



# CALIFORNIA STATE SCIENCE FAIR 2014 PROJECT SUMMARY

<b>Name(s)</b> <b>Kevin G. Makens</b>	<b>Project Number</b> <b>S1209</b>
<b>Project Title</b> <b>Can the Human Eye See above 60 FPS?</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> My objective in this experiment is to see if the high frame rate monitors of today are really worth it to gamers and if people can tell the difference. The main point of this experiment was to end the debate occurring on the internet, that you can not see above 60 Frames Per Second (FPS).</p> <p><b>Methods/Materials</b> To run this experiment I used an ASUS VG248QE monitor that is capable of 144 hz (1 hz = 1 FPS) output. There were two experiments for this project, the first was testing if they could see a single frame, and the second was testing if they could tell using motion. I used two different pieces of software for the different experiments. For the 1st, I finally used high speed video rendering software to flash the image on the screen after attempting to get Java, C++, or game engines to work with 100% reliability, which they did not. The idea behind this experiment is that you flash an image for one refresh of the monitor at the various speeds and ask the participant if they could see the image and what it was. I then used a set criteria to identify if they were right or wrong. The second experiment I had each participant play 15 second of Battlefield 4 and ask which speed they thought it was running at after letting them see a control to give them an idea of a low speed.</p> <p><b>Results</b> The results of the experiments showed that there was a slight difference in subjects ability to perceive, and in fact people could tell the difference between the higher and lower framerates. The two ANOVA tests that were run against the data in these experiments also support that there was a slight difference in the subjects ability to perceive. The implication is that the monitors may be worth it based on speed alone, but only with a very small increase in noticeable smoothness. The data also showed that it is in fact possible to see above 60 FPS.</p> <p><b>Conclusions/Discussion</b> Overall this experiment supported the theory that there is a difference. The experiment provided evidence toward the objectives. The experiment showed that the image can be smoother with higher FPS, as well as providing evidence that the faster monitors are smoother. This experiment provided me insight about framerates, game technology, and that things like garbage collection can impact the reliability of an experiment. This experiment also required me to be creative in problem solving with my programming, even though the initial code did not work out in the end.</p>	
<b>Summary Statement</b> This project is done to see if people can perceive the difference between high speed 120+ hz and normal 60 hz monitors.	
<b>Help Received</b> Father gave feedback on abstract wording; Teacher graded original lab report and poster and provided feedback;	