



CALIFORNIA STATE SCIENCE FAIR 2016 PROJECT SUMMARY

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| Name(s) Daniel W. Yao | Project Number 36818 |
| Project Title The Magical Stabilizer | |
| Objectives/Goals The project's primary objective is to find what threshold values at which the Schmitt trigger, a decision-making circuit, which turns on at a high threshold and stays locked on until it falls to a lower low threshold, would function the best, or turn off or on according only to the operator's control, regardless of noise or deviations from the form of the desired signal. Abstract Methods/Materials The data collection involved feeding a noisy signal from a signal generator or the hand-built alternator, which uses magnets, PVC piping, 30 AWG copper wire, and other construction material, and is amplified if necessary into the Schmitt trigger. I used the potentiometers attached to the voltage source and the transistors collectors to modify the threshold values. The rest of the materials includes typical electronics hobbyists' supplies, such as resistors, jumper wire, a breadboard, an ammeter, and an 1.8V LED. Results The experiments revealed that the highest reliable low threshold value would be the lowest voltage the input voltage reaches. The high threshold would be about the middle point of the voltage range for the input when turned on. Conclusions/Discussion As previously stated, the high threshold would be around the middle of the range of which the input voltage reaches, and the low threshold would be preferably be a little lower than the lowest voltage the "ON" state would reach. The results of my experiments provide far more specific guidelines of which the threshold values should pertain to, in other words, increasing the reliability of a mechanism designed to increase reliability. Hobbyists and engineers alike can rely on these results to find appropriate component vales for designing integrated circuits and other more commonly used versions of the circuit specifically designed towards the context of the situation, finally utilizing the true value of the Schmitt trigger's ability for customization. | |
| Summary Statement Through repeated testing of various threshold values, my results revealed that the best positioning of the thresholds depend on the "ON" voltage's range and its lowest "ON" voltage. | |
| Help Received Dr. Jeffrey Cheung, Dr. Derek Cheung, and Dr. Jian Xu all acted as advisors and assisted me with some technical issues along the way. Dr. Reuben Bushnell was my instructor for a time, providing me nearly all of my knowledge in electromagnetism. I myself constructed all of the hardware, the poster, and the data. | |