Time Travelling to Avoid Trump

Progress Report

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Chapter 1

Summary of Topic

1.1 Special relativity

We will primarily be investigating time dilation in special relativity.

Put *very* simply, special relativity tells us that if we move very fast, we time travel into the future. (Of course, that is by no means a rigorous — or entirely accurate — explanation. We will explain it more fully in subsection 1.1.1.)

One of the main equations we will use is:

$$\frac{\Delta t_m}{\Delta t_s} = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}$$

Again, put simply, this equation relates the ratio of elapsed time between two observers to the speed of one of them. Following is a more rigorous explanation.

1.1.1 What is that formula?

$$\frac{\Delta t_m}{\Delta t_s} = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}$$

We will not go into proving this formula here, as that is beyond the scope of this text. Look at (Bruni, Dick, Speijer, & Stewart, 2012, p. 580 – 586) for a simple explanation or (Einstein, 1916) for a more rigorous one. For now, we will just explain what all of this means.

Imagine two people, each holding a clock. We will call these people m and s.

m is a person standing still relative to an inertial frame of reference (such as the earth[1]).

s is a person moving with a velocity of v m/s relative to m.

c is the speed of light in m/s.

Then, Δt_m is how much time person m records on their clock, and Δt_s is how much time person s records on their clock after s travels a certain distance relative to m (The actual distance is not important, since we are just looking at a ratio. However, if it helps to visualize it, you can imagine that person s is travelling for 1 second, making the distance equal to the magnitude of v.).

[1] The earth is not technically an inertial frame of reference, but it is close enough to one for our purposes.

1.2 Other topics

We will also touch on other topics, such as kinematics, to do our calculations.

For example, we will need to calculate how long it takes to accelerate to a given percentage of c assuming an acceleration no greater than what a human can handle for a sustained period of time.

Depending on where our analysis goes, we may also look at: general relativity, centripetal motion, basic orbital mechanics, or basic rocket science.

Chapter 2

Analysis

2.1 Proposal

Using special relativity we will analyze the feasibility of time travelling to the future using a variety of current and theoretical forms of transportation. Specifically, we will be exploring the possibility of using special relativity to skip to the end of Donald Trump's presidency, which is 3 years, 59 days, 20 hours, and 30 minutes from the time our ISP is due. All calculations will be done assuming we depart on our journey immediately after handing in our ISP on November 22, 2017.

An idea will be considered feasible if there is a measurable difference between the time experienced by us (the one's escaping the presidency of Donald Trump) compared to the time experienced by those on earth. For example, we will even consider a one second difference a success, although a larger difference would be even better.

2.2 Ideas under consideration

We will carry out and present this analysis by first exploring existing technology, although most of it is not practical for our purposed. This will include methods of transportation such as biking or driving, in order to present a sense of scale for the task.

We will then consider technologies that while proven on paper, and seriously considered for implementation, have not been implemented yet. This includes technologies such as Hyperloop or nuclear propulsion.

Finally, we will look at what we can accomplish if we leave the earth. This includes ideas such as black hole starships.

2.3 Analysis approach

For each idea we consider, we will perform a full analysis of its ability to solve our problem. This includes considering fuel for any rockets, as well as the time needed to accelerate to what will be speeds approaching c. As we are only looking at the physics side of time travelling, we will ignore economic considerations such as cost or how long it would take to actually build the technology if it does not exist yet. In the case of two technologies with similar outcomes, we will only then consider economic factors. We will stage our analysis such that each technology explored improves on the weaknesses of the previous one.

Chapter 3

Work Equalization and Integration Summary

We believe it is best if everyone is involved with as many parts of the ISP as possible with the skills they have. Of course, some people are stronger at performing certain tasks than other tasks. Because of this, we will split up the work as follows:

Vincent Vincent's main job will be preparing the documents and presentation. He will also do some calculations and research.

David David will do most of the calculations, and some research.

Aviv Aviv will do a lot of research, and will also proofread the paper, as well as check for any errors in our calculations. Aviv will also perform some of his own calculations.

Doing it this way, each group member should spend about an equal amount of time working on the project.

As part of putting together the actual documents, Vincent will integrate everyone's work into a beautiful, coherent, professional LaTeX document, as done in academia. This also has the benefits of: easier bibliography management, faster formula writing, and better presentation. Since we can also use LaTeX for our presentation at the end, of the project, everything will have a clean, coherent look.

Bibliography

Bruni, D., Dick, G., Speijer, J., & Stewart, C. (2012). *Physics 12*. Nelson Education.
Einstein, A. (1916). Relativity: the special and general theory.