

THE ATTENTION AND AFFECT PROJECT:
WHAT ARE THE
PHENOMENA TO BE EXPLAINED?

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The “Attention and Affect” project has the following aims:

- (i) to identify high level functional requirements for the architecture of intelligent agents like human beings, especially requirements concerned with processing of motives and control of attention,
- (ii) to explore possible designs capable of fulfilling those requirements,
- (iii) to implement working models to test and demonstrate the properties of the designs,
- (iv) to design effective interfaces for demonstrating the key features of the models, and to enable them to be used for teaching,
- (v) to use the generative power of proposed mechanisms as a basis for constructing a conceptual framework for describing affective states involving control of attention.

What should such models explain? We need to collect examples of relevant phenomena and find a good (provisional, theory-based) way of organising them.

Towards a taxonomy of relevant phenomena.

1. Generation of new motives/motivators
2. New information relevant to (potential) motivators
3. Diversion of attention; (partial) loss of control of attention
4. Situations where diversion of attention should, or should not, be prevented
5. Ways in which motivators can be compared
6. Types of meta-level decision making
7. Phenomena in affective states (moods, emotions, attitudes, etc.) concerned with (loss of) control of attention
8. Disorders relating to control of attention
9. Learning or development relevant to control of attention
10. Evolution of attentional control capabilities

1. Generation of new motives/motivators

New goals, desires, wishes, inclinations etc.

Distinctions to be made include:

a. Derivative vs non-derivative motivators

b. Internally generated/externally generated

E.g. thinking of X then thinking X would be a nice thing to have or do.

Contrast smelling something delicious, or seeing someone who needs help.

b.1. Physiological vs “purely” cognitive generators

E.g. thirst or hunger vs thinking about something, realising something

b.2. Long term vs short term generators

E.g. personality, vs attitudes, vs mood, vs provocation

c. synchronous/asynchronous

Synchronous generation includes new sub-goals generated during goal expansion.

d. Some asynchronous motive generators are general purpose long term monitors; others are special purpose monitors set up because of a current goal or need, etc.

Either can generate a new motive, but the latter will produce a new motive relevant to an existing motive. Contrast synchronous goal/plan expansion.

f. Distinctions made in the Ortony et. al. book

Mostly concerned with the *content* of the motivators rather than the control mechanisms involved or their relation to attention.

g. Second order motivators

Violation of or satisfaction of or prospect of violation or satisfaction generates a new second order motivator, e.g. to punish or help whoever caused the violation or satisfaction, or to minimise effects, etc.

Compare wanting not to find something attractive. Wanting to be pleased by something.

h. Termination of motivators

Some go away of their own accord, some don't (*Different reasons.*)

i. Some rejected motivators keep “returning” (trying to gain control) whereas some don't.

Partial loss of control of attention to diverting motivators seems to be a special case of a more general phenomenon: thoughts, percepts, memories, can all attempt to gain attention, and sometimes win, sometimes not. *Insistence*, i.e. the ability of a piece of information to gain attention, is therefore a very general notion.

Many of the above phenomena involve dispositions that seem able to persist even while unrealised because other things (temporarily) override them.

All of these processes seem to require quite sophisticated information-management and decision-management processes

2. Processing new information relevant to (potential) motivators

Internal

Thoughts may be produced by many processes, including reflecting on past experiences, reasoning about what to do, daydreaming, etc.

External

Things perceived in the environment can trigger processes relevant to motives.

New information can be relevant in a variety of different ways (apart from triggering new motives). E.g.

Showing that a motive is unattainable.

Showing a new way to attain a motive.

Showing that a particular sub-plan has a flaw.

Showing that there's a new opportunity to achieve something.

Showing that there's a chance to kill two birds with one stone.

Showing that a planned action would have an undesirable side-effect.

Etc.

bf Effects can include: changing, suspending or aborting a current action; changing the status of a postponed goal; changing something from a mere desire to an intention; refining or abandoning a not yet initiated plan for a future action, etc.

3. Diversion of attention; (partial) loss of control of attention

a. Externally generated diversions

b. Internally generated diversions (e.g. you suddenly remember something, or start wondering whether you did something.)

c. Attention diversion by motivators vs diversion by other things (noise, smell, thought,) (What other things?)

d. Diversion of perceptual attention vs diversion of thinking, planning, etc. activity.

e. Episodic vs Dispositional diversion

Dispositions can exist while unmanifested because something else dominates temporarily e.g. a disposition to divert attention, a disposition to have certain motivators in certain contexts, a disposition to resist change of activity or attention.

f. Other miscellaneous examples

(supplied by Luc Beaudoin)

f.1 Various types of lapses of attention. Following Reason, 1985, concerning “Intention system failures”.

f.1.1 Detached intentions (where you’ve got the right action-type but the wrong object):

“I intended to close the window as it was cold. I closed the cupboard instead.”

f.1.2 Lost intentions: “I opened the fridge and stood there looking at its contents, unable to remember what to do”

4. Situations where diversion of attention is desirable/undesirable.

Cases where protection from attention diversion is important, and where it occurs/doesn't occur successfully.

Different kinds of "limited" resources

Cases where allowing attention diversion is important, and where it does occur/doesn't occur.

5. Ways in which motivators can be compared

Examples of comparative evaluation of new motivators

E.g.:

- * Importance (e.g. long term importance)

- * Generalised urgency

Time till it's too late. More generally, a function from delay to costs and benefits. (Generalised by Luc)

- * Costs of achievement

- * Good and bad side effects

- * Etc. etc.

(Contrast "insistence".)

6. Types of meta-level decision making, or meta-management

First order decision-making:

Make a plan, a partial plan; postpone plan-making till after execution has started; replan during execution, etc.

Various kinds of (meta-)management decisions about a new motivator.
(reject it, do it later, decide later whether to do it, interleave it with another plan, etc.)

7. Phenomena in affective states (emotions, moods, etc.) concerned with (potential) distraction of attention

Examples of grief, fear, anguish, embarrassment, joy, pride, excited anticipation, grudging admiration, etc. etc.

Cases where motivators, thoughts, etc. with high insistence either actually distract or tend to distract attention.

I.e. the agent has partly lost control over thought processes

Examples of moods with and without emotions

Happy, sad, depressed, irritable, contented, alert(?), bored, adventurous, optimistic, pessimistic

(Attention only indirectly involved)

Examples of attitudes that (are able to) generate emotions.

Prejudice towards X, love of Y, etc.

Examples of borderline cases of emotions and non-emotions, or of borderline cases between emotions.

Some kinds of highly insistent divergence of attention are not really *emotional* because there is no strong motivational state involved

(Though they can generated e.g. annoyance, etc.)

Are there only differences of degree?

Dispositional states which persist even during intervals in which they are not manifested because something else dominates.

Does your anger go away because you are diverted for a while by some great danger, or is it merely temporarily not in control?

8. Disorders relating to control of attention: psychopathology of attention?

(Examples and comments provided by Luc Beaudoin)

Start with some standard classification (DSM III??) and later generate a theory-based taxonomy of disorders.

Anxiety based affective disorders:

Panic disorder, claustrophobia and agoraphobia; Other phobic disorders. E.g. fear of pigeons, snakes, moths, the dark?

Situation somehow makes the subject negatively evaluate it and want to escape it.

Some aspects are cognitive control phenomena:

the agent *cannot* ignore the provoking situation, even if he/she “knows” there’s no basis for the fear, or panic.

Clinical symptoms also include shortness of breath, palpitation, sweating, dizziness, fear of dying, fear of going crazy.

Other relevant psychopathologies include generalized anxiety disorder, and the mood disorders (various depressions and bipolar disorder).

Obsessive-compulsive disorders (obsessions, ruminations, rituals, avoidances), where thoughts and motives trouble the subject, who tries but cannot resist them. E.g. overvalued ideation (???), obsessive handwashing.

Panic disorder and agoraphobia are similar to OCD in as much as the subject loses control over what he can think about (the object of the panic takes over), and although he “knows” this object doesn’t matter, he couldn’t care more about it while he’s panicking. A difference is that panic attacks are usually triggered by specific sets of circumstances, and they are acute (not long lasting).

9. Learning or development relevant to control of attention

Various types of learning or development that change any of the above phenomena.

- a. Learning to assign new insistence values
 - b. Learning which tasks need “protection” against diversion, by means of high interrupt thresholds?
 - c. Learning new ways to evaluate importance, urgency, etc.
 - d. Learning to improve meta-planning
 - e. Developing ability to suspend and later re-activate actions.
 - f. Developing ability to interleave actions and keep track of both
- Etc.

10. Evolution of attentional control capabilities

Different design architectures can support different sets of capabilities for control of attention, diversion of attention, meta-management, etc. (Different state-transitions supported, etc.)

E.g. See Tim Read’s draft classification.

The boundary between the phenomena that are relevant and those that are not will remain fuzzy till a good theory is available to clarify it.

The “nursemaid domain” provides a framework for exploring some of the design options, without too much complexity. But there’s always risk of oversimplification.