

Einstein's Train in relative Rain

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Summary

We present a thought experiment similar to Einstein's train and lightning example. This experiment yields very paradox consequences. Some basic knowledge about the special theory of relativity is assumed. Supporters of the Theory of Relativity are invited to give answers.

Keywords

Theory of Relativity, Train, Rain, Paradox

Description of the Experiment

Assume we have two trains being exactly the same. Further we have a tunnel with two tracks. Being in rest the two trains have exactly the same length as the tunnel. Outside the tunnel it's raining. The trains are coated with a very new material which changes its color from blue in the wet to red once the train is completely dry. Now the trains come from opposite directions with some speed v towards the tunnel, one from left and the other from right. As seen by an observer in the mid of the tunnel they shall enter the tunnel at the same time (at opposite ends of course).

Expected Observations

The trains start in the wet being colored blue. An observer in one train sees the tunnel shorter than his own train (length-contraction). Also he sees the other train shorter than his own one and also shorter than the tunnel.

Who sees what ?

1. The observer in the mid of the tunnel sees the trains shorter than the tunnel. For some time interval (may be quite short) he sees the trains completely within the tunnel. The trains are completely dry for this period of time. Both trains would have to change their color to red.
2. An observer in a train sees the tunnel shorter than his train. So his train is never completely in the tunnel. The color of his own train remains blue. This observer sees the other train shorter than the tunnel what causes the train to be completely within the tunnel for some short time. So the other train has to become red.

Possible Problems

One may ask, whether all observers do agree what's inside the tunnel and what's outside.

But this cannot be a serious problem. While the observations predicted by the special theory of relativity affect length (contraction), time (time-dilatation) or speed (adding speeds), they do not affect the relative position of one object vs. another one. An object which is left of a second one remains left of this regardless of the inertial system used (as long as the orientation of the systems remains the same). If there would be a line across each portal of the tunnel, inside is at one side of the line while outside is at the other side. So all observers would have to agree where is rain and where is dry, that means given any point they would assign the same state of rain/dry to it. The measures of rain or dry areas may be judged as different by each observer (tunnel length).

Conclusion

Which color do our trains have ? The observer in the own train would say blue, the observer from the other train says red. So we have a relativity of colors blue and red (of course this has nothing to do with a Doppler red-blue-shift !) or the states wet and dry.

We didn't use more than the special theory of relativity claims.
Is there a relativistic explanation to resolve the paradox or will the trust in the special theory of relativity request us to assign two different states to an object ?

Appendix

The problem is not induced by the new hypothetical material the trains are coated with. Alternatively we could assume two electrical switches for each train being located one at each end. The switches shall be sensitive to humidity and assumed to be connected in parallel in an electrical circuit. This gives exactly the effect, that we have current while at least one end of the train is wet and no current when both ends are dry. Once the current is off, we will keep it off for good. Given current or not we can control red or blue bulbs to give light. This apparatus is quite really practical and eliminates the need for the new coating material.