward)?
   If so, show how. If not, explain why not.
g) Give the representational content to the desire to go skiing, according to the *relational specification approach* (both forward and backward)?
h) Suppose A indeed goes skiing. Give an (iterated) explanation from a functionalist perspective of the following form.

Why does A goes skiing?

A goes skiing, because ....

Why .....?

...., because ...

et cetera.

Assignment 2

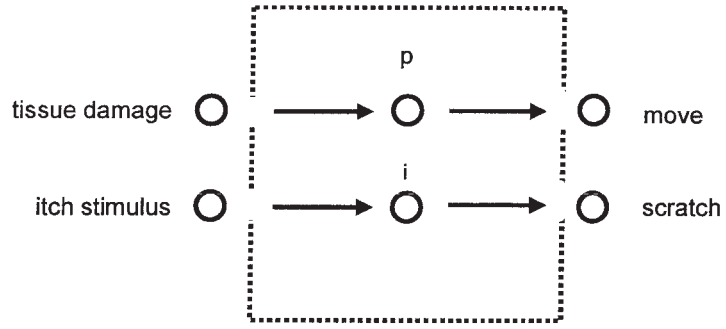
Consider the following example, given by J. Kim in his book *Philosophy of Mind*:

> 'Let us consider the following very simple, idealized model of how our mechanisms for pain and itch work: Each of us has a "pain box" and an "itch box" in our brains. We can think of the pain box as consisting of a bundle of neural fibres ("nociceptive neurons") somewhere in the brain that gets activated when we experience pain, and similarly for the itch box. When pain sensors in our tissues are stimulated, they send neural signals up the pain input channel to the pain box, which then gets activated and sends signals down its output channel to our motor systems to cause appropriate pain behavior (winces and groans). The itch mechanism works similarly: When a mosquito bites you, your itch receptors send signals up the itch input channel to your itch box and so on, finally culminating in you itch behavior (scratching).
>
> Suppose now that a mad neurophysiologist rewires your brain by criss-crossing both the input and output channels of your pain and itch centers. That is, the signals from your pain receptors now go to your (former) itch box and the signals from this box now trigger your motor system to emit winces and groans; similarly, the signals from your itch receptors now go to your (former) pain box, which sends its signals to the motor system that causes scratching behavior. Even though your brain is cross-wired with respect

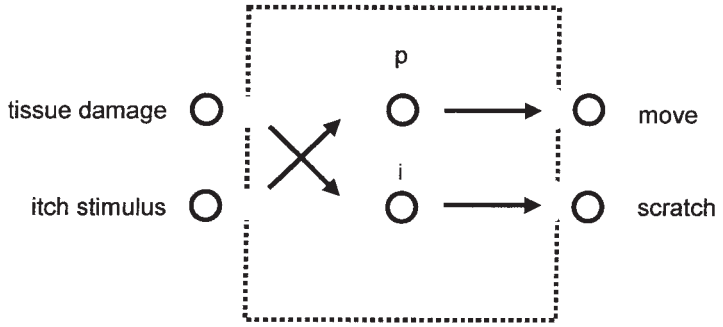
to mine, we both realize the same functional psychology; we both scratch when bitten by mosquitoes and groan when our fingers are burned. From the functionalist point of view, we instantiate the same pain-itch psychology'. (Kim, 1996), p. 115.

Based on this example, consider the following variants of (physically realised) cross-wired brains.

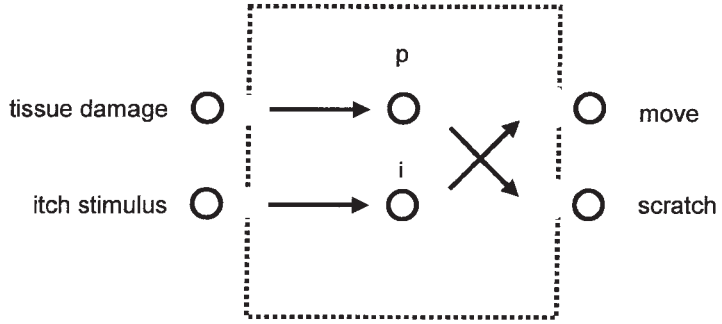
I. Normal situation



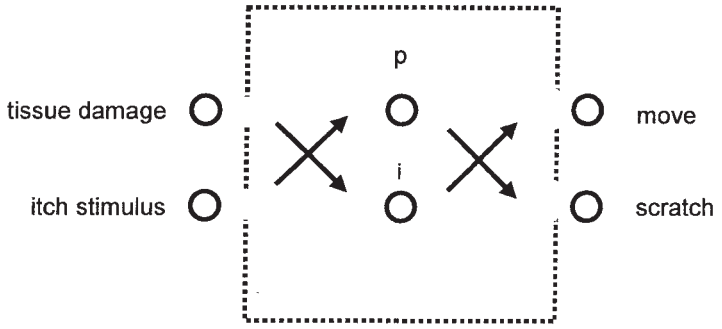
II. Crossed input connections



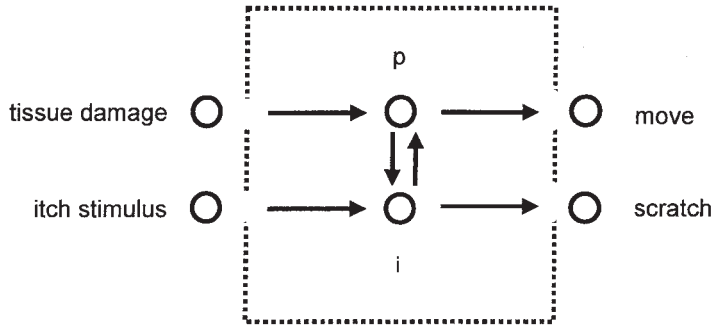
III. Crossed output connections



IV. Crossed input and output connections



V. Internal crossing



a) Discuss for each of the 5 cases what the representational content is of the internal state properties p and i, according to the *causal/correlational approach*.

b) Discuss in which case(s) and how the disjunction problem for the causal/correlational approach to representational content occurs here.

c) Does the conjunction problem occur? Explain.

d) What do you expect to experience in each of the 5 cases if you step barefoot in a nail? And how would you behave? Discuss.

Assignment 3

Answer the following questions

a) What is an *extended mind*? Give an example.

b) In design of Agent Systems, two cases can be distinguished: *agent behaviour design* and *interaction protocol design*. Explain the difference between both cases.

c) Explain the difference between *behaviouralism* and *functionalism*

d) The *Generic Design Model* GDM consists of three top-level components. How are these called? For each component, describe its main function in one sentence

e) What is the difference between *global* and *local* reduction?