Minds and Machines
spring 2003

Functionalism, contd.

preliminaries

- extra copies of Chalmers and Crane in COOP by class #16 (maybe class #18)

- first paper topics distributed, due in recitation before spring break

lesson (?) from replacement scenarios

- minded creatures can in principle be made out of anything, provided certain structural constraints are met

- you couldn't make a mind out of Jello, but you could make one out of silicon chips

lesson (?) from Aunt Bubbles

- minded creatures must have a certain sort of internal structure -- being a giant lookup table isn't enough

lessons (?) from our discussion of behaviorism

- mental states are the inner causes of behavior

- the correspondence between mental states and behavior is many-many

  (a) mental state M may produce different sorts of behavior, depending on the creature's other mental states

  (b) the same behavior may be produced by different mental states
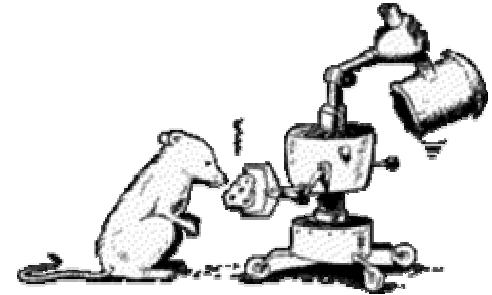
the mousetrap

mousey
input

dead/trapped
mouse output

mousetraps can be "multiply realized"

the mousetrap

- the simplest sort of *functional kind*

- since no constraints are placed on its inner organization, it is also a *behavioral kind*

the 3-Coke vending machine

initial states	$M_3 I_0$	$M_2 I_0$	$M_1 I_0$	$M_3 I_1$	$M_2 I_1$	$M_1 I_1$
output for 25¢ input	"25¢"	"25¢"	"25¢"			
next states	$M_3 I_1$	$M_2 I_1$	$M_1 I_1$	$M_2 I_0$	$M_1 I_0$	shut down

the 3-Coke vending machine

- can be multiply realized

- a functional but not behavioral kind

- what *are* the states M_3, I_2, etc?

  -- the table tells the whole story

24.119 spring 03

a toy functionalist theory of pain

input / state	toe-stubbing	icepack on toe
P	P, "Ow!"	R, "Phew!"
R	P, "Ow!"	R, no output

the toy functionalist theory

- the state of being in pain (or being in a state of relief) just *is* being in P (R)
- S is in P iff S is in the first of two states X, Y, that are related to one another and to the possible inputs and outputs of S as follows:

  being in X and stubbing its toe causes S to remain in X and emit "Ow!"; being in Y and stubbing its toe causes S be in X and emit "Ow!"; being in X and having an icepack on the toe causes S to be in Y and emit "Phew!"; being in Y and having an icepack on the toe causes S to remain in Y and produce no output

12

functionalism

- functionalism is the view that mental states are *functional states* -- states specified in terms of their causal relations to inputs, outputs, and other states

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functionalism and the lessons (?)

- mental states can be multiply realized
- input-output isn't enough: it's what's in between that matters (so we can deny that the Aunt Bubbles machine has mental states)
- mental states are the inner causes of behavior
- the correspondence between mental states and behavior is many-many (see the 3-Coke vending machine)
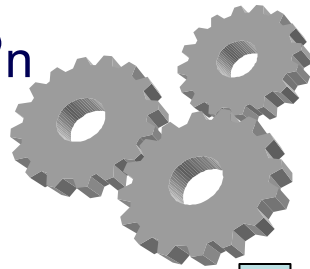
reminder: Turing machines

- simple computing machines
- if a function can be computed at all, it can be computed by some Turing machine
- it's important not to confuse the machine as abstract object (about which things are proved) with a physical realization of the machine
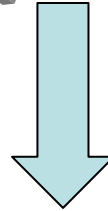
Alan Turing (1912-54)

Turing machines

states: S_1, S_2,…,S_n

head
{R, L, 1, 0, halt}

…100011111000011111011100000000
00…

tape

A simple Turing machine

	S_1	S_2
1	R, S_1	H
0	1, S_2	H

(top-left cell: state / scanned cell)

24.119 spring 03

functionalism and Turing machines

- the Turing machine played an important role in the development of functionalism

- "machine functionalism" (Block, Putnam) is an early version of functionalism

- however, the architecture of Turing machines is unnecessarily restrictive (e.g., a machine is only in one state at a particular time; we are in many mental states simultaneously)

functionalism and physicalism

"By 'physicalism', I mean the doctrine that pain, for example, i[s] identical to a physical (or physiological) state…if functionalism [is] true, physicalism is false" (Block, 95)

- if functionalism is true, then there could be a creature entirely made from "non-physical" stuff that had mental states
- that's the sense in which functionalism is not a physicalist theory
- but there's also a sense in which functionalism *is* a physicalist theory (the more usual sense, these days)
- if functionalism is true, only physical materials are needed in order to make a mind

representationalism (the representational theory of the mind)

- mental states require inner representations: a subject is in such-and-such mental state with representational content that *p* only if a proper part of the subject has the representational content that *p*

- for example, if the subject believes that snow is white, then according to representationalism some proper part of the subject (part of her brain, presumably) has the representational content *that snow is white*

computationalism (the computational theory of the mind)

- a combination of (a) functionalism, (b) representationalism, and (c) the idea that mental processes are *computational*: they involve the algorithmic manipulation of symbols (i.e. the inner representations)

relations between the three theses

- computationalism implies functionalism and representationalism
- neither of the converse implications holds
- neither functionalism nor representationalism implies the other

"Troubles with functionalism"

Imagine a body externally like a human body, say yours, but internally quite different. The neurons from sensory organs are connected to a bank of lights in a hollow cavity in the head. A set of buttons connects to the motor-output neurons. Inside the cavity resides a group of little men. Each has a very simple task: to implement a "square" of an adequate machine table that describes you. (96)

On one wall is a bulletin board on which is posted a state card, i.e., a card that bears a symbol designating one of the states specified in the machine table. Here is what the little men do: Suppose the posted card has a 'G' on it... Suppose the light representing input I 17 goes on. One of the G-men has the following as his sole task: when the card reads 'G' and the I 17 light goes on, he presses output button O 191 and changes the state card to 'M'... In spite of the low level of intelligence required of each little man, the system as a whole manages to simulate you because the functional organization they have been trained to realize is yours... (96)

Block's homunculus head

input

state

G-man

I₁₆ I₁₇ I₁₈

G

M

O_{190} O_{191}

output
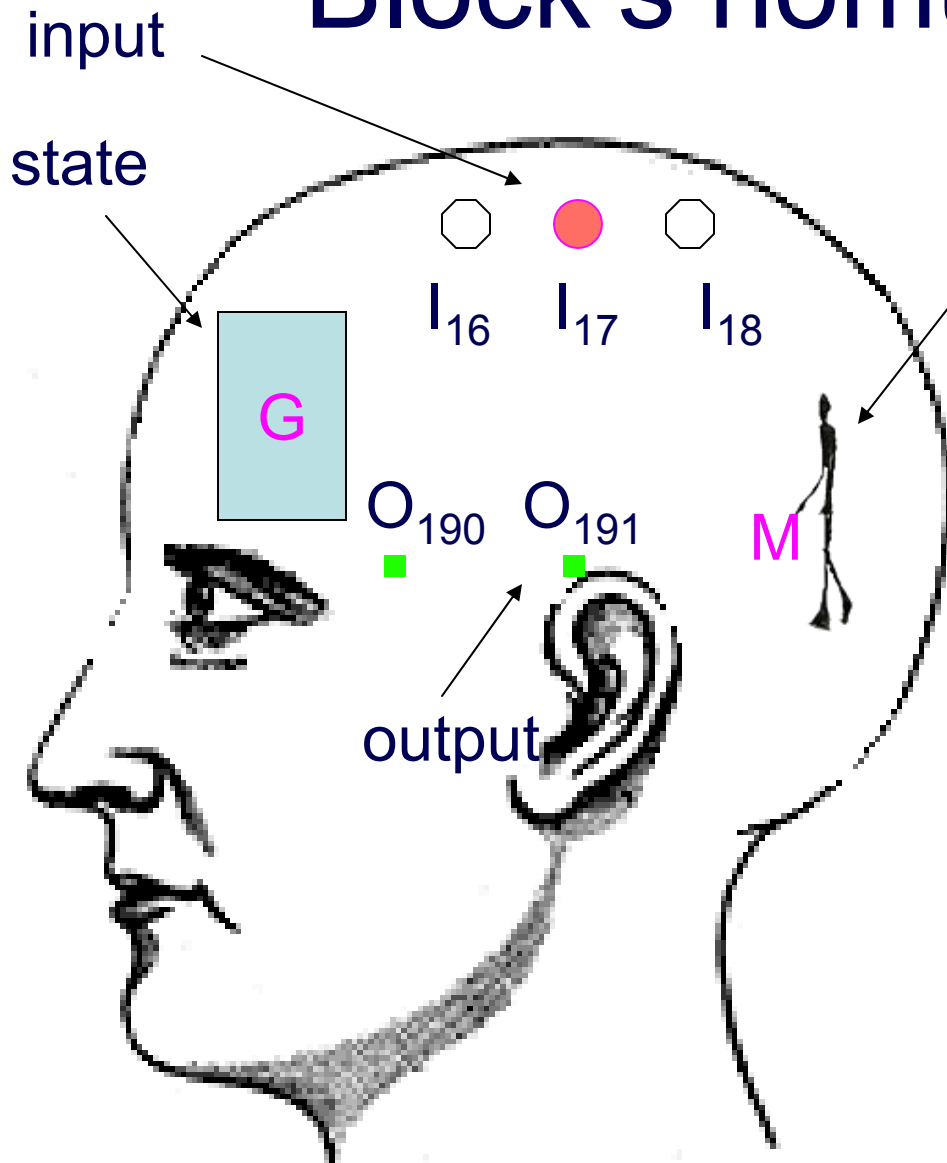
input state	I_{16}	1_{17}	I_{18}
G	$O_{25}K$	$O_{191}M$	$O_{45}P$
H	O_8H	$O_{77}Z$	O_5C

there is prima facie doubt whether [the homunculus head] has any mental states at all -- especially whether it has what philosophers have variously called "qualitative states", "raw feel" or "immediate phenomenological qualities"…there is prima facie doubt whether there is anything it is like to be the homunculi-headed system.   (97)

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- a bit on Lewis next time

- read Putnam ("The meaning of 'meaning'") and Burge