Alternate Design 1

Team 5- Go-Kart
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Go-Kart for Joey Toce
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This design for the chassis utilizes a single roll bar rather than a roll cage. This bar is wider and taller than the seated client offering full protection in the case of a tip or roll. Supports for this roll bar come from both the front and back enforcing strength and increasing safety. The battery, motor and accompanying mechanical and electrical equipment will be set behind the seat providing torque to the rear axle only. The seat will be permanently fitted to the chassis on a single-axis steel rail sliding track with a locking mechanism. The front of the chassis will be reserved for electrical components to turn the front wheels appropriately.

The design of the seat will be based on that of the client’s current wheelchair, but with several unique features to optimize safety and comfort. The client’s current wheelchair seat is padded to provide comfort, with a headrest and adjustable trunk supports. The seat also includes a padded groin support, foot rests, as well as leg straps to keep the client seated properly while preventing slipping out. These are the features which will be replicated in the go-kart seat with the following additions and slight alterations. The seat itself will be a bucket-style rather than flat bottom in the wheelchair to keep the client better contained. It will be slightly tilted back to not only ease the task of keeping the knees bent at 90°, but also maintaining a lower center of gravity while doing so. As stated, the seat will be permanently attached to the chassis on single axis
steel rail sliding track with adjustable locking mechanism. This will allow for the seat to be quickly adjusted to ease entrance and exit from the kart.

The drive train for the go kart includes all of the necessary components that take the signals from the microcontroller and convert them into a mechanical output. This includes the speed controller, motor, and gearing as well as the braking system. The go kart will get power from the batteries and will be regulated by the speed control via Pulse Width Modulation (PWM). The speed controller proposed to be used in this system can deliver a current range from 100-300A which is more than enough to power the motor. The speed controller comes with on board potentiometers which can give a threshold limit to the amount of power that can be delivered to the battery. It also contains an adjustable torque limiter which can help avoid current overload to the motor.

The braking system will also use a motor controller but does not have to be as robust as the one used in the drive train. The braking system will use this motor controller to control an alternate motor that controls the compression of the brake calipers. The calipers will compress onto a rotary brake disc that is mounted on the axle which will ultimately bring the go kart to a stop.

The steering system is designed to be extremely responsive and since the client does not possess the motor control to be able to turn a steering wheel, alternate methods will be introduced in order to make the wheels move. The steering mechanism will be powered by a commercial gear motor. The gear motor provides the system will plenty of torque in order to execute turns quickly and efficiently. The gear motor will be connected to a rack and pinion system through a gear reduction to improve performance of handling. The rack and pinion system proposed in this design is an 11 inch rack and pinion with a 5/8 inch 36 spline input shaft that is sold commercially for the use in recreational go karts. Tie rods will connect the rack and pinion system to the front wheel brackets and help control the steering of the go kart.

The remote control will use two dual axis thumb joystick remote controls. One of the joysticks will be used for steering. The second joystick will be used for the forward motion and the braking. When the joystick is pushed forward, the go kart will accelerate; when the joystick is pushed back the brakes will be engaged and the go kart will stop. The remote control will also have a kill switch which will override all of the other
systems. If the kill switch is engaged the go kart will be shut down. The remote control will use radio frequency so that there does not have to be a direct line of sight for the radio to work. This will also allow a greater range for the remote control.

The dashboard controls will consist of three pushbuttons. The center button will be for forward motion, the left and right buttons will control left and right, respectively. Each button will deliver power to go kart, so that only one button needs to be pressed at a time. The buttons must be continuously depressed in order for operation. When the button is released, power will stop being delivered to the go kart. When the left and right buttons are pressed, less power will be delivered to the go kart. This will allow for slow turns to ensure the kart does not flip. The dashboard controls will also say what direction the go kart is going when they are pressed. If the forward button is pressed, the client will hear “Forward”. The same will happen with left and right. This will help the client learn his directions.

The software will be controlled using a Microchip PIC microcontroller. The microcontroller will be controlled by embedded C code. The software will be in charge of taking the input signals from the remote control, or the dashboard buttons, and converting those signals into mechanical output through the electrical interface. The software must also account for control loops to continuously relay signals throughout the system.

There will be two main loops, the primary control loop will control normal function of the go kart and the emergency control loop will shut the go kart down safely when the kill switch is activated. The main loops will also consist of secondary loops which will control more specific functions.