

Problem Solving and Adaptive Logics. A Logico-Philosophical Study

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1.1 On Solving Problems



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nothing on the **process**: how proceed in order to solve





we need (again) a general approach

here proposed: a formal approach (similar to a formal logic)



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Is this possible?

main worries discussed in 1.2

first some more on problems





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in principle all kinds & all domains
scientific and everyday (same *kind* of reasoning behind them)



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whether a question is difficult to answer does not depend
on whether it derives from a difficulty



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original problem is $\{? \{A, \sim A\}\}$

if B , C and D , then A

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so (in this context) they form a single problem:

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actually: problem = set of questions + set of pursued answers
(but this will appear from the context)



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Note: a step may be sensible because it contributes to the solution of the problem, or because it shows that a certain road to that solution is a dead end



An example



Galilei looking for the law of the free fall

absence of adequate measuring instruments!

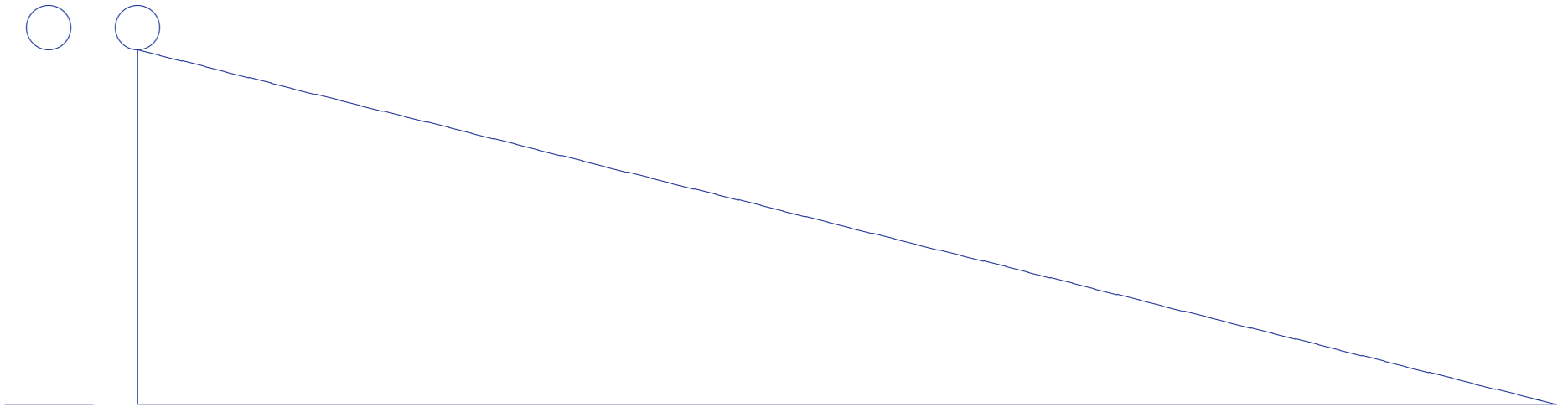


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the same force that makes the ball fall, makes it roll down the slope

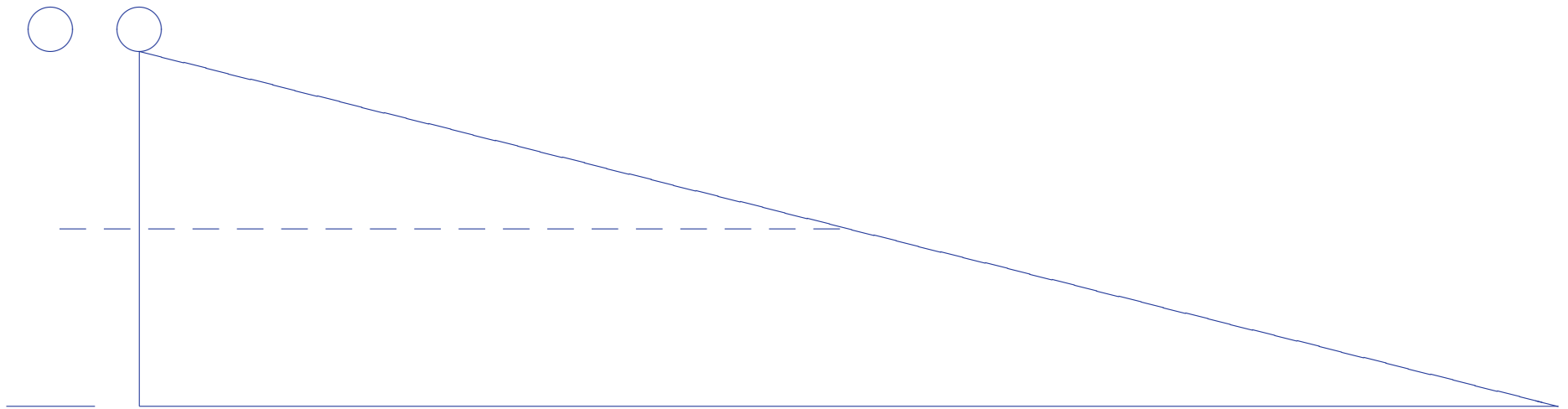


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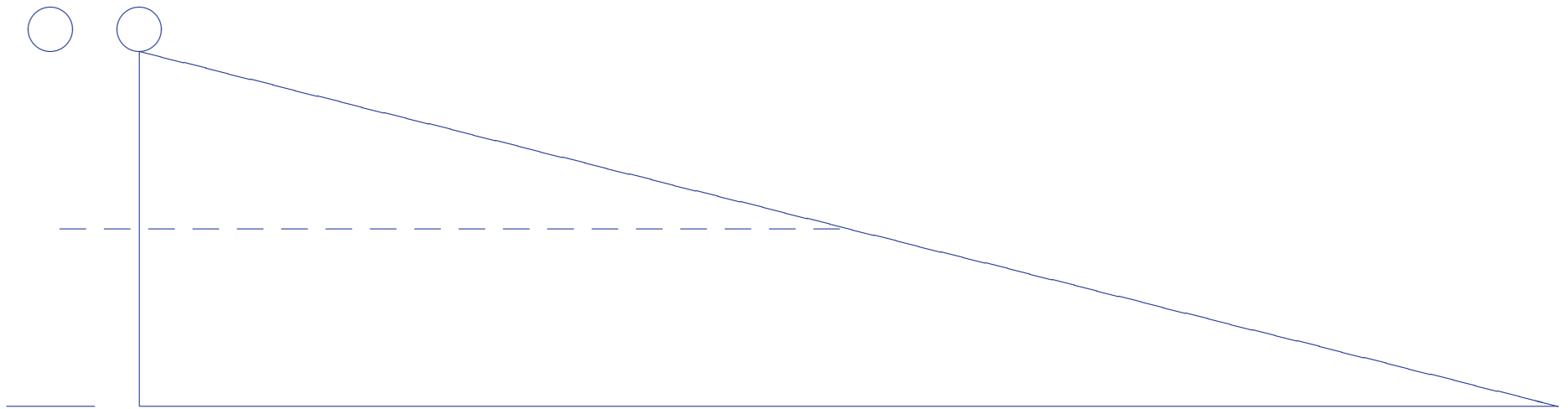
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measuring the times?

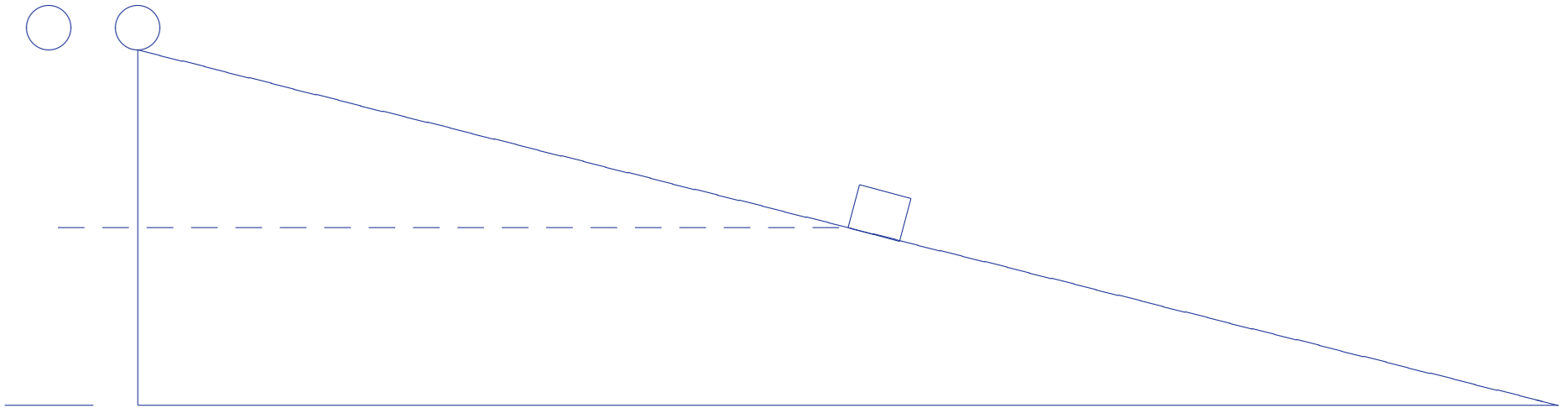


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weigh the amount of water flowing in a vessel from the start to the point where the ball hits the wooden block

compare the weights for different positions of the block
(only the ratios matter)



interesting example:

- admittedly: no conceptual changes involved
- some sophistication
 - solution is a generalization (not a singular statement)
 - new empirical data required
 - experiments required
 - experiments had to be devised

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standard erotetic logic

- insufficiently goal directed
- too restrictive (except for yes–no questions)

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usual positive tests are rather distant from proofs

and so are (partial) methods for showing non-derivability



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if you want to obtain A , and $A \vee B$ is available, look for $\sim B$

⇒ add to the proof: $[\sim B] A$

etc.



result: a procedure (see later) with the properties:



(1) if $\Gamma \vdash_{\text{CL}} A$, then the procedure leads to a proof of A from Γ

(2) if the procedure leads to a proof of A from Γ , then $\Gamma \vdash_{\text{CL}} A$

(3) if the procedure stops, not providing a proof, then $\Gamma \not\vdash_{\text{CL}} A$

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other (standard) logics:

rather straightforward way to turn inference rules into prospective rules
and to turn prospective proofs into standard proofs

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(= that are not even partially recursive)

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the claim:

formulating prospective proofs for adaptive logics provides us with a formal approach to problem solving

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I do not claim that logics that fit the present standard view are not sensible

I only claim that, in departing slightly from the standard view, one is able to decently explicate forms of reasoning that

- (i) are extremely important in human (scientific and other) reasoning
- (ii) do not fit the standard view

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example:

on the prospective-dynamics procedure, a premise cannot be added to the proof unless a present **target** can be obtained from the premise by means of subformulas and negations of subformulas of the premise

if the target is p , $p \supset q$ cannot be added, but $q \supset p$ can

1.7 The Plan

comment on table of contents