A New Twist to the Miners Puzzle

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Introduction Kratzer's seminal work on modality [5, 6, 4] was recently challenged by the *miners puzzle* by Kolodny and MacFarlane [3]. We argue that the puzzle has hidden premises which lead to a deontic conflict. Furthermore, the original premises do not give an accurate description of the situation and need to be modified. The proposed new premises allow the deontic conflict to be solved via the novel treatment of modals in *Suppositional Inquisitive Semantics* (InqS)[1, 2].

The puzzle There are miners trapped in one of two shafts, with water levels rising. It is possible to block one of the two mine shafts, but not both. If you block the correct mine shaft, everyone survives; if you block the wrong one, the water will flood the other, killing all miners; and if you block neither shaft, the water will kill one miner. Kolodny and MacFarlane conclude from the story that, intuitively, (1) holds. Note that obligation will be represented by $\boxed{v}\,\varphi$ and necessity by $\boxed{\epsilon}\,\varphi$.

(1) We ought to block neither shaft. $\boxed{v}\,(\neg p' \wedge \neg q')$

Kolodny and MacFarlane posit that the following premises hold.

(2) a. The miners are in in shaft A or B. $p \vee q$
b. If the miners are in shaft A, we ought to block shaft A. $p \rightarrow \boxed{v}\,p'$
c. If the miners are in shaft B, we ought to block shaft B. $q \rightarrow \boxed{v}\,q'$

From these premises we cannot conclude (1), instead, (2-a), (2-b) and (2-c) entail (3).

(3) Either we ought to block shaft A or we ought to block shaft B. $\boxed{v}\,p' \vee \boxed{v}\,q'$

Hidden premises Kolodny and MacFarlane omit some hidden premises, such as (4-a) and (4-b).

(4) a. We cannot block both shafts. $\neg(p' \wedge q')$
b. The miners are not in both shafts. $\neg(p \wedge q)$

If we take the factual information to include, (2-a) (2-b), (4-a) and (4-b), we are left with the factual worlds $\{p\overline{q}\}$ and $\{\overline{p}q\}$. We can bring about three different states of affairs: $\{p'\overline{q}'\}, \{\overline{p}'q'\}, \{\overline{p'q'}\}$. Taken together, with different worlds for violations and non-violations, this gives us 12 worlds.

There are less innocuous hidden premises, as blocking the wrong shaft will kill everyone, but this is not captured by the premises. So we add (5-a) and (5-b) to say that gambling with the lives of all the miners ought to be avoided.

(5) a. If it is possible that the miners are in shaft A, then we ought not to block shaft B.
$\diamond_{\epsilon}\, p \rightarrow \boxed{v}\,\neg q'$
b. If it is possible that the miners are in shaft B, then we ought not to block shaft A.
$\diamond_{\epsilon}\, q \rightarrow \boxed{v}\,\neg p'$

With the addition of (5-a) and (5-b), together with (2-a), (4-a) and (4-b), all $\{p'\overline{q}'\}$ and $\{\overline{p}'q'\}$ worlds are violation worlds. So we can conclude (1).

So far we have excluded Kolodny's and MacFarlane's premises (2-b) and (2-c). If we add them, we eliminate all non-violation $\{\overline{p'q'}\}$ worlds. So we still conclude that (1) holds, but we also conclude that $\boxed{v}p'$ and $\boxed{v}q'$ holds. This means that we have a deontic conflict, i.e., all alternative states of affairs will lead to us breaking rules. This is a natural outcome as Kolodny and MacFarlane state that we do not know where the miners are, and blocking both shafts will lead to at least one miner dying - so, we can at best gamble with the risk of killing all miners, or kill a miner - both of which are undesirable options which violate intuitive maxims.

Rejecting the premises Intuitively, (2-b) and (2-c) are too weak. The intuitiveness of (5-a) and (5-b) attests that we should not block the shaft unless we are certain that the miners are in the correct shaft. So we replace (2-b) and (2-c) with the premises (6-a) and (6-b).

(6) a. If the miners **must** be in shaft A, we ought to block shaft A. $\boxed{\epsilon}p \rightarrow \boxed{v}p'$

b. If the miners **must** be in shaft B, we ought to block shaft B. $\boxed{\epsilon}q \rightarrow \boxed{v}q'$

(6-a) and (6-b) give an intuitively more precise characterization of the situation but in Kratzer semantics, (6-a) and (6-b) together with (2-a) counter-intuitively still entail (3).

The problem arises in Kratzer semantics due to its treatment of empty states. For example, (6-a) holds when $\boxed{v}p'$ is the case when $\boxed{\epsilon}p$ is supported. In this case, when $\boxed{\epsilon}p$ does not hold, the semantics checks whether $\boxed{v}p'$ is supported by an empty state. As every sentence is supported by an empty state, so is $\boxed{v}p'$, and (6-a) as a whole. This means that when $\boxed{\epsilon}p$ does not hold, $\boxed{v}p'$ is vacuously true. Intuitively, the solution is to stop the empty state from supporting all sentences.

Introducing InqS To solve the puzzle, we will introduce InqS [2] which adds suppositional content to its notion of meaning. In InqS any state that does not support or reject a sentence *suppositionally dismisses* it. An empty state suppositionally dismisses every sentence.

The treatment of deontic and epistemic modals follows the Andersonian treatment of modals in Aher and Groenendijk [1]. The account provides an account of both deontic and epistemic modals which is well-behaved when embedded in the antecedent or consequent of a conditional.

For reasons of space, we cannot explicitly state the clauses of the semantics. Fortunately, the solution to the puzzle does not require a modification of the semantics.

The solution According to the story, (2-a) holds, so $\neg p$ and $\neg q$ are possible. This means that one cannot suppose that $\boxed{\epsilon}p$ and $\boxed{\epsilon}q$ hold. According to the clauses of InqS, when $\neg p$ is possible, $\boxed{\epsilon}p$ is rejected, and, likewise, when $\neg q$ is possible, $\boxed{\epsilon}q$ is rejected. The rejection of $\boxed{\epsilon}p$ and $\boxed{\epsilon}q$ causes *supposition failure* in (6-a) and (6-b) because the empty state does not support or reject any sentence. Consequently, neither $\boxed{v}p'$ nor $\boxed{v}q'$ are the case as long as $\neg p$ and $\neg q$ remain possible, so $\boxed{v}p' \vee \boxed{v}q'$ does not hold either. This means that we cannot derive (3).

Conclusion InqS correctly predicts that we ought to block shafts only if we know where the miners are. After adding the new premises (5-a), (5-b), (6-a) and (6-b), InqS correctly predicts that (1) holds and (3) does not, which solves the deontic conflict and the puzzle as a whole.

References

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