Alternate Design I

The portable, power wheelchair will essentially be an alteration of a manual wheelchair frame. This design will use two large wheels in the back and two smaller wheels on the front. The frame will have an extension attached to the front wheels to make sure that the back and front are well balanced, see figure 1. The motors and transmission will be attached to the rear axles and a control box will be attached or hung underneath the seat. If the control box is attached to the bottom of the seat it will have to be either one box or two depending on the dimensions. The control box will have the main electrical components: microprocessor, PWM, battery, motor, and speed controller. Due to the portability required, in this design the two sides of the wheelchair will come together just like in a normal manual wheelchair. When the wheelchair is folded up the middle of the seat will be unlatch and fold upward toward the armrests. The back of the seat will have to be removed to allow the folding mechanic to work. If the control box is hung underneath the seat it will then rotate up between the seats. If the control box is attached to the bottom of the seat then when the chair is folded it will come up with the seats, see figure 3. If the control box is too large, two boxes will be used and attached to both sides of the seat. It will fold up with the same mechanics as shown in figure 3.

**Figure 1.** Side view design one.  
**Figure 2.** Frontal view of design one.
The frame and back will consist of an X structure that will be constructed as shown in figure 5, and 6. Four pivot points will be placed at each corner and a pivot point will be placed in the center to allow the steel bars to rotate appropriately.
Alternate Design II

The second design will also modify an existing manual wheelchair frame. Four wheels of the same size will be used to keep the height of the chair from the ground. The extension used for design one will be removed since all of the wheel are the same height. There will be a box underneath the chair that will contain the microprocessor, batteries, speed controller and motor. The control box will take up the entire space between the frame and the seat. The back of the seat will fold forward on top of the box. As the seat comes down the arm rest that are displaced to the side will rotate down and pull back (slide back) to allow them to be parallel and at the same level as the back of the seat, see figure 8. The arm rests will consist of two sliding hinges and one stationary hinge, see figure 1. The arm rests will be displaced to the side of the seat to avoid damage to the joystick. A cover will be made to ensure the safety of the joystick during transporting. It will have a handle attached to the back of the control box so that it can be lifted easily. It will be like a carrying case.
Figure 8. Folded side view.

The frame and back side of this design will be similar, they will consist of an X structure without moveable parts, see figures 9 and 10.

Figure 10. Back view.

Figure 11. Top view of frame.

Alternate Design III

As with the previous designs, an existing manual wheelchair will be modified for this design. There will be two medium sized wheels in the back and smaller wheels in the front. An extension will be need for the front of the wheelchair to make sure that the power chair is level. The control box will be attached to the underside of the seat with contain all of the electrical components. The control box will take up the entire space between the seat and the frame of the chair. The seat will come up with the control box and the front drive wheel, see figure 13. The arms rests will consist of two sliding hinges and one stationary hinge, see figure 11. Except there will be a stationary steel rod that will maintain the distance between the bottom and the back of the seat when folded. The arm rest will side down as the diagonal bar pivot up. The chair will be able to be transported on its back wheels. This design will also require an enclosure/cover to ensure the safety of the joystick.

Figure 11. Side view of third design.

Figure 12. Front view.
Figure 13. Folded side view

The frame and back of the chair will consist of an X structure as shown in figures 14 and 15.

Figure 14. Top view of frame.  

Figure 15. Back view of design 3.