INTRODUCTION
The All-Terrain Traveling Base was designed to provide a scheme for wheelchairs to travel on various terrains, including sand surface, hard surface, grass, incline surface, bumpy terrain and stairs. The motivation of the project was to design a capable base for wheelchairs, which can climb stairs and travel on different types of surfaces independently, because very few current products are applicable. A combination of belt and wheel system was chosen as our solution. Under wireless control, the traveling base can move forward and backward, adjust the seating level, turn left and right, and overcome different terrains.

SUMMARY OF IMPACT
The designed traveling base provides an effective and economic solution for electrical wheelchairs to climb stairs and overcome rough terrains. It will offer many wheelchair users more independence and freedom. For instance, in New York City, many subway or train stations do not have elevators. By replacing the regular wheelchair base with the All-Terrain Traveling Base, wheelchair users would never worry about the availability of elevators or travel a long distance for a handicap path. They can use the shortest path to arrive at the platform, just as other people. Moreover, we notice that the proposed technique can also be applied to a broader range of vehicles, e.g. all-terrain mobile robots.

TECHNICAL DESCRIPTION
The designed traveling base consists of four major subsystems: driving, transmission and motion delivery, body connection and control system. The overall shape of the base resembles a spider with all the electrical components contained inside its body. The prototype base is controlled through a four-channel remote controller.
The base can transform into different poses by adjusting the active length of the linear actuators. In the driving position, linear actuators are fully extended, and the base reaches its highest level. Gear motor delivers force through the sprockets and shafts to the body wheels. By rotating the belt, the force is delivered to the driving wheels which directly contact with ground, and the whole base is travelling. In the case of climbing stairs, the linear actuators shrink until the belt holder is parallel to the ground. In this way, the contact surface between the belt and the ground is large enough to drive the base upward or downward by the friction force.

Due to the constraints in manufacturing and cost, a scale-down prototype was fabricated. The body material used 6061-Aluminum, the actuator holder was made of 4130-Steel sheet, the wheels were made of plastic, and the belt was made of rubber. As a result, the allowed external load to the prototype is about 60 pounds in the normal driving position. A full-scale base would be able to support a payload of 250 pounds.

The cost of the parts and supplies for this project was $1250.

Figure 16. Design of All-Terrain Traveling Base