The Demon's Game

Infinite sequences can cause trouble for rational decision making.

In this lecture I'd like to describe a couple of paradoxes that bring that out. I learned about them from philosophers Frank Arntzenius, Adam Elga and John Hawthorne.

Imagine an infinite group of people $P_1, P_2, P_3, \ldots$. An evil demon suggests that they play a game. "I'm going to ask each of you to say *aye* or *nay*", he says. "If only finitely many amongst you say *aye*, there will be prizes for everyone: each of you will receive as many gold coins as there are people who said *aye*. Should infinitely many of you say *aye*, however, nobody will receive anything."

If the members of our group were in a position to agree on a strategy beforehand, they could end up with as many gold coins as they wanted. All they would need to do is pick a number k, and commit to a plan whereby persons $P_1, \ldots, P_k$ answer *aye*, and everyone else answers *nay*. As long as everyone sticks to the plan, every member of the group will end up with k gold coins.

But the demon is no fool. He knows that he could bankrupt himself if he allowed the group to agree on a strategy beforehand. So he isolates each member of the group as soon as the rules have been announced. As a result, each person must decide whether to say *aye* or *nay* without having any information about the decisions of other members of the group.

With such precautions in place, the evil demon has nothing to fear.

To see this, imagine yourself as a member of the group. You are isolated from your colleagues, and you are pondering your answer. Should you say *aye* or should you say *nay*? You know that your decision can have no effect on other people's decisions, and reason as follows:

> If infinitely many of my colleagues answer *aye* nobody will get any coins, regardless of what I decide to do. So my decision can only make a difference to the outcome on the assumption that at most finitely many of my colleagues answer *aye*. But in that case I should definitely answer *aye*. For doing so will result in an additional gold coin for everyone, including myself! (If I were to answer *nay*, on the other hand, I wouldn't be helping anyone.)

So: answering *aye* couldn't possibly make things worse, and could very well make things better. The rational thing to do is therefore to answer *aye*!

Of course, other members of the group are in exactly the same situation as you. So what is rational for you is also rational for them.

That is why the demon has nothing to fear.

As long as every member of the group behaves rationally, everyone will answer *aye*, and the demon won't have to cough up any money. (It goes without saying that the demon could lose a lot of money if only finitely many members of the group are fully rational. But the demon was careful to avoid selecting such a group for his game: nothing gives him more pleasure than torturing fully rational people.)

Our group is in a position to avail itself of as much money as it likes. And yet we can predict in advance that it will fail to do so, even though every member of the group behaves rationally.

What has gone wrong?

Video Review: The Demon's Game

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So imagine this situation.

I get an omega sequence.

This time, you have an omega sequence of people.

So you have Person 0, and Person 1, and Person 2, and so forth.

And the devil approaches them and says,

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