



**CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY**

Name(s) Chloe C. Kuo	Project Number 35604
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Project Title An Improved Wheelchair for Playing Wheelchair Tennis

<p>Objectives/Goals</p> <p>The purpose of my project is to see if wheelchairs for playing wheelchair tennis can be further improved upon. I intend to design and test a model system that utilizes a hands-free electronic interface that can lock and unlock an axle, thus enabling at times one-handed drive or two-handed drive to occur. If successful, I hope on a larger context that my results will cause two things to occur:</p> <ul style="list-style-type: none"> - stimulate further discussion and engineering research on additional innovations for wheelchairs used in wheelchair tennis and other sports played by disabled athletes, and - explore further safety and performance mechanisms that can be engineered into manual wheelchairs utilized by the broader population of disabled people. <p>Abstract</p> <p>Methods/Materials</p> <p>Metal Pipes, Beams, and Disks, Arduino Uno Microcontroller, Servomotor, Electronic Components, Voice Recognition Module, Universal Joints, Couplers</p> <p>I broke down the creation of my model wheelchair test system into four different phases:</p> <ol style="list-style-type: none"> 1) Integration of an Arduino microcontroller to a small electronic components 2) Integration of voice recognition in the Arduino interface to operate the axle coupling mechanism 3) Construction of a scale model test wheelchair 4) Integration of the electronic interface and mechanical framework <p>Results</p> <p>After constructing 3 prototype wheelchair models, I successfully created a model wheelchair, which I performed tests on. Following a flowchart I created, I tested my project in 4 different experiments that were designed to represent all possible situations that could be encountered. My wheelchair returned expected results for each test.</p> <p>Conclusions/Discussion</p> <ul style="list-style-type: none"> - I was able to design, build, and test a user controlled, hands-free, one-handed drive system in a model wheelchair so my hypothesis is correct. - I believe that the innovations I have developed can be applied to conventional wheelchairs for disabled people. - For future experiments, I would like to build a real tennis wheelchair and test it by playing competitive wheelchair tennis. I would also like to optimize the one-handed driving system by including braking and motorization. - A one-handed drive system that can be selectively engaged and disengaged should be seriously considered as an improvement for future wheelchairs.

<p>Summary Statement</p> <p>My project sought to test the feasibility of designing and building an improved wheelchair for playing wheelchair tennis.</p>

<p>Help Received</p> <p>Machinist cut out parts I designed for my wheelchair.</p>
