Homework

Homework due Jul 15, 2020 21:30 IST

The exercises below will count towards your grade. **You have only one chance to answer these questions**. Take your time, and think carefully before answering.

Problem 1

30.0/30.0 points (graded)

Recall that for a time-travel story to be *consistent*, it must never give us conflicting descriptions of a single point in the narrative's timeline.

With that in mind, determine whether each of the following stories can be interpreted as a consistent time travel story.

Make sure you interpret them as stories about ordinary time, rather than super-time, and as time travel stories rather than world-travel stories.

Story 1: You do badly in an exam, and resolve to travel back in time to give yourself a hint before the exam takes place. You successfully travel back in time. But, you mistakenly hand your earlier self the wrong hint, and she ends up doing even worse on the exam.

- ○ Consistent
- ◉ Inconsistent ✔

Story 2: One day you wake up to find plans for building a time machine under your pillow. You use the plans to build a time machine, and you spend many happy years traveling through time. During one of your travels, you leave the plans under your younger self's pillow.

- ◉ Consistent

- ◯ Inconsistent

✔

Story 3: A team of lepidopterists travels back in time to the Paleogene, hoping to catch a glimpse of early butterflies. The designer of the time-machine cautions the team to stick to their path: they are not to interfere with the past in any way. As they are completing their journey, one of the scientists steps on a branch and startles a butterfly. When the team returns to the present, they are confronted with a changed world: land octopuses have conquered the earth, and rule with an iron tentacle. A small interference in the past has radically changed the future.

- ◯ Consistent
- ◉ Inconsistent

✔

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Problem 2

10.0/20.0 points (graded)

The **Control Hypothesis** is a view about what it takes to act freely:

> **Control Hypothesis**:
> An agent acts freely in doing X if and only if: (1) she does X by making a certain decision, and (2) she is in a position to do something other than X by making a different decision.

Now consider the following scenario

> After several hours of good fun, you decide to leave the party, and spend the rest of the evening at home. Unbeknownst to you, your hosts were finding you extremely obnoxious, and they were about to kick you out just as you left. So, had you instead decided to stay, you wouldn't have been able to: you would have been forced to leave anyway.

According to the Control Hypothesis, did you act freely in leaving the party?

- ◯ Yes

- (●) No

✔

Does the Control Hypothesis give a plausible or intuitive verdict on whether you leave the party freely?

- (●) Yes
- ( ) No

✖

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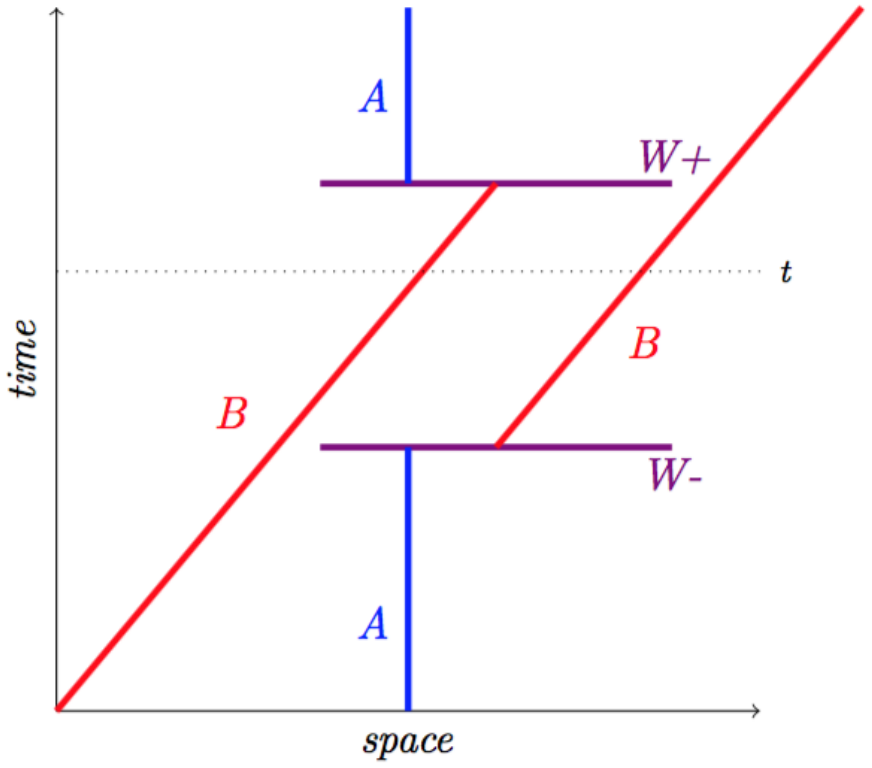
Problem 3

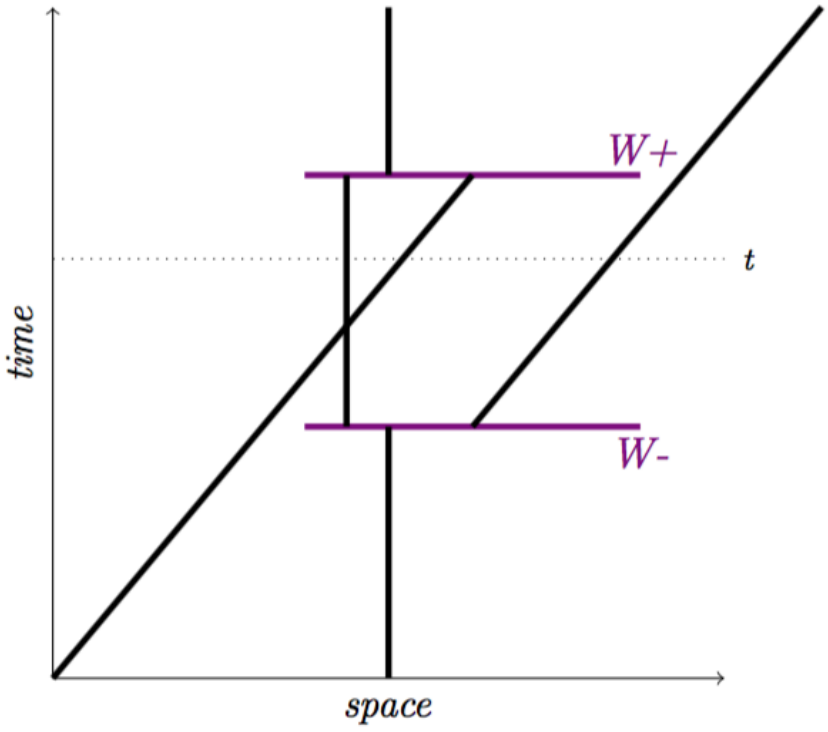
0/30 points (graded)

Section 4.3.1 of the course materials discusses a toy model of time travel. The diagram below depicts a wormhole within the world of the toy model. The points represented by $W-$ are identified with the points represented by $W+$. Particle A jumps to the future when its spacetime trajectory reaches the wormhole from outside the wormhole region; particle B jumps to the past when its spacetime trajectory reaches the wormhole from inside the wormhole reigion.



Note that only one particle, namely, particle B, exists at time t, though B experiences time t twice.

Now consider a different diagram, in which the identities of particles are not specified:



Assuming the laws of the toy model are in place, how many different particles exist at

time t?

- ◯ One ✔
- ◉ Two
- ◯ Four
- ◯ The description of the case does not determine a correct answer

✖

Explanation

One. But three different time-slices of that one particle occur at three different locations at time t. To see this, consider the particle corresponding to the left-most spacetime trajectory in the diagram. It starts out moving right. After a while, it enters the wormhole region and collides with an later version of itself, which is stationary. The collision causes it to become stationary. While stationary it reaches time t. It then reaches the wormhole and jumps to the past. After a while it collides with an earlier version of itself, which is moving right. The collision causes it to start moving right again. While moving right, it reaches time t a second time. After that, it reaches the wormhole a second time and again jumps to the past. It continues moving right and reaches time t for a third time. Shortly after that, it exits the spacetime region.

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ℹ Answers are displayed within the problem

Problem 4

10.0/20.0 points (graded)

There is famous scene in *The Matrix* in which the Oracle predicts that Neo will break a vase. (You can find it online by searching matrix oracle vase". Or you can go here.)

Is it possible to come up with a consistent time travel story that explains how the Oracle acquires the information necessary to make her successful prediction?

- ◉ Yes
- ◯ No

✔

Neo breaks the vase after turning back. Based only on what the film reveals about the situation, does the Control Hypothesis entail that Neo fails to act freely in turning back?

- (●) Yes
- ( ) No

✖

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