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Do you experience more G-Force in the front or the back of the roller coaster?

As many children often love the joys and the fears of roller coasters growing up they never sit and wonder much about the science behind roller coasters. For us on the other hand we have always wondered where one experiences more G's, in the back or the front of the roller coaster. Do you ever feel the weightlessness in the loop on California Screamin' and then the unbearable weight you feel? In our paper, we will guide you throughout our journey of uncovering the mystery that our curious minds have always wondered.

All good experiments need resources and material. The biggest part of our experiment would have had to been the MetaWear Bluetooth Accelerometer. The MetaWear Bluetooth Accelerometer features "fully integrated hardware, software, APIs, and mobile Apps, makes it possible to effectively empower your devices with intelligence, scalability and flexibility." (MbientLab). The accelerometer is fully functional motion sensor the tracks the movement of a person using milli-G's, a form of G-force. The accelerometer shows the G-force based on the x, y, and z variables or forward, side-to-side, and up and down. It shows us the negative amount of G's and the positive amount of G's the car including the Human being will experience on a roller coaster of this size.

During the midst of this project issues came up with the amount of G's. The program and the accelerometer were not communicating correctly and could not pull the G amount from the milli-G's. We were able to determine this was because of a user error and we were unfamiliar

with the conversion type of milli-G's to G's. After discussions with the physics teacher, Ms. A. Simpson, and the use of simple internet googling the answer was found. From here we plugged in the conversion type where we divided the G amount by 1000 to get the milli-G conversion to G's. This issue was due to the correct conversion to the Accelerometer during live testing but we forgot to incorporate the change on the data log that appeared after the test was completed.

The roller coasters or the hot wheels track could have not been measured without the use of the Objective-C code and MetaWear Application Programming Interface ("API"). "An API is a software-to-software interface, not a user interface." (Roos). The API constructed by MbientLab allows us to seamlessly build our Application using a already prebuilt NSObject. "A NSObject is the root class of most Objective-C class hierarchies. Through NSObject, objects inherit a basic interface to the runtime system and the ability to behave as Objective-C objects." (Apple, Inc.). This custom NSObject Class Reference file already has preferences and a piece of code attached to it that helps assist my code to make the job a lot easier.

The code constructed communicated with the API and the custom NSObject types which thens communicate with the custom software created for the MbientLab MetaWear Bluetooth Accelerometer. From here the code goes on to give the option to start recording the device on the top of the hot wheels car. Once the user, in this case us, tells the phone to begin recording the data the device started to receive data from the accelerometer. From here you will see on the screen many numbers change on the App when the hot wheels car goes down the track, this is because of the G's the car begins to endure while it's on its endeavor. Once the car comes to a full and complete stop the "Stop Recording" button is pushed the app complies all the data entries and sorts it into a simple text document. From here the document opens a E-mail for you

to email to yourself or someone else to go through the data yourself. After the email is sent the Bluetooth Accelerometer light will blink and indicate a reset between the program and the device. When you see the green light, you know your good to go!

Throughout this project we had the goal in mind to prove our hypothesis, ‘we believe you do experience more g’s in the back of the roller coaster than the front of the roller coaster’. We went on to prove that yes in fact you do experience more G’s moving forward in the back than you would anywhere else on the coaster. However, with our discovery we found that you experience more negative G’s in the front, the feel of weightlessness. This was a weird site to see. Throughout the roller coaster a person will experience both positive and negative G’s.

However, the basis for our project was the Lord. He is the one who has empowered us through everything to complete this experiment. He gave us the skills and the talents to work on the project. In honor of the Lord we dedicate this project to Him. A verse we have incorporated from the Common English Bible would be Acts 17:28a *“In God we live, move, and exist.”* (BibleGateway). Through the Lord he has given us the strength to live, breath, and move. Movement is a key essential in life and without it we would be behind in our scientific understand. Movement involves G’s and with these G’s we need to be careful to how people are exposed to the fast and rapid movement of a vehicle or when going into space. Through God he expands our knowledge base of the universe and through him we can accomplish anything.

Works Cited

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