**Introduction**

Good afternoon ladies and gentlemen, how nice of you to come join to watch our presentation even though you didn’t really have a choice. I want to start off with a question: who sometimes feels like certain applications of technology are slowly spinning out of control? E-bikes for instance, those vehicle like two-wheeled rockets which propel manly old people up to almost hypersonic speeds around mach 10. This Tuesday there were some news articles published about the number of cyclist who had severe accidents last year. The number of sever accidents has increased by 30 percent in the past ten years, in an increasing amount of accidents e-bikes are involved. Not only old but also young people on e-bikes experience more accidents. The peculiar thing is, most of these accidents are solo accidents, which means that only the cyclist was involved. Apparently cycling is too difficult for some people and well lets be honest Dutch people don’t want to cycle with a helmet on. Then what is the solution for the severe injuries? Making bikes safer by making it easier to stabilize them.

To design a stable bike it would be nice to have some kind of understanding of how different designs lead to a safer or more hazardous bike. To test many different designs, a model of how different bikes behave comes in handy. In the development of this model, we first take a look at the unicycle which has fewer components than the regular bike. But when you think about it a bike is just two unicycles put together with a frame between them, making it easy to see how the model of the unicycle can be developed into a model of the bicycle. For this model we will look at the equations of motion of both the unicycle and the bicycle. These we will then use to linearize the model for comparison with previous research and to check for certain initial conditions whether the system of equations is stable or not. But instead of solving the linearized equations we will perform a numerical analysis of the non linear equations of motion to see how different parameters of the bike change the stability of the bike.

**Angles and representation of bike**

Ege

**Physics, Lagrangian, kinetic, rotational and potential energy**

**Videos and outro**

In the next part of the project we are going to linearize the system of equations we obtained to compare it to the linear systems used in previous research. Meanwhile we will numerically solve the equations for the unicycle and tinker with the parameters of the bike a bit to see which designs make the bike more stable. The result of for the unicycle will then be used to obtain the description of a regular bicycle. To visualize the numerical results we have made a program to show the path of the bike, \*show video\* this video in particular is of a drunk person trying to ride a unicycle and failing miserably at it. The ultimate goal of the model for the bike would be to find out which design features lead to a more stable bike. Once we know those, we might be able to not only prevent the unicycle from spinning out of control and crashing but also make e-bikes a little bit safer.