Truth and Modality

How do we reconcile them?

Overview of talk

- The 'truthmaking' account of truth and modality.

- 2 problems for the truth of modal statements

1) *Accounting for* the perceived truth of modal statements – 'Possible Worlds' semantics

2) What are the *truthmakers* for modal statements? On what grounds do we judge a modal statement true or false? Discuss!

Truthmaking and modality

- Accept ‘truthmaker theory’ as the only ‘Rottweiler realist’ theory.
- Truth **bearers** can be sentences, statements, assertions and thoughts, all of which express *propositions*.
- Truth **makers** are ways some things in the world are
- The truthmaker of the statement 'There are 57 people in this room', if true, are the 57 people actually in this room. A proposition or statement is true if it correctly **represents** a way things actually are.
- A **modal** proposition states what is **possible**, **necessary** or **impossible**. It can also assert what **might be** or what **might have been** the case. It does **not** state what actually **is**.
- So modality creates a problem for theories of truth and truthmaking

Modal statements - some examples:

1) Pigs **might** fly. (**F**)

2) **Necessarily**, bachelors are male. (**T**)

3) David Cameron won the 2015 election (**T**), but he **might have lost** it (**T)**.

4) I am a human being (**T**), but I **might have been** a poached egg or a football match (**F)**.

5) The number 8 is **necessarily** even. (**T)**

6) The number of planets is **necessarily** even. (**F**)

7) There are 11 players in a football team. (**T**) It's **possible** that there might have been 13 (had the rules been set up differently) (**T**), but it's **impossible** that there could have been zero players (**T**).

8) No individual concrete object **can** be in two distinct spatiotemporal locations (No one thing can be in two places at the same time). (**T**)

9) **Necessarily** gold is the element with atomic number 79. (**T**)

10) **Necessarily** whales are mammals. (**T**)

Problems with modality and truth

- We have little difficulty in judging intuitively *whether* modal statements are true or false.

- But, given that they concern facts which do not obtain, there are two key problems with relation to their truth.

1. How to **account for** their **truth** within a logical system, so that our arguments come out valid & our theories come out true and provable.

2. The second - and deeper - question is to state *why* a modal statement is true or false - what is its truthmaker?

How truth values are assigned in *non-modal* logic

a) Propositional logic –key ingredients

1. **Atomic sentences (propositions)** : 'pigs fly'; 'bachelors are male'.
2. **The logical connectives** :

a) Conjunction (and) &
b) Disjunction (or) V
c) The material conditional (if…then) →
d) The biconditional (if and only if - *iff*) ↔

3. **The negation operator** ¬

Combine them as follows:

11) (Pigs fly) **F** & (bachelors are male) **T – FALSE**.
12) (Pigs fly) **F** V (bachelors are male) **T – TRUE**
13) ¬(Pigs fly) **T** & (bachelors are male) **T – TRUE**

Key point: all these logical operators are **truth-functional**: they affect the **truth value** of the sentences in which they occur.

b) Predicate logic - v. rough summary

Key ingredients (in addition to the earlier ones)

1) A *variable* (1st order logic) for the subject of a proposition:
lower-case letters *x*, *y*

2) *2 quantifiers*:

a) the *universal* quantifier 'all', written ∀

b) the *existential* quantifier 'some' ('there exists at least one'), written ∃.

'Pigs fly' becomes:

$\forall x(x \rightarrow Fx)$ - 'For all x, if x is a pig then x flies'

'It's not the case that pigs fly' becomes:

$\forall x\ (Px \rightarrow \neg Fx)$ - 'If x is a pig, then x doesn't fly'.

Note: the quantifiers ∀ and ∃ do **NOT** affect the truth-value of the propositions in which they occur.

Classical v. modal logic

- Classical logic is designed to assign truth values to statements of how things *are*, not with how they *might be* or *might have been*.

- It can handle ‘Pigs **don’t** fly’, but it can’t handle ‘Pigs **might** fly’

- In the mid-20C a number of modal logic systems were developed to include **2** further operators:

  '**necessarily**' $\Box$ known as 'box‘
  '**possibly**' $\Diamond$ known as 'diamond’

- 'Pigs might fly' becomes $\forall x\,(Px) \rightarrow \Diamond(Fx)$
  ('If x is a pig, then it's possible that x flies'.)

Modal logic - continued

- Necessity, possibility and impossibility are interdefinable:

- A proposition which is **necessarily true** (a necessary truth) is **not possibly false.**
  def: [□p = ¬◊¬p]

- A proposition which is **possibly true** (a possible truth) is **not necessarily false.**
  def: [◊p = ¬□¬p]

- A proposition which is **actually true** is **possibly true**
  [p → ◊p]
  because if p weren't possible it couldn't be actual!

- The definitions and axiom above make intuitive sense. But there are problems…

Modality in a mess (1) - the problem of 'extensionality'

- 'Demodalising' two of the sentences of slide 2:

  15) The **number 8** is even. **T**

  16) The **number of planets** is even. **T**

  (now that Pluto has been demoted!)

- Both sentences illustrate an important principle in **non-modal** logic:

  Co-referential (co-extensional) terms, when substituted, should **not** affect the truth value of the sentences in which they occur.

- This principle is infringed when the **necessity operator** is added back in:

  5) The **number 8** is *necessarily* even.

True. It's not possible for 8 to be an odd number! Think about it…

  6) The **number of planets** is *necessarily* even.

False. The number of planets could have been otherwise - and was!

- The problem is that the **necessity** operator is **not** *truth-functional*.

  It does not alter the truth value of sentences in a **systematic** way (unlike the necessity operator: 'Pigs fly' – **False.** **¬**(Pigs fly) – **True.**)

Modality in a mess 2 – *structure* without *meaning*

- The various systems of modal logic all make different basic assumptions about the interplay of necessity and possibility; their axioms and theorems grow increasingly complex.

- We can end up with long strings of iterated boxes and diamonds:

  $\neg((\Box\Diamond\Box\Diamond\Box\Box\Diamond\Diamond p) \,\&\, \neg(\Box\Diamond\Diamond p))$

- What on earth does this *mean*?!!!

- If we apply the 'reduction rules' of system S5, thereby eliminating all boxes and diamonds except the final ones, we get:

  $\neg((\Diamond p) \,\&\, \neg(\Diamond p))$

  It's not the case that 'possibly p' and 'not possibly p' are both true.

  This is the **modal** form of a fundamental law of logic:

` - a proposition and its negation cannot both be true.

Thus far: modal logic gives strange results, does not reflect everyday usage, there are several modal systems. It gives us *syntax*, hence *structure*, but no *semantics* – no clear *definitions* of ◊ and □**.**

‘Possible Worlds’ to the rescue?

- In the 'Possible Worlds' semantics (developed by Saul Kripke in a series of papers between 1959 and 1963) **Necessity** and **Possibility** are defined as follows:

  □ P: A proposition is **necessarily** true if it is true in **all** Possible Worlds.

  ◊ P: A proposition is **possibly** true if it is true in **some *(at least one)*** Possible World.

- Technically speaking, ◊ and □ are **not** *sentential operators* like Negation (¬) but *quantifiers*, like ∀ and ∃. This is why they are **not** truth functional.

The varieties of modality - 1

- There are various 'varieties' of modality: **logical, metaphysical**, **epistemic**, **physical**, **mathematical**, **deontic**, **legal...** etc. All these have their own set of Possible Worlds.

- Moreover, Kripke – and others - suggest how the various systems of modal logic might map onto the varieties of modality that we **actually use**.

- System **D**, for example, maps onto **deontic necessity;** this concerns what one **must** or **must not** do (**ought, ought not** to do) – useful in ethics and the law. Key axiom: ($\Box p \rightarrow \Diamond p$)

- Ought ($\Box p$) implies can ($\Diamond p$), but doesn't imply that p actually happens. In all possible worlds, one ought to resist torturing babies, but in some worlds such resistance fails to obtain.

Varieties of modality (2)

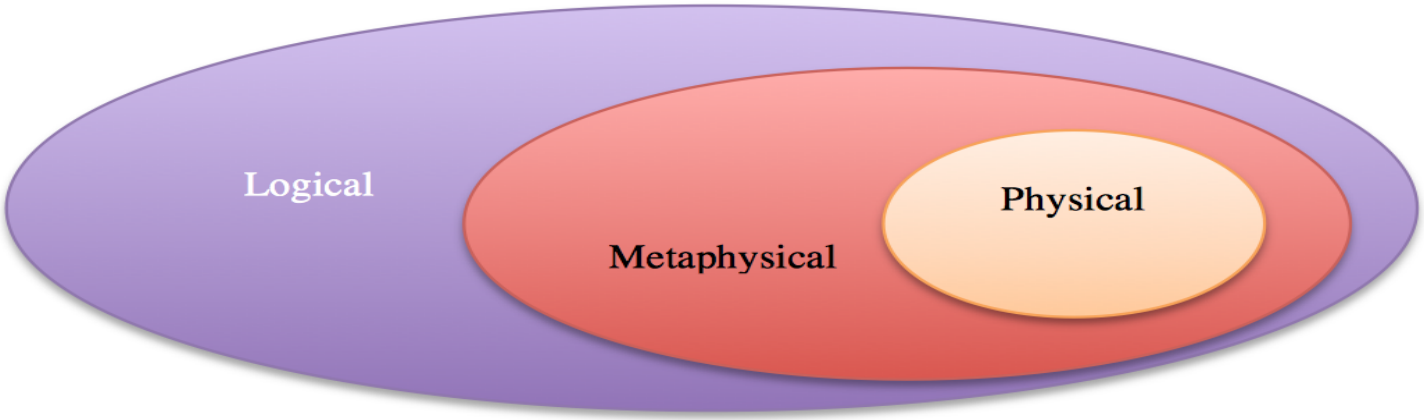
- Deontic logic is unusual because it looks like an instance of necessity (interpreted here as a moral imperative or necessity) (□p) **not** implying actuality (p).

- If '□p' is true, it is true in all possible worlds. Since all possible worlds include the actual world, we would expect p to be true in the actual world. But it isn't always, as we saw in the case of deontic modality.

- □p implies p (□p → p) **only** in the '**alethic'** modalities – metaphysical, logical and physical (nomic), so-called because necessary truth implies actual truth.

- Metaphysical and logical necessities are those to which the 'strongest' logical system, S5, applies.
(That's the one with the notorious axiom '◊□p → □p': 'if t p is possibly necessary, then p is necessary')

The alethic modalities - Possibility (NOT necessity) diagram



- Logical possibility - anything which does not contradict the laws of logic is possible. Anything conceivable. Very open, used by Hume and Descartes.

- Metaphysical possibility – constrained by the natures or essences of the entities in the particular modal domain (Kit Fine, Bob Hale)

- Physical possibility – constrained by the physical laws and constants of our universe.

What are the truthmakers of our modal claims?

- Although the 'Possible Worlds' apparatus seems to give us a way of **applying** truth conditions and truth values to modal propositions, it doesn't seem to **explain** modality.

- If we try to say **why** the modal statements we looked at earlier are true or false, we realise that we must **already** have some presuppositions as to how modality works **before** arriving at a judgment using the 'Possible Worlds' apparatus.

- So what do we think **are** the truthmakers for our modal statements?

- If the truthmaker for non-modal statements is a way some things in the **actual world** are, then the truthmaker for a modal statement is a way some things are in **some, all, or no possible world**.

Applying 'Possible Worlds' semantics to modal propositions

1) Pigs **might** fly. (**F**)

2) **Necessarily**, bachelors are male. (**T**)

3) Although David Cameron won the 2015 election (**T**), he **might have lost** it (**T)**.

4) I am a human being (**T**), but I **might have been** a poached egg or a football match (**F)**.

5) The number 8 is **necessarily** even. (**T)**

6) The number of planets is **necessarily** even. (**F**)

7) There are 11 players in a football team. (**T**) It's **possible** that there might have been 13 (had the rules been set up differently) (**T**), but it's **impossible** that there could have been zero players (**T**).

8) No individual concrete object **can** be in two distinct spatiotemporal locations.

9) **Necessarily** gold is the element with atomic number 79. (**T**)

10) **Necessarily** whales are mammals. (**T**)