LOGICS OF AGENCY
CHAPTER 1: INTRODUCTION TO AGENCY

Nicolas Troquard

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- Nicolas Troquard
- Laboratory of Algorithmic, Complexity and Logic
- Background: computer science, artificial intelligence (KR&R), logics
- Other interests: philosophy and ontology of action
- This course: some logics (few technicalities), some pointers in philosophy, some applications (within the interests of the lecturer)

Agent: an entity typically with some mental state, that is capable of action

Agency: exercise or manifestation of a capacity of action

SOME NOTIONS PRESENTED IN THIS COURSE

- action, doing an action,
- intentional action,
- choice, making a choice, making a deliberative choice,
- being responsible for a result,
- social influence,
- obligations to do,
- having the capacity of making a choice,
- ...

- explicit action as a particular kind of events
    - first-order theories: $\exists a, e, does(a, e)$
    - logics of programs, dynamic logics: $\langle a{:}\alpha \rangle \varphi$
- action as a modality: $\nabla_a \varphi$
    - bringing it about: $E_a \varphi$
    - seeing to it that: $[a\, dstit : \varphi]$

OVERVIEW OF THIS COURSE

Chapters:

1. Context: a bit of philosophy, linguistics, and logic
2. Dynamic logics and intentional theory of action
3. Modal agency: semantics, bringing-it-about, seeing-to-it-that
4. Applications: social influence, obligations
5. Applications: power

1. Context: a bit of philosophy, linguistics, and logic
2. A few notions that are important, yet not presented in details in this course

OUTLINE

1 IN LINGUISTICS

2 IN PHILOSOPHY

3 LOGIC

Verbs are predicates with 1, 2, 3, ... arguments. The combination of a verb and arguments yield a truth value. E.g.:

- 1 argument: Ann sleeps.
- 2 arguments: Ann knows Italian.
- 3 arguments: Ann gives 10EUR to Bernard.

"Logically analogous" verb phrases can have different grammatical functions.

- (You,) learn Italian! [change of state]
- *(You,) know Italian! [state]

Most basic distinction of verb phrases (back to Aristotle):

- States: I know Italian. Bernard loves Ann.
- Events: He builds a House. Ann drives home.

[Ryle 1949]: distinguishes between achievements and accomplishments

- States: no change of state
- Accomplishments: changes of state with an associated task
- Achievements: changes of state without an associated task

[Vendler 1957]: adds activities

- *states*: *A* loved somebody from t_1 to t_2 means that any instant between t_1 and t_2 *A* loved that person (know, sit)
- *activities*: *A* was running at time *t* means that time instant *t* is on a time stretch throughout which *A* is running (run, eat)
- *accomplishments*: *A* was drawing a circle at *t* means that *t* is on the time stretch in which *A* drew that circle (write a letter, build a house)
- *achievements*: *A* won a race between t_1 and t_2 means that the time instant at which *A* won the race is between t_1 and t_2 (reach, arrive)

MORE SCHEMATICALLY

Verbs phrases:

↘ States

↘ Events

    ↘ Unbounded events: Activities

    ↘ Bounded events

        ↘ process + culmination: Accomplishments

        ↘ culmination: Achievements

It's never over.

[Moens & Steedman 1988] add a fifth category: points (flash, burst)

VENDLER'S CRITERIA FOR VERBS INVOLVING SPECIFIC PROCESS

	-process	+process
-definite	state	activity
+definite	achievement	accomplishment

Vendler introduced Continuous Tense Criteria (CTC) to distinguish:

- state and achievements (involving no specific process) and
- activity and accomplishments (involving a specific process)

(Definiteness Criteria are used to distinguish state and activity verbs from achievement and accomplishment verbs. Not presented here.)

WHY CTC IN A COURSE ON AGENCY?

According to Verkuyl, Vendler is guided by (CTC $\in \{ProgF, Do, AgMod, Stop/Start\}$):

- If a Verb is positive w.r.t. CTC, then it belongs to the set of Activity verbs or Accomplishment verbs.
- If a verb belongs to the set of Activity or Accomplishment verbs, then it is positive w.r.t. CTC.

... but most of the criteria focus on some unclear (because approximately) forms of agentivity.

In fact, "[E]xtending Vendler's system, [Dowty 1986] distinguishes agentive from non-agentive classes. He does so because he observed that many criteria given by Vendler have to do with agentivity, control, animacy or other agentive and quasi-agentive notions." [Verkuyl 1989]

Vendler's *ProgF* criterium.

- *I am knowing it is 5:20pm. (state)
- He was running on a dirt road. (activity)
- She is running a mile. (accomplishment)
- *She is recognizing him. (achievement)

Vendler's *Stop*/*Start* criterium.

1. *She stopped/started loving him.
2. She stopped/started running.
3. She stopped/started drawing a circle.
4. *She stopped/started recognizing him.

Verkuyl's *AgMod* criterion:

1. *John attentively knows the answer. (state)
2. John deliberately pushed the cart. (activity)
3. John studiously painted a circle. (accomplishment)
4. *John carefully found a penny. (achievement)

ProgF, *Stop*/*Start*, *AgMod* work rather well to decide agentivity of verb phrases.

In [Belnap and Perloff 1988] (see also [Kenny 1963, Chap. VII]):

The sentence φ marks the agentiveness of agent *a* just in case φ may be usefully paraphrased as "*a* sees to it that φ".

Example: "Ann eats sand" marks the agentivity of Ann in some context iff we can substitute it with

"Ann sees to it that she eats sand"

in the context.

We will study the logical forms of theses sentences in details.

OUTLINE

BASIC ACTIONS

A basic action is perfectly simple in the same sense in which the old 'simple ideas' were said to be: they were not compounded out of anything more elementary than themselves, but were instead the ultimately simple elements out of which other ideas were compounded. [Danto 65]

Some challenges of basic action in knowledge representation.

- "Raise your hand":
    - "Are you the chairperson of this assembly or a choreographer?"
- Avrel! Kill this coyote!
    - Should I shoot it or strangle it, Joe?

Problems/difficulties:

- granularity of action
- meaningful distinction between actions

- Action is explained by intentionality [Anscombe 1957] [Davidson 2001]
    - one event can be more than one action under different descriptions
    - some actions are generated by other actions (see also [Goldman 1970], [Danto 1986])
- Intentionality and acting for a reason come hand in hand

ACTION AS A KIND OF EVENT

Often, an action is considered a particular kind of event.

Action sentences are seen as denoting some logical combinations of relations between particulars.
[Davidson 1967, 2001 Essay 6]

"John buttered the toast slowly with a knife" becomes:

$\exists e(\textbf{butter}(e, \textit{John}, \textit{the toast}) \, \& \, \textbf{slowly}(e) \, \& \, \textbf{with a knife}(e))$

where e is a variable, *John* and *the toast* are constants, and **butter**/3, **slowly**/1, and **with a knife**/1 are predicates (modifying clauses).

$$\exists e(\mathbf{kill}(e, \textit{Avrel}, \textit{the coyotte}))$$

$$\exists e(\mathbf{kill}(e, \textit{Avrel}, \textit{the coyotte}) \ \& \ \mathbf{strangling}(e))$$

$$\exists e(\mathbf{kill}(e, \textit{Avrel}, \textit{the coyotte}) \ \& \ \mathbf{shooting \ at}(e, \textit{the coyotte}))$$

$$\exists e(\mathbf{kill}(e, \textit{Avrel}, \textit{the coyotte}) \ \& \ \mathbf{shooting \ at}(e, \textit{the shrub}))$$

[...] the dominant logical template takes an agent as a wart on the skin of an action, and takes an action as a kind of event. [Belnap et al. 2001]

DOING DELIBERATELY

"John buttered the toast slowly with a knife deliberately."

Davidson argues that one cannot treat "deliberately" like other modifying clauses.

He proposes: the construction "It was intentional of x that p" where x names the agent and p is a sentence that says the agent did something. [Davidson 67]

E.g.: "Oedipus intentionally sought the slayer of Laius." becomes
"It was intentional of Oedipus that he (himself) sought the slayer of Laius."

THE INTENTIONAL STANCE

> *"Hitting a ball is an action, falling down a flight of stairs is not. A theory of action seeks, among other things, to explain the distinctions we make." [Segal 1991]*

What makes an entity an acting entity of an event is generally acknowledged to be the intentionality in action (or the intention for an achievement). To be the agent of an event, one has to make a deliberate decision governed by one's beliefs and desires (e.g., [Anscombe 63], [Dennett 71]).

Bratman ([Bratman 86]) built upon this and proposes that intentions operate like a filter over every action in order to select the actions that are desired and believed to be successful.

In logic, e.g.: [Cohen & Levesque 90] (next chapter), [Rao & Georgeff 91].

A "pinch" of structure: Audi's acting for a reason

Basically acting (e.g., "shooting at the coyote") for a reason (**I**):

> *S's A-ing is an action for a reason, r, at t, if and only if, at t, S A's, and there is a connecting relation, C, such that (1) S wants to r and believes C to hold between her A-ing and r, or believes something to the effect that C holds between her A-ing and r; (2) S's A-ing is at least in part explained by this motivating want and at least one connecting belief, and is guided by the belief(s); (3) S is noninferentially disposed, independently of seeking reasons she has had, or might have had, at or before t, for A-ing, to attribute her A-ing to the want and (explaining) belief(s); (4) S's A-ing is nonaccidentally produced by the want and (explaining) belief(s); and (5) the want and (explaining) belief(s) do not bring about (or sustain) S's A-ing via an alien intermediary. [Audi 1986]*

Nonbasically acting (e.g., "killing the coyote") for a reason (**II**):

*S B's nonbasically, for a reason, at t, if and only if, at t, there is some action A such that (1) A is **basic** and is an action for a reason in the sense specified in **I**; (2) S B's by (or in) A-ing; (3) B satisfies the first four conditions of **I**; and (4) if S's A-ing generates her B-ing via an intermediary that causes the result of B-ing, then (a) S appropriately controls any such intermediary, and (b) S's A-ing also causes, or is a cause of, this result. [Audi 1986] [switched B and A in the quote]*

Goal:

- objective *r* (coyotte dead)
- goal of objective *r* (want coyotte dead)

Plan

- plan/nonbasic action *B* (kill coyotte)
- plan refinement *A* (kill coyotte by shooting at it)
- belief that *A* and *B* helps yield objective (relations *C*)

Agentivity:

- deliberate / nonaccidental plan of action *A* and *B*
- control over *A* and *B*

Often, agency $\sim$ free will: something is caused by a deliberate action.

> *"The main weakness in treating agency as a synonym for free will is that such an approach ignores or only gives lip service to the social nature of agency and the pervasive influence of culture on human intentions, beliefs, and actions."* [L.M. Ahearn 2001]

Collective action: generally, the result of some deliberate collective decision via deliberation, argumentation, ...

Formation of shared goals and shared intentions (e.g., [Tuomella & Miller 1988], [Tuomela 95]).

- agents' "we-intention" as part of a group are built from individual attitudes
- many similarities with shared and common knowledge ([Tuomela & Balzer 1997])
- (rebuttal by [Searle 1990])

In logic, e.g.: [Dunin-Kęplicz & Verbrugge 2010]

THE SOCIAL STRUCTURE ACTION: COMPLEX/INSTITUTIONAL ACTION

Goldman's event generation [Goldman 70].

- distinction between physical events and institutional events
- agents act upon the physical environment
- generate some more physical events by a causal relation,
- generate institutional events by a conventional relation (similar to Searle's notion of 'counts-as' [Searle 1995]).

In logic, e.g.: [Grossi et al. 2008], [Herzig et al. 2011].

INTENTIONS ARE SOMETIMES TOO DEMANDING

- Some entities are capables of action but do not possess representational mental states. ([Davidson 1982]: only human agents have the relevant mental attitudes because they require linguistic competence.)
    - "The team is putting a tremendous effort."
    - "The dog bites the postman."
    - "The computer is playing Go."
- Some instances of human agency tend to be explained without the ascription of representational mental states.
    - "Alan hit Bernard in the nose as he suddenly turned around."
    - "As he parked his car, Charlie woke up from his stupor. He had been driving without thinking about it."

OUTLINE

COMPUTER SCIENCE: DYNAMIC LOGICS

Propositional Dynamic Logic (PDL) [Hoare 1969] [Pratt 1976] also relies on event terms in the object language.

- names for atomic events
- complex events are built recursively by means of imperative programming constructs
    - ";" (sequential composition),
    - "∪" (nondeterministic composition),
    - "∗" (iteration),
    - "?" (test), ...

Example: the action of "*i*'s felling a tree by performing the atomic 'chop' action until the tree is down":

$$\pi = (\neg\textit{treeDown}?; i{:}\textbf{chop})^*; \textit{treeDown}?$$

Application to agency: intentional action, ...

St. Anselm (11th century): If *a* does something he does so such that something is true or false. ([Henry 1953], [Chisholm 1964])

- The relevant aspect of agency is what actions bring about.
- No matter how the structure of the action.

The King is responsible for Anselm being in exile

⇔

The King sees to it that Anselm is in exile

∇_{King}"Anselm is in exile"

Application to agency: obligations to do, social influence, power, ...

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