The Ride-On Remote-Controller Car

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Figure 1. The Ride-On Remote-Controlled Car

INTRODUCTION
The ride-on remote-controlled car (RRC) was constructed to give a child with limited or no mobility the freedom movement without another human directly propagating their movements. The client the RRC was constructed for was a three year old girl who was diagnosed with Rett Syndrome. Rett Syndrome affects the development of the nervous system. Symptoms usually consist of developmental reversal around six months of age resulting in poor motor skills and language expression issues. The client was unable to walk, crawl, speak, or feed herself. The client’s family requested our assistance in providing a means for her to enjoy the outdoors. She lacks the motor skills to explore and enjoy the outdoors on her own.

SUMMARY OF IMPACT
To give the client a sense of mobility and freedom, the ride-on remote-controlled car was constructed. The vehicle would not be controlled by the client but would allow her to be mobile without someone immediately next to her propagating and sustaining her movements, a freedom she was not able to enjoy until the RRC. With the client strapped into the RRC, her parent or guardian can drive the vehicle using a standard RC radio controller. Children with an immobilizing disability don’t experience any independence from their care givers. The RRC provides a means of transportation into the nature and the surrounding environment giving the client a new sense of freedom.

TECHNICAL DESCRIPTION
To construct a ride-on remote-controlled car, a Fisher Price® brand Power Wheels® was acquired and modified to be remote control, more rugged and safer. Structurally, the Power Wheels® remained unaltered. The battery, battery connector plug and electric motors were left unaltered. The manual switch transmission and all associated wires were removed. The remote control (RC) system was purchased separately and installed into the Power Wheels®.
The RC system has several key components: a radio transmitter and receiver, battery elimination circuit, an electronic speed controller, and a steering servo.

The radio transmitter broadcasts the desired movements of the RRC via two channel communications, one for forward or reverse and one for steering left or right. The transmitter uses multiple pulse width modulation (PWM) signals to communicate with the radio receiver. The radio receiver deciphers the transmitter’s communications and divides the signals for each channel into separate channels outputting a standard RC signal. A standard RC signal uses pulse width modulation for communication. Typically, signal duration is 10ms. A pulse of 1ms indicates low, 1.5ms neutral and 2ms high.

The battery elimination circuit functions as a power supply for the radio receiver, eliminating the need for a separate battery for the receiver. The battery elimination circuit also functions to provide sufficient current to the steering servo motor. Using a battery elimination circuit built into a speed controller may not provide sufficient current for the steering servo to achieve the maximum amount of torque possible.

The electronic speed controller receives the PWM signal and translates it from low, neutral, high to reverse, stopped, forward. The electronic speed controller feeds the proportional amount of voltage from the Power Wheels® battery to the electric motors, establishing the drive system for the RRC.

The steering servo receives the PWM signal and translates it from low, neutral, high to -45° rotation (left), 0° rotation (center), 45° rotation (right). The steering servo is an electric motor with a potentiometer to measure the degree of rotation of the motor shaft. The servo receives the RC PWM and moves the servo to the appropriate degree of rotation using the potentiometer’s position feedback and returns to center when the signal received is neutral. The servo acquired was a 5:1 gear ratio high torque servo. The motor shaft had a servo horn mounted on it. The servo horn was attached to the existing rack and pinion steering system. The servo replaced the function of the pinion, pulling the rack from side to side.

The approximate cost of all parts including the Power Wheels® was $575.