



**CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY**

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Project Title Automated Cargo Transport: Microcontrollers Utilizing an Environment Detection System and RF Signals to Follow a User	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this project is to create an automated shopping cart that can autonomously follow a disabled person as they move through a store, eliminating the need for physical exertion.</p> <p>Methods/Materials The shopping cart has to be able to know the location of the user relative to a set point, and have the ability to move to the point while avoiding any obstacles that might be present in its path. To accomplish this, we created an environment detection system that uses a microcontroller to process inputs from infrared, compass, and RF sensors. The microcontroller, a Boe-Bot from Parallax, uses the inputs from the EDS to calculate a vector between the cart and the user, and modify this vector based on real-time sensor input.</p> <p>Results Through testing, we were able to create algorithms that allow the robot to calculate vectors between itself and outside objects. The Boe-Bot was able to successfully follow a user in a lab environment. One major problem we encountered was that the sensors encountered a certain percentage of error that we could not remove. The programming language we used, BASIC, often couldn't handle the numbers to the accuracy that we needed. This became problematic because we were unable to increase our accuracy without further complicating our methodology.</p> <p>Conclusions/Discussion The algorithms found through our testing process are sound and usable in the real world. However, if this product is to be used on a larger scale, more robust sensors are required. The error that the sensors were encountering was accumulated error, meaning that the microcontroller's error gradually increases over time until it completely loses track of the user. However, the algorithms themselves worked and can be implemented in a variety of different areas of work, including construction and medical environments, to help workers move materials/people from place to place without unnecessary physical exertion.</p>	
Summary Statement An automated vehicle that can follow a user and maneuver around obstacles using an environment detection system.	
Help Received Received materials from Mr. Kawanami, our project advisor	