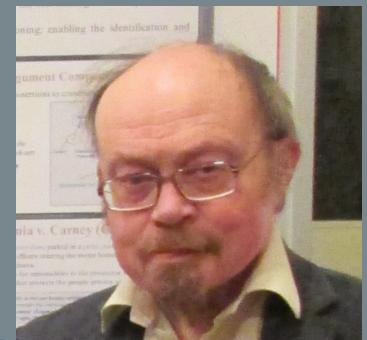


Argument Schemes for Reasoning About the Actions of Others

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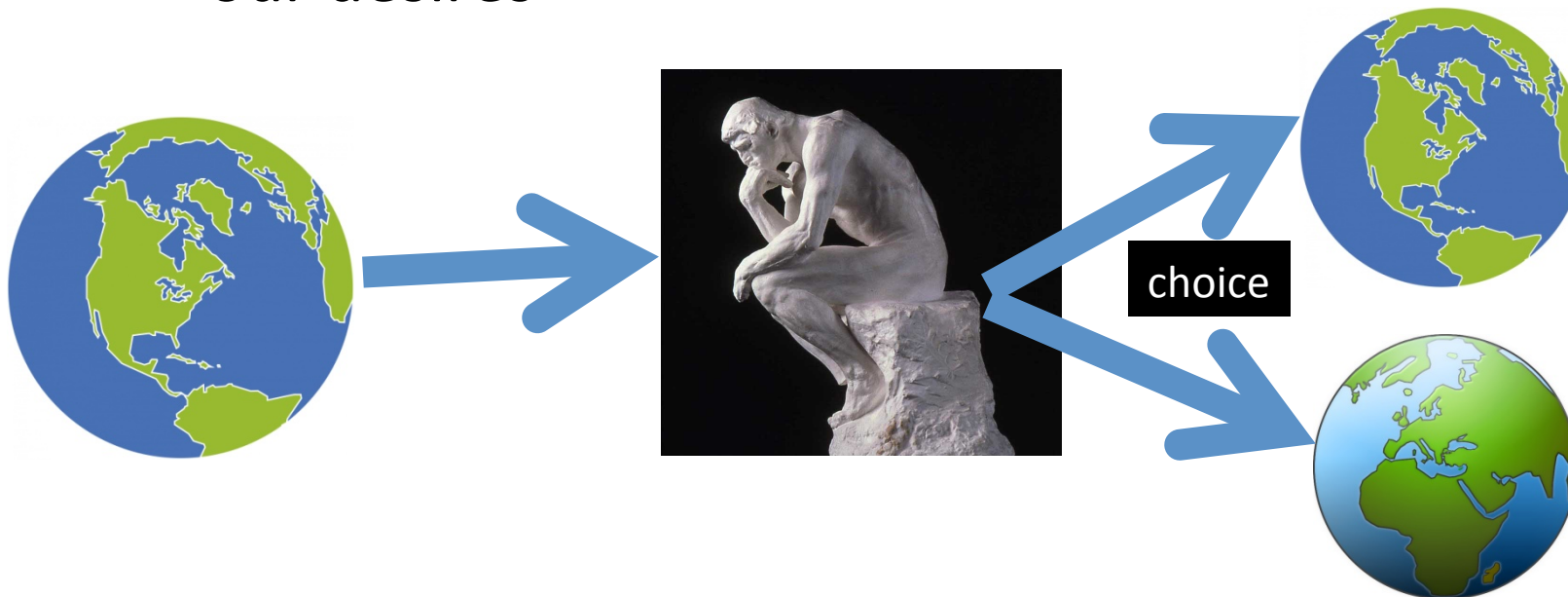


Outline

- Motivation and problem addressed
- Reasoning about others' actions using expected utilities, in the context of value-based practical reasoning
- Argumentation schemes to capture the reasoning over the expected utilities
- Dialogues that make use of the arguments captured by the schemes
- Conclusion

Practical Reasoning v Theoretical Reasoning

- Direction of fit:
 - In theoretical reasoning we fit our beliefs to the world
 - In practical reasoning we (try to) fit the world to our desires



Importance of Others

- We can choose our actions, but what will happen often depends on others



We go the station, but
the train may be
cancelled



We make an offer, but
the dealer may or may not
sell the car

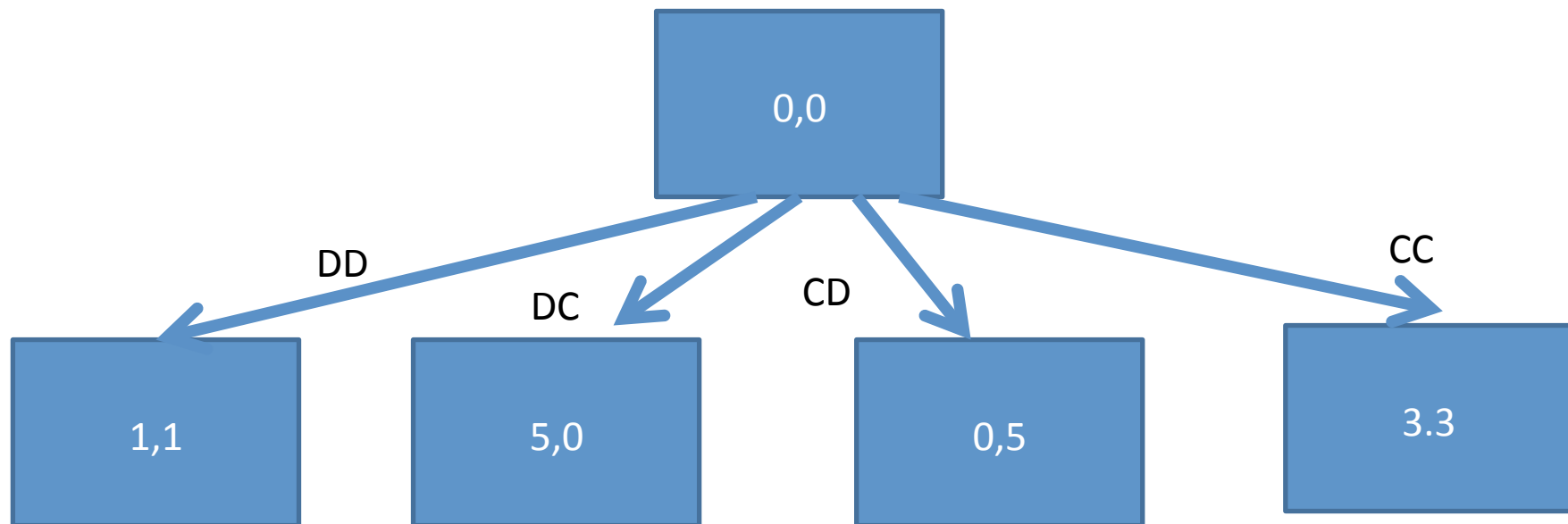


We propose marriage,
but proposal may be
accepted or rejected

Joint Actions



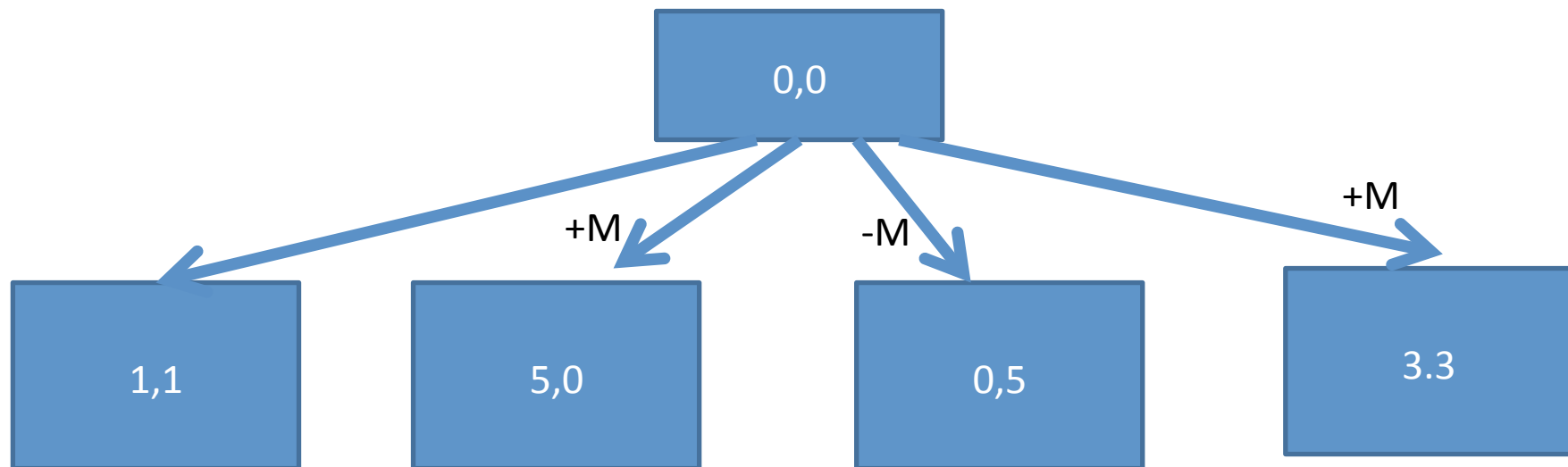
- State transitions depend on ***joint actions***, an action composed from the action of all the relevant agents.
- Example: Prisoners' Dilemma



Value Based Practical Reasoning



- Transitions are labelled with **values** they ***promote and demote***. Values and their ordering represent individual aims, aspirations and preferences of agents



Justifying an Action



- Practical Reasoning Argumentation Scheme:
 - In the current circumstances R
 - I should do action A
 - To produce new circumstances S
 - Which will realise a goal G
 - Which promotes Value V
 - Example: In 0,0 I should defect to move to 5,0 which increases my money and promotes my value of wealth
 - But this depends on the other agent ***cooperating***

The value explains why G is a goal, and is my reason to perform A

Reasoning About Others



- We have chosen an action in the hope that a particular (advantageous) joint action will occur. But why should we suppose that the other agent will make the desired choice?
- We can try to justify the choice of the other agent using the same argument from the perspective of the other agent.
- But this requires ***assumptions*** about
 - Beliefs, values and preferences
- To address this, make use of expected utilities for reasoning about others' actions within our account of value-based practical reasoning

And money is not the only consideration



- Other values relevant in Prisoner's Dilemma scenarios
 - **Player Money** (M1 and M2): promoted if player 1's (or 2's) payoff is greater than 1 and demoted if it is less than 1.
 - **Player Guilt** (G1 and G2): demoted if player 1 (or 2) defects and player 2 (or 1) cooperates.
 - **Player Self-Esteem** (S1 and S2): demoted if player 1 (or 2) cooperates and player 2 (or 1) defects: player 1 (or 2) may feel that they have allowed themselves to be taken advantage of and that they should have known better.

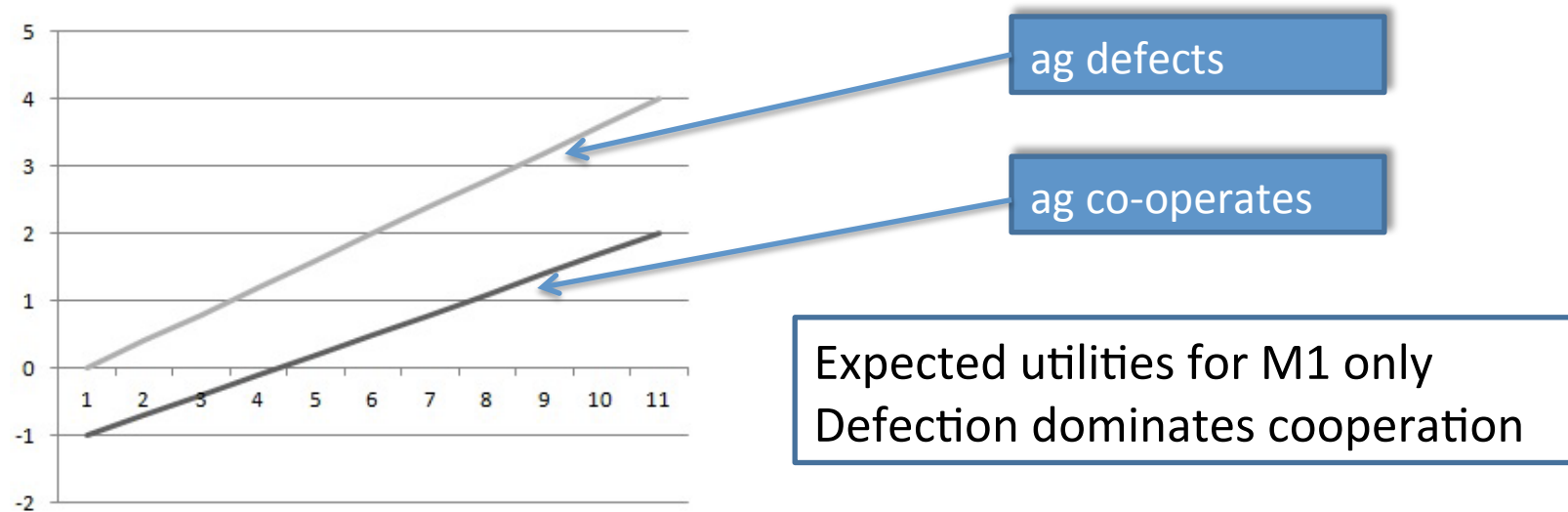
Set of Joint Actions



- We do not know how the other agent will act, so consider a ***set of joint actions***, that could result from an individual action being executed.
- Calculate the expected utility of performing the action, in terms of the probabilities of the joint actions containing that action.
- So, in addition to traditional ordering on values, also need **weights** on the values.
 - Use the weights to calculate the **expected utility** of an agent performing an action
- Then assume that if the desired joint action does not result from A, the worst case alternative joint action will be the one that does result

Consider *all* probabilities

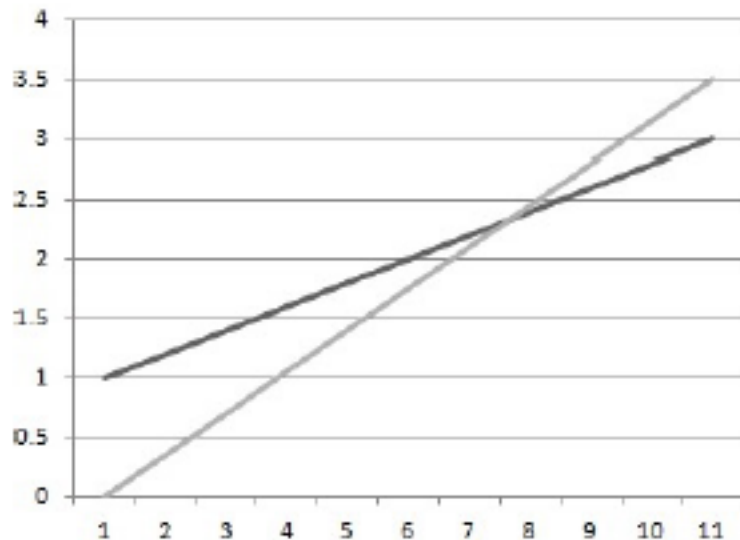
- We can now plot the expected utility of an action α for **all** probabilities of the joint action that result from α
 - Utility = actual payoff – guaranteed payoff



Adding a second value



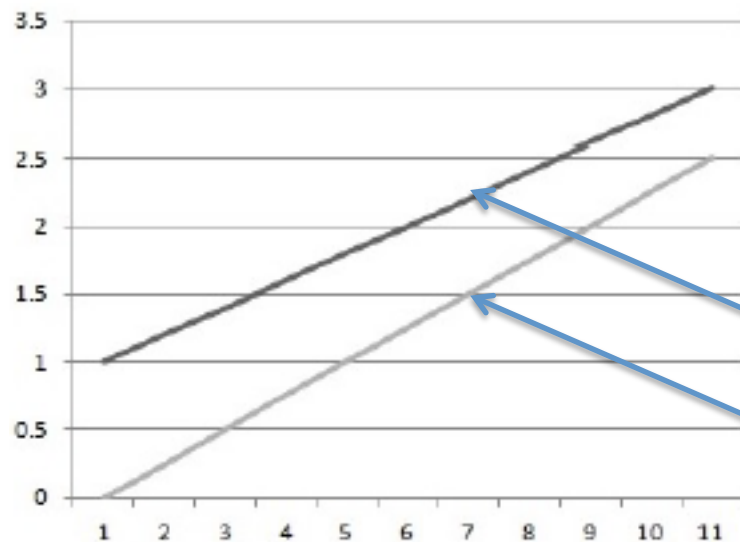
- Let's add in the value of M2 (other's money) and weight it at 0.5M1.
- Calculate the expected utility of defecting for the various probabilities of the other cooperating.



- Crossover occurs at $\text{prob}(j_0) = 0.67$
 - For high probabilities of cooperation, defection is preferred
 - For low probabilities of cooperation, cooperation preferred.

Add the value of guilt

- Now add in the value of Guilt with a weight of 1: gives a negative utility when an agent defects and the other cooperates



- Adding in guilt, cooperation now dominates defection

ag cooperates

ag defects

Arguments based on expected utilities



- Several types of argument can be based on the expected utilities for PD
 1. With your value preferences, you should C (respectively, D) since the expected utility is always greater than any alternative. **Strong argument.**
 2. With your value preferences, you should C (respectively, D) since the expected utility is always positive. **Weak argument.**
 3. With your value preferences, you should C (respectively, D) since the expected utility is greater than the alternative when the probability of cooperation is greater (less) than P. **Requires probability assumption to be justified.**
 - Can consider values associated with particular cultures/audiences

Can capture this reasoning as argumentation schemes

- The schemes have a conclusion in common

Conclusion: ag should perform α

Four premises the schemes have in common:

Values Premise: V is the set of values considered to be relevant by ag

Weighting Premise: The relative valuation of the values given by ag is a set of <value, relativeWeight> pairs

Joint Action Premise: The set of joint actions S in which ag performs α

Expected Utility Premise: The expected utilities for the various probabilities of the desired joint action resulting from ag performing α

The Argumentation Schemes



- We can now specify three schemes to capture the arguments based on the expected utilities and each scheme has its own characteristic premises
 1. Argument from Dominance
 2. Argument From Positive Expected Utility
 3. Argument From Probable Compliance

(see paper for specific details of the premises)

These schemes can be used within dialogues either for persuasion or deliberation.

The schemes' critical questions



- Critical questions applicable to all schemes:
 - CQ1: Are all the members of V relevant?
 - CQ2: Are any other values relevant?
 - CQ3: Are any members of V over weighted?
 - CQ4: Are any members of V under weighted?
- Different CQs are directed at different premises
- Additional CQs relevant to some schemes

Rebuttals



- The CQs will have their own typical rebuttals, but these may depend on the context supplied by the original scheme.
- For example, CQ3 (are any members of V over weighted?) could be met by the rebuttal:
even if the relative weight of v is reduced to $n\%$,
the expected utility of α for the joint action
remains greater than its alternatives for all
values of $\text{prob}(j_0)$.

Dialogues based on the schemes



- These schemes, challenges based on the critical questions and rebuttals can be deployed in a dialogue.
- Assertions take the form:

Given *ListOfValueWeightPairs*, one should α because *CharacteristicPremise*.

- Example based on PD involving two dialogue participants, C and D:
D1: Given $\langle M1, 1 \rangle$, one should defect because the expected value of defection is always greater than the expected value of cooperation.

Dialogues based on the schemes

C can challenge using CQ2 then counter with Argument from Probable Cause

C1: You must take some account of the payoff to the other player.

C2: Given $\langle M1, 1 \rangle$, $\langle M2, 0.5 \rangle$, one should cooperate since the expected utility is greater for probability of the other cooperating less than 0.67.

D has several possibilities for responding: invoke CQ1, CQ2 or CQ3...

- R1, based on CQ1: There is no reason to care about the payoff of the other.
- R2, based on CQ2: Introduce another value, demoted by cooperation – self esteem is a possibility.
- R3, based on CQ3: Argue that M2 is overrated. For example, reduce the weight of M2 to 0.2.

Dialogues based on the schemes



- The dialogue can continue down various paths
 - Which moves are chosen will depend upon the type of dialogue the schemes and CQs are being used in
- In a persuasion dialogue, the persuader has to take into account the weights that the persuadee attributes to values
- In a deliberation dialogue, the discussion may involve whether a value should be accounted for since the participants are looking to jointly decide how to act and come towards a consensus on the relative weights of arguments



Summary

- Within our account of practical reasoning, we have provided a new way of capturing reasoning about the actions of others using argumentation and expected utilities.
 - Assumptions are not required about the beliefs, values and preferences of other agents whose choice of action affects the outcome.
- Considered the set of joint actions that can result from the performance of an individual action
- Utility is calculated in terms of the values promoted and demoted in performing the individual action
- Expected utilities derived are captured in argumentation schemes to be deployed in dialogues (either persuasion or deliberation)

Thank you for your attention!

Any questions?