MyRobot™

Education ♦ Innovation ♦ Entrepreneurship

Business Plan

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I. Executive Summary

MyRobot was originally formed to answer the call of hobbyists who want to get into robotics as a hobby, but are frustrated by the huge barriers to entry which are chiefly composed of high cost and high technological knowledge. We are a manufacturer of personal robotics products that target two main consumer niche markets: hobby robotics and robotics in education. Long term, we hope to become the industry leader in consumer robotic products.

Our initial product line is composed of three items: 1) the **Mini-PC** microcomputer, 2) the **MDRV** motor driver, and 3) the **WMS** odometer/speed controller/wheel encoder. All of the products are currently in high demand with very little competition. Our products are of better quality, higher performance, and lower cost than anything on the market. Eventually however, MyRobot's goal is to move away from manufacturing and into a purely information coordinating and trading role.

Who: Chris Troutner - Owner

What: MyRobot – Company

Why: MyRobot was formed to make a profit by improving communication, organization, and information sharing between hobby roboticists and educators, and to monitor and profit from new advances in the robotics marketplace.

How Much: Minimum start-up cost (~$10K to $50K)

Pros: Great market potential, great products, proven business model

Cons: Inexperienced management. CEO needed

MyRobot is currently seeking funding capital and business experience from outside investors. We believe that our choice of niche market, creation of superior products, and use of a proven business model give us a significant advantage over the small amount of competition that exists. However, we recognize that theory and ambition are no substitute for experience. We are seeking investors who have experience working with start-ups and bringing new businesses to market.

Definitions

Throughout this document, three terms, 'hobbyists', 'educators', and 'robotic platform', are used frequently. Hobbyist refers to those people who are interested in having a personal robot – either to play with as a toy, battle competitively, or experiment with as a hobby. Educator refers to junior high, high school, college, and university teachers. A robotic platform is a ready-to-go robot with an integrated mechanical and electrical system. The user only needs to know the basics of programming in order to control and interact with it.

A Word on Programming Languages

There are also several references in this document to programming languages. All computers and microcontrollers (single chip computers) speak the language of binary. Binary is composed of 1's and 0's, which is extremely hard for a human to read. To solve this, several different programming languages have been invented which lets a person write programs in a more human readable language. This is then 'compiled' into binary.

The next step up from binary is assembly. This is the most efficient language, but also most difficult to program. There are also several 'high-level' languages, the most popular of which are BASIC and C. These two languages have been around for decades and are considered the industry standards. C is the most popular and efficient, and is used almost exclusively in industry. However, BASIC is more like the English language, and thus easier to understand and usually learned first by hobbyists.

II. MyRobot: Overview and History

Mission Statement

MyRobot was formed to make a profit by improving communication, organization, and information sharing between hobby roboticists and educators, and to monitor and profit from new advances in the robotics marketplace. Research has shown that those three elements are the root of most frustrations experienced by our consumers. We propose to accomplish our goals through the manufacture and sale of affordable and superior robotic products, through the leveraging of the Value-Chain business model to empower our consumers and distribute our products, and finally by participating in the community of roboticists and helping it to grow.

What Makes Us Really Different: Our Slogan

The reason our slogan is "Education, Innovation, Entrepreneurship" is because first we educate our consumer. When they buy our robot kit, they should know how to program and interact with it in two hours. We take them by the hand and introduce them step-by-step to robotics, electronics, mechanics, and programming in a fun way; our goal is to make learning robotics as fun as playing a video game. As soon as is possible, this process will take place through an interactive video, shipped with each product via CD.

Second, we encourage our consumer to be innovative and try out new ideas with their robots. Via the web site they can read articles, download guides, and share information with other consumers on cool things they can do with their robot.

Entrepreneurship is the third and last step. It means after we educate the consumer, then encourage their innovative spirit, we inspire them to become a partner with us by creating something new to add to the web site. If they create a unique bit of code, hardware, or software modification, they are invited to write up a how-to guide that we can post on our web site and charge $2-$10 for. We will then pay the author 65% of the net profits of every sale of their article, or, as capital permits, we will buy the article outright for $100 to $500. Of course, there are several requirements to ensure that they are creating something of real value for our other consumers, but the idea is that it will allow our consumers to give something back - and get something very real in return. We are the only company in the market that will employ this business strategy. This concept is explained further is section *III. – The Value-Chain Business Model*.

The Logic Behind The Mission

The cornerstone of MyRobot is the vision that robots are the next logical, evolutionary step up from personal computers. The robots of the not-so-distant future will be 'smart' computers with the ability to interact with the physical world around them. As society slowly, but surely, transition from passive computers to interactive and autonomous ones, many opportunities will be presented. By

closely following our mission statement, we will position ourselves as leaders in both existing and future markets. Taking a lesson from the history of the early PC market, we feel that hobbyists will be the first group to embrace household robotics use, and have thus decided to start there.

III. The Value-Chain Business Model

Overview

MyRobot proposes to follow the successful Value-Chain business model. Some companies who use this model are Levi Straus, Dell, and Cisco Systems. Cisco in particular defined this business model when they used it to achieve sales over $30 million per day, a market valuation of $360 billion, and over $689,000 in revenue per employee in 1998.

Value Chains design, produce, and deliver products or services to meet a specific set of customer needs. They first identify and define needs, then design and build solutions. They deliver the goods to points of distribution or directly to end-customers, and often provide documentation, service, and support. Value is added each step of the way, from the extraction of raw materials through to customer fulfillment. What makes the Value-Chain business model unique is that it allows third parties to create the content, so that it can focus exclusively on the directing activities and other core aspects of the business.

Case Studies

This section will focus on Cisco and how they deployed the value chain business model so successfully. The history of Cisco can best be summarized by this excerpt from *Digital Capital*

> **Cisco's leadership model crystallized in response to a crisis. When its simple, box-oriented router business encountered new competition during the early 1990s, the company *augmented its value proposition* to include leading-edge, comprehensive network solutions. When Cisco realized it wasn't innovating fast enough, it began *forming partnerships* with other technology companies and embarked on an *aggressive acquisitions* campaign. When the opportunity arose to *use the Net as a sales, support, and partnering infrastructure*, Cisco quickly established what became the world's busiest commerce Web site.**
>
> **Source: 'Digital Capital' by Don Tapscott, David Ticoll, Alex Lowy, Harvard Business School Press, ISBN: 1578511933**

But how did they implement their strategy? And why were they so successful? They utilized the leverage of a Value-Chain by answering the following four questions:

- What is the essence of the value proposition that we offer to our end-customers?
- What are the most effective, value-adding contributions that we can make and that also reinforce our leadership position?
- How do we design our b-web as a customer-fulfillment network, in which all participants have the knowledge and the motivation to focus on end-

customers?

- How do we work with suppliers to develop win-win partnerships and improve efficiency and quality?

Cisco/MyRobot Comparison

The following describes how Cisco answered those four questions to achieve success, and how MyRobot will answer those questions to achieve success as well.

What is the essence of the value proposition that we offer to our end-customers? MyRobot proposes to stick closely to it's mission of improving the communication, organization, and information sharing between hobby roboticists and educators. Cisco started out as a manufacturer of routers, but really succeeded when they began to view themselves not as a manufacturer, but as a network. **We will delegate the manufacture and design of our products to third parties so that we can focus on the essence of our value proposition which is a strong educational and information sharing network.**

What are the most effective, value-adding contributions that we can make and that also reinforce our leadership position? Cisco is ultra-aggressive about controlling their core technology, software designs, brand, marketing, configuration services, support, and customer relations. Similarly, MyRobot will focus on customer relations, product endorsement, brand recognition, and product competitiveness in both price and quality.

How do we design our b-web as a customer-fulfillment network, in which all participants have the knowledge and the motivation to focus on end-customers?

> The Cisco Connection Online (CCO) Web site engages customers in creating their own value. It generates customer capital through bulletin boards, network equipment selection and configuration tools, and online ordering, tracking, and service. These customer-support functions are nearly as important as the company's product sales. Cisco estimates that it saves $250 million per year by having customers download software upgrades from the Web, and it saves several times this amount by posting all its support and marketing documents. Before CCO, incorrectly configured orders topped 20 percent and were a major drain on the company's profits. The site also imposes switching costs; as customers engage with CCO, they become reluctant to invest time in a competitor's site—and Cisco's customer capital grows.

Likewise, the MyRobot HQ (Headquarters) website will be just as integral and effective as Cisco's CCO web site. Consumers will be able to read support documentation, discuss problems and tips with each other, download software upgrades for their robot, and trade software. As more people participate in the web site, more value will be created, and they will be less likely to become interested in any competitors in the future. There currently no competitors in the market that offer anything like this. This form of information sharing takes place already, but it is unorganized and scattered throughout the net.

How do we work with suppliers to develop win-win partnerships and improve efficiency and quality? Cisco (like Dell) feeds it's demand information directly to it's manufacturers. In the past, Cisco's partners each built their own unique supply-and-demand forecasts based on previous history. Now, orders flow from Cisco's website and office directly to the manufactures, part-producers, and

distributors as they happen. This minimizes the cost of having a large inventory – a necessary evil in the past. MyRobot has is currently negotiating with several manufactures with a clear goal of achieving the same type of structure.

Value-Chain Model Applied

The company web page will be the focal point where we want all our consumers to visit. The goal is to create an on-line community to give our users incentive to visit frequently. From here, we will create an after-sale profit by offering add-ons, guides, tutorials, kits, schematics, and more for our consumers to build onto their original platforms.

The development of our after-sale products will largely be done by our consumers. The objective is to encourage our users to develop their own modifications and adaptations, and then document them. We will then test it for quality and conform it to our standards, then offer it for sale on our web site, thus acting as a clearinghouse. The result is that the inventor will make a continual passive income from their product, and we will make a commission from each sale for advertising, web space, and services. This method gives us a two-fold benefit -

- It allows us to create new products without any R&D cost, and very little overhead.
- We will not have to hire nearly as many employees, since our consumers are, in effect, our engineering team.

Additionally, this gives our consumers more incentive to buy our products - so they can make money too. We will be providing our consumers with a very real incentive to get into robotics as a vocation rather than just for the enjoyment of it.

Another beneficial byproduct of this development method is that consumers are likely to develop near-identical products for sale. This will encourage lower-prices and higher quality for those who buy them. **Additionally, instead of leaving gaps in the market for competitors to grow, we will be allowing potential competitors to work with us - thereby significantly reducing future competition.**

IV. The Market

Every great product or service exists because it fulfills the needs of those who use it. Every great company knows exactly who those people are and what those needs exist before launching their product. MyRobot's goal is to become a great company.

Who are our customers and why do they need us?

The majority of our consumers fall into two easily identifiable markets: personal robotics and education. Consumers in each market have several frustrations/needs that MyRobot can alleviate. Table 1 lists the major needs/frustrations in order of importance:

Consumer Needs For…

Personal Robotics	Education
1. Complete and Concise information on both Basic Concepts and Specific Applications in robotics 2. Low Cost 3. Easily individualized and modified robotic platforms 4. User Friendly 5. Rugged & Dependable robotic platforms	1. Customizable Teaching Curriculum 2. Higher entertainment value for increased memory retention 3. Decrease in time spent teaching each subject 4. Make boring or intimidating courses fun and easy (not the same as 2) 5. Longevity/Dependableness of product

Table 1 - Consumer Needs*

*For source data, please see Appendix A

MyRobot meets all these needs through our proven Value-Chain business model. It is important to note that our physical robotic products simply act one of the mediums through which the business model gives value to the consumer.

MyRobot conducted a survey among members of on-line mailing lists and newsgroups. From the survey data listed below in Table 2, **our target customer is older than 30, makes over $50K per year, is primarily male, lives anywhere in the world, and is of a technical profession.** However, please note that unlike the consumer needs listed in Table 1, the results in Table 2 only apply to the demographic of people who frequent mailing lists and newsgroups.

Age	Result	Percentage
Not Listed	12	38.71%
17-18	1	3.23%
19-20	1	3.23%
25-20	2	6.45%
30-35+	15	48.39%

Age Results

Annual Income (Thousand of Dollars)	Result	Percentage
Not Listed	18	58.06%
50+	10	32.26%
40-50	1	3.23%
10-20	1	3.23%
5-	1	3.23%

Income Results

Table 2 – Age & Income Survey Results

Market Size

Once needs are identified, it's important to find out how big the market is in order to determine whether or not it would be profitable to cater to its needs. No trade organization exists for the rapidly growing personal robotic market since it has only been around for a few years. Because of this, concrete data on the size of the market is hard to find and market growth is impossible to pin point. Our data below represents only a rough estimate of the existing market and only a tiny portion of the potential market.

Table 2 is a summary of the estimated sales for personal robotics from 2003 to 2006. It came from a report submitted in 2003 to the United Nations. **It is important to note that the projected sales below are in number of robots sold, not dollars. The actual monetary value will be *much* higher. The projected sales of the robotics market from 2003 to 2006 totals around 2.8 billion robots for private use alone.** A copy of the report can be downloaded from http://www.myrobothq.com/UNECE_robo.pdf.

SERVICE ROBOTS FOR PERSONAL AND PRIVATE USE:		
Type of Robot	**2002**	**2003-2006**
Domestic robots	**53,500**	**638,000**
Vacuum cleaning		400,000
Lawn-mowing		125,000
Other		113,000
Entertainment/hobby/leisure time robots	**545,000**	**1,500,000**
Educational robots	**8,300**	**15,320**
Robots in marketing	**20**	**10,100**
Customized robots	**20**	**40**
Total number of units	**606,840**	**2,163,460**
Estimated value in $ millions	**960**	**2,750**

Table 3 - Estimated Sales from 2003 to 2006 (UN Economic Report)*

*For source data, please see Appendix B

In examining the estimate in the UN report (2.8 billion), one comment made in the UNECE report should also be noted:

> It is projected that sales of all types of domestic robots (vacuum cleaning, lawn-mowing, window cleaning and other types) in the period of 2003-2006 can reach some 638,000 units. Although this number excludes the too optimistic forecasts of several millions of units made by some companies, **it might, in the light of sales recorded already in 2003, be far too low.**
>
> The market for **toy and entertainment robots is forecasted to exceed 1.5 million units**, most of which, of course, are very low cost. One company expects sales of several millions of units within the next few years. This estimate has been excluded from the numbers shown…

Other Potential Profiles

During market research, we saw several requests for a robot that parents and children could build together. For youth, we offer a robotic platform they can work on and play with, out of the box, and are not required to know anything about electronics or programming. Meanwhile, we still remain technical enough to keep their educated parents entertained as well.

More and more high schools are starting to teach electronics courses to their students. Even elementary and middle schools are looking to robotics to teach their kids new concepts. Just like with the previous consumer group, our product allows anyone over the age of 12 a solid a platform on which to learn electronics, programming, mechanics, and physics - without having to know any previous technical knowledge.

Another market to be considered is the toy market. Children, excited by shows such as Battle Bots, are telling their parents they want a robot to play with. Many parents will view our platforms as a toy for their children. The price for our platforms are in the price range for a high-end toy, but the real advantage is giving the children who receive our platform something which they can use and learn from for years.

How Do We Meet the Consumer's Needs?

The Target Consumer

For the general hobbyist, we offer the most powerful robotics products on the market for the price range. We saw interest in hobby robotics from the most experienced computer gurus to the most technically clueless - and our products provide for both. It allows those without any technical experience something to play with and learn from, while giving even the most knowledgeable engineer something both entertaining and educational.

From our survey (see Appendix A), we saw that 67.7% said that lack of technical documentation was their greatest frustration. 25.8% said that they had a hard time finding basic information on electronics and mechanics. Another 25.8% said that cost was a primary frustration in robotics. MyRobot directly answers all these complaints. Our business structure allows the creation of technical documents with an exponential growth curve, and by incorporating a rating system similar to Amazon.com and

EBay's, our customers will be able to find the information most valuable to them. By looking at a combination of our survey data, competitors, and market demand, we feel confident that our price level is the best for the market, while still maintaining healthy margins for ourselves.

Our Competitive Advantage

Current robot platforms in the market today fit into one of two categories:

- Cheap and not programmable
- Expensive and having some level of programmability

This means that a typical platform (under $100), is limited by the fact that it is not programmable. More functional and programmable robots on the market are usually over $200, and generally outside the range of what the hobbyist, or other target consumers mentioned, is willing to pay. Programmability is important because it is what allows a robot to 'come alive'. It is what makes the difference between a robot and a toy. By offering a high level of programmability to our products at a low price, we automatically gain an advantage over our competition and raise the bar on the whole market.

How We Differentiate

Here is a list of what we'll do differently than any other robotic company currently in the market:

- More versatile and 'hackable' product than any other in the market
  - (35.5% indicated they wanted this)
- Multiple platforms at different price levels
- Superior consumer service and response (highly lacking in the industry)
- Highly interactive web site (also highly lacking in the industry)
- **Consumers will be able to build and sell their own modifications**
  - (NEW! – This answers the biggest need in the market, indicated by over 45% of those surveyed)

While we feel our robot platforms are superior, what really makes our company different is the level of consumer interaction that it creates. MyRobot may sell robotic platforms, but we are in the business of selling information products and staying on the forefront of new opportunities in the expanding robotics market. We do not sell toys, we sell entertaining, self-educating tools and a supportive community. What we sell, is what our consumer demands, and that is a superior product coupled with superior information.

Where will we reach them?

At Competitions

Throughout the year, several robotic competitions and trade shows are held both locally and nationally. A good portion of initial sales will come from local

trade shows. An effort will be made to attend as many trade shows nationally as possible and as growth allows. Figure 1 below is a short list of some of the annual robotic competitions.

Statistical research and analysis from personal attendance shows a pessimistic average of attendance per competition to be around 1384 people, with a 5% sales rate of those attendees. This was calculated by taking the number of people who attended competitions we surveyed, and dividing it by the number of robots entered into the competition. After subtracting 1/3 of the this number to create a conservative forecast, we then used it to estimate the attendance at comparable competitions who's number of robot entrees we knew.

2.007 MIT's remote-controlled robot competition

6.270 MIT's autonomous robot design competition

AAAI Mobile Robot Competition From the American Association for Artificial Intelligence

Aerial Robotics Competition This is the place for smart helicopters and blimps

All Japan MicroMouse Contest Micromouse maze running in Japan

All Japan Robot Sumo Worlds largest robot competition with 4000 robots entered!

AMD Jerry Sanders Creative Design Contest Autonomous or radio control ball collectors

BattleBots The most dangerous collection of battling robots in the world.

BEAM Their minimalist approach to robotics results in simple robots and fun competitions

BEST Boosting Engineering, Science, and Technology through Robotic Competition

Bot Bash People who like to build robots and then go out and smash them into each other

BotBall Teams of High School students design, build, and program a mobile robot

Canada First Robotic Games Sponsored by businesses to motivate students and expand the pool of "technology literate" graduates

Carnegie Mellon Mobot Races MObile roBOTs

Central Jersey Robo Conflict 12 pound remote controlled devices in competitive and combat-oriented games

CIRC Autonomous Sumo Robot Competition By the Central Illinois Robotics Club

Critter Crunch A robotic combat in which the object is to immobilize your opponent or to push him out of the arena.

DragonCon Robot Battles Immobilize your opponent

EuroBot Annual autonomous robot competition in France

FIRA Robot World Cup International Robot Soccer

Fire Fighting Robot Contest Autonomous robots extinguish fires in a maze

FIRST Corporations sponsor local High Schools across the USA

Intelligent Ground Robotic Competition Annual competition with almost $15,000 in prize money

K'NEX K*bot World Championships Annual International Competition With Strictly K'NEX Parts

Manitoba Robot Games Large Canadian competition

Micro-Rato In Portugal

Micromouse Competition held at UC Davis, CA

Mid US Robotics Club Robot Combat in the Midwest and Rocky Mountain states

Midwest Robot Competition Fighting Robots in the Midwest

NC Robot Street Fight In North Carolina

Northeast Indiana Robot Games Three weight classes of Robot Sumo Mayhem

Northeast Robotics Club Combat robotics in the Northeast

Northwest Antweight Competition Tiny fighting robots

Northwest Robot Sumo Tournament One of the biggest American sumo competitions

OCAD Sumo Robot Challenge Bashing/crashing/smashing robots

RI/SME Student Robotic Engineering Challenge

Robocide Fighting robots in Florida

RoboCup The official home page for the international Robot Soccer competition

RoboFest Autonomous robot contest for K-12 schools

RoboFesta International Robot Games Festival

RoboFlag Autonomous Mobile Robots Playing Capture The Flag

RoboJoust Producers of the The Las Vegas Street Fights

RoboMaxx Robtics fair and exhibition in Oregon

RoboRama Robot competition sponsored by the Dallas Personal Robotics Group

Robot Battles Head-to-head combat with other 'bots

Robot Club & Grill The best meal you've ever had behind bullet-proof glass

Robot Conflict Robotic Battles on the East Coast

Robot Riots Combat robots in Canada

Robot Sumo The annual competition held at the Exploratorium in San Francisco

Robot Wars A UK TV show

Robot Vacuum Cleaner Contest Fastest robot to vacuum 1/2 pound of rice wins

Robothon The annual competition of the Seattle Robotics Society

Robotica Robot mayhem in Portugal

RSSC Robot Competition Robotics Society of Southern California

S.E.R.C. South Eastern Combat Robotics

Singapore Robotic Games Eleven different competitions including legged robot race, wall climbing, and "robot battlefield"

Steel Conflict Robots with attitude

Trinity LEGO Cybernetics Challenge A game of robot Volley Ball between teams of two robots built using Lego Mindstorms

Twin Cities MechWar Mayhem in Minnesota

USA Robot Sumo Japanese champions come to the US! $2000 first prize.

UMAL Upper Midwest Antweight League - Tiny fighting robots

Underwater Robotics Competition If you think that 2D navigation is difficult, try 3D!

Walking Machine Challenge SAE Student competition

Western Canadian Robot Games Canada's premier robotic event includes Robot Sumo, BEAM, and Robot Hockey

Figure 1 – Annual Robotics Competitions

At Clubs

Throughout the nation and world, several hobbyist robotics clubs have been started. Some clubs are only composed of a dozen or so members, while others are composed of several hundred. There are 35 clubs listed below in Figure 2, with an average member size of around 50. This makes approximately 1750 highly potential customers. Robotics clubs represent a demographic that will be the most receptive to our company, products, and mission. They also represent the most influential group in broadcasting our company to the existing market.

-United States-

Alabama, Huntsville - The Mid-South Area Robotics Society

Arizona, Phoenix - Phoenix Area Robot Experimenters

California, Fullerton - Robotics Society of Southern California

California, Berkeley - East Bay Builders Group

California, Sacramento - Sacramento Area Robotics Group

California, San Diego - San Diego Robotics Society

California, San Jose - HomeBrew Robotics Club

California, San Francisco - San Francisco Robotics Society

Connecticut, Hartford - Connecticut Robotics Society

Georgia, Atlanta - Atlanta Hobby Robot Club

Illinois, Chicago - Chicago Area Robotics Group

Illinois, Peoria - Central Illinois Robot Club

Iowa State University - The ISU Robotics Club

Michigan, Travis City - Robot Club of Travis City

Minnesota, St. Paul - Twin Cities Robotics Group

New Hampshire, Nashua - Nashua Robot Builders Club

New Jersey - Laboratory Robotics Interest Group

New Jersey - Central Jersey Robotics Group

New Jersey - Central New Jersey Autonomous Robotics Club

New York, Schenectady - Union College Robot Club

North Carolina, Raleigh - Triangle Amateur Robotics

Oregon, Portland - Portland Area Robotics Society

Oregon, Rogue Valley - Southern Oregon Robotics Society

Pennsylvania, Pittsburgh - Robot-Club & Grill

Texas, Austin - The Robot Group

Texas, Dallas - Dallas Personal Robotics Group

Washington, Seattle - Seattle Robotics Society

-World Wide-

Canada, Toronto - Art & Robotics Group

Canada, Vancouver Island - Vancouver Island Robotics

Canada, Winnipeg - Winnipeg Area Robotics Society

Internet - Yahoo Robotics Club

Finland, Tampere - Finnish Robotics Association

France - EFREI Robotique

Netherlands - HCC Robotica gg

Scotland, University of Edinburgh - Mobil Robots Group

Figure 2 - Robotics Clubs Around the World

At School

High schools, 2-year Colleges, and 4-year Universities represent a large potential market for MyRobot products. As computers eek their way into every aspect of our life, learning how to work with microcontrollers (like the one on the MyRobot Mini-PC) is becoming increasingly more important. Colleges, Universities, and even high-schools all over the world are beginning to emphasize courses in this field, and many of our products, including the Mini-PC board, are perfect educational platforms.

FIRST (For Inspiration and Recognition of Science and Technology) is a national hobby robotics organization for kids from elementary through high school that is taking the nation by storm. There are several FIRST chapters in every state, each sponsored by a local public school. We expect a large part of our customer base will be composed of student and robot enthusiasts involved with FIRST. Read more about FIRST on pg. 23.

Courses in many universities have already adopted products almost identical to the MyRobot Mini-PC to teach microcontroller basics. These universities include Oregon State University, Texas A&M, and many others. Table 4 shows enrollment in 4-year university engineering programs in the US as well as projected growth rates for future enrollment. This data comes from the American Society for Engineering Education (ASEE) report from 2001 and 2003, so current enrollment is actually a bit higher.

US University and 4-year Engineering Programs	Quantity 1999-2000	Quantity 2002-2003	Appx. growth %/yr.
Number of ABET-accredited engineering programs	346		
Total US engineering BS degrees per year	***63,700***	*70,949*	*3.8%*
Electrical/computer eng. BS degrees per year	19,843	25,686	9.8%
Mechanical eng. BS degrees/year	13,082	13,769	1.8%
Total US engineering undergraduate enrollment	***359,018***	*373,957*	*1.4%*
Electrical/computer eng. undergrad. enrollment	115,230	123,685	2.5%
Mechanical eng. undergrad enrollment	67,122	75,650	4.2%

Table 4 – ASEE Enrollment Statistics for 4-year Universities

Source: http://www.asee.org/about/publications/profiles/upload/2003engprofile.pdf

Similar to the table above, Table 5 shows enrollment in 2-year college engineering (technology) programs. *Technology* typically denotes a 2-year engineering program, where *engineering* programs typically denote 4-year university programs.

Current studies show 1132 community colleges in the US. 226 of them award TAC or ABET accredited associates degrees. It is important to note that the enrollment and degree information in the table below is only that reported from 85 of the TAC/ABET accredited schools. **Actual enrollment and awarded**

degrees are *much* higher. The data below is based on the 2002-2003 ASEE report.

U.S. 2-year Community Colleges (source: ASEE, 2003)

US 2-year and community college engineering	Quantity
Total number of community colleges in the US	*1132*
Total number accredited by TAC or ABET	*226*
Number of schools surveyed	*85 (of 226)*

Program	Enrollment	Degrees
Total 2-year electrical technology enrollment	7,940	1,559
Total 2-year computer technology enrollment	2,670	223
Total 2-year mechanical technology enrollment	3,666	627
Total 2-year general technology enrollment	2,843	883
Total engineering technology enrollment (all disciplines) at the 85 surveyed schools	***37,689***	

Table 5 – 2003 Community College Statistics*

*Source: http://www.asee.org/about/publications/profiles/upload/2003%20ET%20Profile.pdf

Table 6 below shows current enrollment of high school students in the United States and the total number of high schools in the US based on the national census taken in 2000 from the US Census Burro. US high schools are the primary focus of FIRST, and thus, represent a significant portion of our potential consumer base.

Total number of US High Schools:	22,800
Total number of US High School Students:	12,500,000

Table 6 - Insert caption here*

*Source: http://www.census.gov/population/socdemo/school/ppl-148/tab09.xls

On the Web!

Hobby robotics is an ideal market for a web-based business due to the geographically scattered customer base and heavy emphasis on information based products. Many clubs and organizations in the market have their roots in the web.

Table 7 are the results of monitoring several internet newsgroups that are targeted towards robotics from December 15th 2003 until to January 15th 2004. Best guess estimates are that the number of members listed represent less than 25% of the actual membership, and the number of newsgroups listed represent less than 15% of all newsgroups targeted at robotics. However, the data clearly shows an existing potential market.

Newsgroup Demographics	
(Active Members from Dec. 15th to Jan. 15th)	
Members	**Group**
410	sci.engr.control
51	sci.engr
2,257	sci.electronics.design
125	sci.robotics.misc
25	sci.realtime
599	comp.arch.embedded
449	comp.ai.vis
13	comp.ai.shells
778	comp.ai.philosophy
154	comp.ai.neural-nets
47	comp.ai.net-lang
13	comp.ai.jair.announce
72	comp.ai.genetic
47	comp.ai.games
52	comp.ai.fuzzy
28	comp.ai.edu
44	comp.ai.alife
20	comp.ai
366	alt.comp.hardware.homebuilt
5,550	**Total**
148,000	**Estimated Existing Total**

Table 7 – Internet Newsgroups

Table 8 represents data collected on internet mailing lists, which are similar to newsgroups. However, these numbers are of the exact membership of each group. The data was supplied by the mailing list administrator. Best estimates are that the number of mailing lists displayed, represent less than 25% of all existing mailing lists in our target area.

Mailing List Demographics	
Members	**Group**
42	The Central Illinois Robotics Club
1453	Laboratory Robotics Interest Group
1373	Seattle Robotics Society
189	Chicago-Area Robotics Group
56	Connecticut Robotics Society
167	Ottawa Robots Enthusiasts
600	Legged Robots Mail list
275	HERO Owners User Group
339	68332 Advanced Bot Builders
267	RoboMinds
1184	Open Source Motor Controllers
1423	OOPIC Users Group
199	Western Canadian Robotics Society
22	RB5X User Group
400	Dallas Personal Robotics Group
92	Open Automation Project
125	Texas First Lego League
10	RoboComp
38	Queen's University Autonomous Robotics Team
8,254	**Total**
33,016	**Estimated Existing Total**

Table 8 – Internet Mailing Lists

Summary

What the demographics above show is that the educational market represents a huge potential for growth. Lego represents the largest player in the market right now, but only because they are the only option for many. Most educational groups, such as FIRST (see pg. 23), have adopted Lego robotics for their ease of use, but Lego is not actively targeting the educational market. While there are one or two other smaller players targeting the educational market, it is estimated that none have been able to capture even 5% of the potential market shown above.

How will we reach them?

FIRST

"FIRST (For Inspiration and Recognition of Science and Technology) is a multinational non-profit organization, that aspires to transform culture, making science, math, engineering, and technology as cool for kids as sports are today.

FIRST was founded in 1989 by Dean Kamen, inventor of the Segway Human Transporter. FIRST operates the FIRST Robotics Competition in which teams of high school students, sponsored and assisted by local companies and volunteers, design, assemble, and test a robot capable of performing a specified task in competition with other teams. FIRST also runs the FIRST LEGO League,

for children 9-14 years old, and FIRST Place, an innovative science and technology center, including a hands-on children's science museum.

FIRST was founded on partnerships with businesses, educational institutions and government. Many Fortune 500 companies provide funding, in-kind donations and volunteers to support the program.

The key to FIRST's success is the work of over 14,000 volunteer mentors, professional engineers, teachers, and other adults working with youth across the country. In addition to the thousands of volunteer team mentors, FIRST competitions and other events were organized and staffed by over 5000 event and committee volunteers. Through these volunteers, FIRST programs engaged over 50,000 youth during the last year. FIRST programs are growing rapidly in the United States and Canada, and demand is accelerating in other countries."

"In 2004 the competition reached more than 20,000 students on over 900 teams in 27 competitions. The teams come from Canada, Brazil, Ecuador, Mexico, Great Britain, and almost every U.S. state. The competitions are high-tech sporting events that show students that the technological fields hold many opportunities and that the basic concepts of science, math, engineering, and invention are exciting and interesting."

**The above is excerpted from FIRST's web site, www.usfirst.org. FIRST's annual report is available at http://www.usfirst.org/about/2003/annualreport2003.pdf.*

MyRobot plans to work extensively with FIRST to provide them top quality products for their teams and build a profitable working relationship. Many FIRST leaders here in Oregon have been approached and they have been very appraising of MyRobot's products and intentions.

Trade show presence

A list of some of the annual robot competitions around the nation are listed on page 17. MyRobot plans on making every effort to attend as many of these competitions as possible in order to 'get the word out' and show industry presence. We also plan on sponsoring teams at many of these competitions in order to gain further recognition. Please see the section *VII. Financial Need and Initial Start-Up* for more details.

It is important to note here that the competitions listed in Figure 1 on page 17 are not the only events MyRobot plans on attending. Many other secondary markets are estimated to prove very responsive to our products such as ham radio conventions, hobby electronics groups and conventions, science fiction conventions, and many others.

Trade Magazine Advertisements

Due to the high cost, magazine advertising will be a more long-term form of advertisement. However, many of the advertising departments for the magazines listed have been extremely helpful and generous with advertisement discounts, especially the ones in our target market.

Table 9 displays circulation and advertising cost information for magazines in our *target* market. Table 10 shows the same for *secondary* magazines near our target market. The low and high cost columns denote the minimum and maximum cost of advertising in each magazine. The low cost is usually a 1/12th page black-and-white advertisement, while the high cost is for a full page 4-color advertisement.

Primary Magazines				
Circulation	**Magazine**	**Low Cost**	**High Cost**	**Source**
15000	**SERVO**	**450**	**1867**	**Rate Card**
60000	**Nuts & Volts**	**625**	**2350**	**Rate Card**
340,000	Invention & Technology	4850	27740	Rate Card
22,802	Robotics World	2765	10645	Rate Card
25,000	Home Automation	900	8100	SRDS 2002
462,802	**Sub-Total**			

Table 9 - Primary Magazines for Advertising

Secondary Magazines				
Circulation	**Magazine**	**Low Cost**	**High Cost**	**Source**
1,054,788	**Discover**	**8510**	**50185**	**SRDS 2002**
1,450,000	**Popular Science**	**24338**	**92264**	**Rate Card**
555,000	**Scientific American**	**8100**	**49500**	**Rate Card**
90,015	**American Scientist**	**1105**	**5345**	**SRDS 2002**
36,732	The Home Shop Machinist	310	1950	SRDS 2002
24,049	Flying Models	78	1138	SRDS 2002
35,000	PC Upgrade	785	4970	SRDS 2002
95,019	Radio Control Car Action	640	4035	SRDS 2002
19,565	Machinist's Workshop	207	1483	SRDS 2002
65,144	Classic Toy Trains	304	3701	SRDS 2002
157,486	Science News	1666	8973	SRDS 2002
12,322	Railmodel Journal	80	980	SRDS 2002
62,447	Railroad Model Craftsman	93	2126	SRDS 2002
28,530	Radio Control Boat Modeler	330	2510	SRDS 2002
177,443	Model Railroader	238	6785	SRDS 2002
72,022	Model Airplane News	250	2635	SRDS 2002
38,500	O Gauge Railroading	122	2154	SRDS 2002
39,588	Garden Railways	139	1620	SRDS 2002
4,028,650	**Sub-Total**			
4,476,000	**Total**			

Table 10 - Secondary Magazines for Advertising

Seminars

Another significant portion of early sales are estimated to come from the hosting of seminars at colleges, universities, selected high schools, and local robotic groups. The purpose of these seminars will be to introduce students and hobbyists to our product line and our entrepreneurial business model.

Advertising for these seminars will be accomplished by posting flyers and contacting officials in the schools and clubs to help spread the word. Average seminar size is estimated to be 82 people, with a sales rate of 10%. This number was calculated by taking the average active membership of IEEE organizations at Universities in Region 6 (which is Oregon, Washington, California, Alaska, Hawaii, Arizona, Utah, and Idaho). This number was decided pessimistic enough since an average attendance per IEEE seminar is usually three to five times greater than active members.

Here is a list of a few local Universities and Colleges where seminars will be held:

Oregon State University	Portland Community College
Portland State University	Mount Hood Community College
University of Washington	Linn-Benton Community College

The following nearby robotics clubs are constantly seeking guest speakers:

Portland Area Robotics Society (PARTS)

Southern Oregon Robotics Society	Sacramento Robotics Group
Seattle Robotics Society	San Diego Robotics Society
San Francisco Robotics Society	HomeBrew Robotics Club
East Bay Builders Group	Vancouver Robot Club

On the Web!

Of course the web site (www.MyRobotHQ.com) will be our primary way of reaching our customers. Weather they hear about us via word of mouth, see us at a competition, attend one of our seminars, or a FIRST mentor recommends our company, one thing we can count on is our consumer to be 'net savvy' and to visit our web site.

Besides simply offering our products for sale, the web site will provide product information, reviews, and competitor product comparisons. Customers will be able to download code examples solicited by both our company and other customers and then download them directly into their Mini-PC and other MyRobot products. They will be able to visit chat rooms, blogs (web logs), and discussion boards to swap ideas and get help on using our products as well as collaborate on projects and form teams to compete with one another.

In short, the website will grab a visitor and keep them there. It will be the end-all-be-all of MyRobot products for MyRobot customers. It is where we will provide not only the content but the context for our consumers.

V. Products

Current Products

MyRobot has developed several products to fit the needs in the marketplace. Each product was designed only after taking a long look at the market and determining what products were in the highest demand, had the greatest profit potential, and could be engineered to fulfill needs not being met by our competitors.

Mini-PC Microcomputer

The MyRobot Mini-PC is everything the name says it is: a small personal computer. This mini-computer however was designed around one of the fastest, most powerful, and affordable 8-bit microcontrollers on the market – the AVR ATMega128 from Atmel. Most of the features this board has to offer to our consumer is summarized below. Please note that many of the features listed below are not offered by any of our competitors. Please see section *V. Competition* for a more detailed comparison of our competitor's products.

The Mini-PC Features

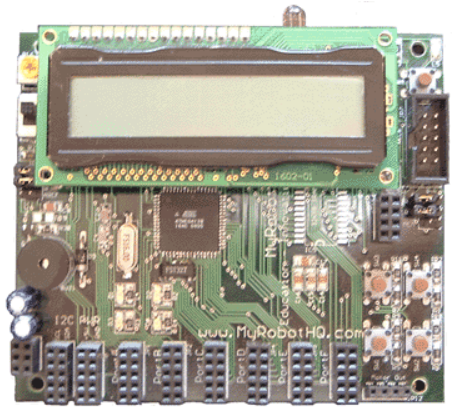


Figure 3 - Mini-PC

Figure 4 - Model-T Prototype with Mini-PC Attached

I. **Asynchronous 32.768 KHz Real Time Clock**
The Real Time Clock (RTC) allows you to track time independent of the main oscillator at a frequency more accurately aligned to the human time base.

II. **4 User Programmable Switches & 4 User Programmable LEDs**
The software controlled LEDs provide quick and easy user feedback. The momentary switches are coupled to interrupts and provide easy control of code stepping for software debugging, painless implementation of a menu system, or just simple feedback.

III. **Software Controlled Piezo Buzzer.**
This buzzer is coupled to a PWM output for easy generation of tones in every frequency within the human hearing range. Have your robot play a little song!

IV. **IR Transmitter & Receiver**
The built in IR Transceiver allows wireless reprogramming, two robots to talk to one another, or use the provided example code to remotely control your robot via any universal TV remote control!

V. **An Atmel ATMEGA128 microcontroller which includes:**
- 16Mhz @ 16 MIPS throughput (this thing is FAST!)
- 6 X 8-bit I/O Ports = 48 Separately Programmable I/O Lines
- 128K Bytes Reprogrammable FLASH Program Memory
- 4K Bytes Internal EEPROM
- 4K Bytes Internal SRAM
- Two 8-bit timer/counters & Two 16-bit timer/counters
- 6 PWM Channels with Resolution from 2 to 16 bits
- Eight 10-bit Analog to Digital Converter Channels
- + Much More!

VI. **In-Circuit Serial Programmable (ISP) - No extra programming hardware required!**
Simply use the included cable to connect the Brain Board to your computers parallel port to quickly and easily reprogram it. No extra hardware required, no high-voltage required, and no time consuming plugging and unplugging of chips.

VII. **Free Open-Source Development Software in C, Basic, Assembly + Many More.**
The installation CD includes a copy of the free open-source GNU WinAVR and GCC-AVR compilers for both Windows and Linux.

VIII. **16-Character by 2-Line LCD Display**
Large display with easy to use function calls in software which allows debugging and programmer feedback.

IX. **32K Bytes Extra External SRAM (Memory)**
Lots of extra space for memory intensive programs such as a Real Time Operating System (RTOS) or Data Acquisition.

X. **5 X 5-Volt Regulated Output for Additional External Circuitry**
The regulated output allows you to power your own external circuitry, sensors, or add-on modules without the hassle and cost of separate voltage regulation.

XI. **5 X I2C (TWI) Ports**
I2C is a protocol developed by Philips Semiconductor. Many robotic components, sensors, and add-on modules use this to talk with one another. The provided 5 ports can be expanded to add up to 127 I2C components, and the provided software libraries and examples make it effortless to control any I2C devices.

XII. **Separate Connector for PWM Speed Control**
A separate connector allows interfacing to a motor driver with PWM Speed Control capabilities without using up valuable space on another port connector. The PWM signal can also be turned off in software for simple motor on/off control. Two on-board variable resistors allow you to control motor speed with the turn of a screwdriver.

XIII. **Large Library of Easy to Use Functions - With Example Code!**
An included library lets the user control this board and all it's peripherals with only a few simple commands. The included tutorial and dozens of example modules allows anyone to become proficient at writing software for their robot quickly and easily.

XIV. **All Software is Open-Source**
All included software is distributed under the GPL Open-Source license. MyRobot encourages the sharing of source code and co-operative development of robotic software to improve robotics as a hobby for everyone.

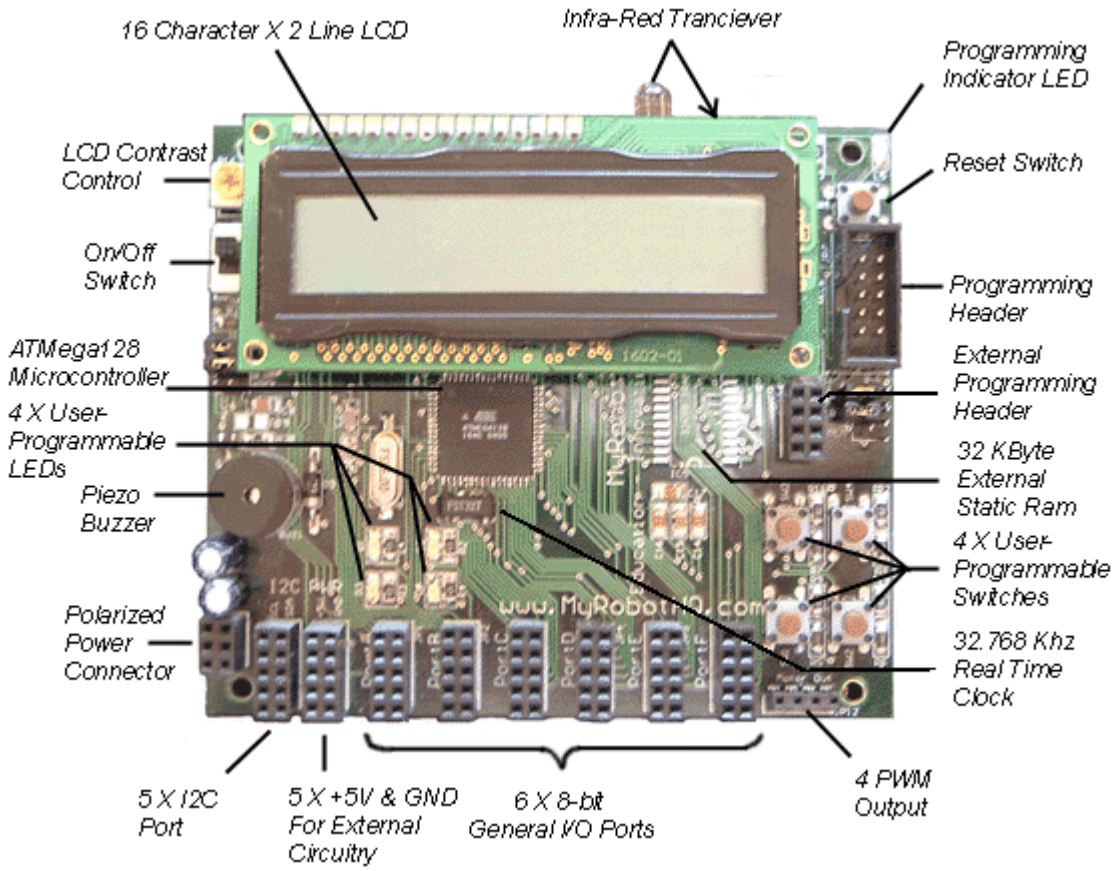
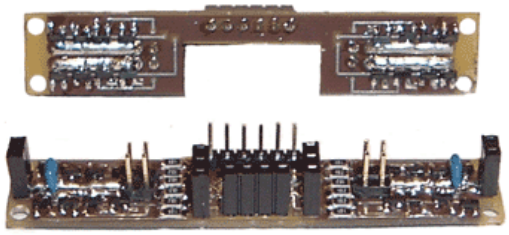


Figure 5 - Anatomy of the Mini-PC

In addition to the features listed above. The Mini-PC was designed to fit within the dimensions dictated by the Northwest Mini-Sumo competition rules. Mini-Sumo is currently the most popular competition for robot hobbyists. This allows us to market our product directly to a large, rapidly growing section of the market that has high demand for small, powerful, and low cost computing power.

A programming dongle is included with every Mini-PC that allows users to upload their code to it from their PC. This capability also allows users to share code and easily collaborate on a project. While a few competing products have this capability, none encourage the sharing of code and project collaboration that we will via our website.

MDRV Motor Driver



I. **Up to 2 Amps Continuous Power Output**
This dual motor driver board is designed to drive a DC or PWM signal at up to 2 amps (continuous) to each motor. i.e. 1 PWM signal for each motor, and each motor using up to 2 amps.

II. **Separate Motor Power Supply**
Two separate connectors allow the motors to be driven by a separate power supply anywhere from 0 to 30 Volts. The motor power is also electrically isolated from the rest of the 5V circuitry which protects the robot against shorts and dangerous transient voltage spikes which often occur during competitions.

III. **Protected Against Internal Shorting**
Many motor driver boards and ICs (such as the L293) will short themselves out internally if the wrong control pattern is sent to them. Irreparable damage is done to the board or IC when this happens, and so much heat is generated it can easily injure anyone handling them at the time. Extra logic was designed into the MDRV Motor Driver to eliminate this from happening in order protect our consumers both physically and monetarily.

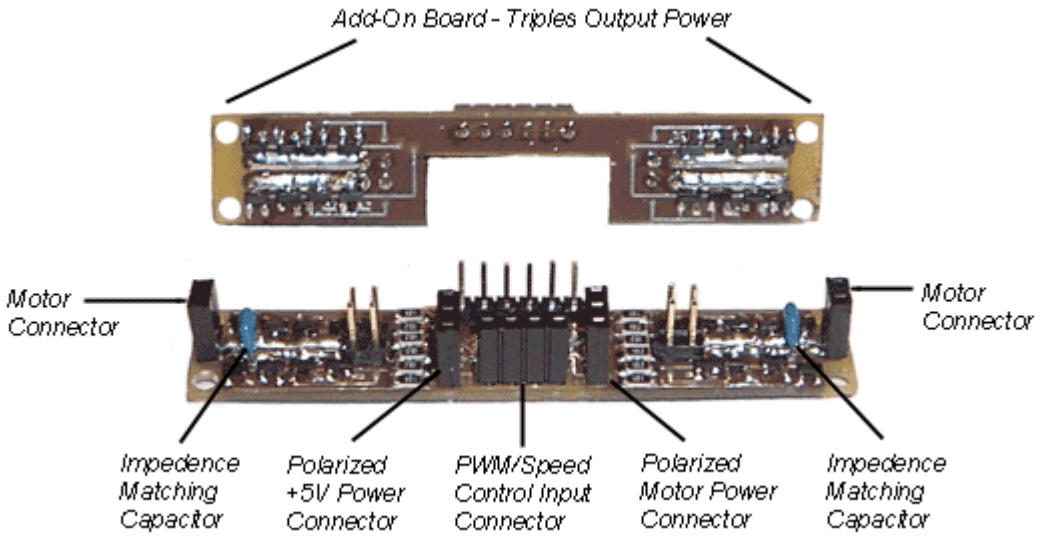
IV. **Perfect Power Option for Medium Sized Robots**
The MDRV board was designed in order to provide an economical solution to hobbyists who build medium sized robots (such as Mini-Sumo). For most hobbyists, if motor driver ICs like the L293 chips don't provide enough power, the only other options are semi-industrial sized motor drivers that are designed to put out way more power than they need and cost much more than they'd want to spend. If you fit the above description, then the MDRV board is the perfect solution for you!

V. **Add-On Board Available to Triple Output Power!**
For those hobbyists who need a little extra power, an inexpensive add-on board is available which triples the output power to each motor. This supplies up to 6 amps to each motor!

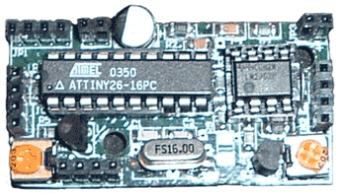
VI. **Impedance Matching Capacitor for Maximum Power Delivery**
All motors appear electrically as an inductor in series with a resistor. The electrical opposite of an inductor is a capacitor. The included user manual instructs the user on how to select and install an impedance matching capacitor to maximize the power delivery to each motor.

VII. **Polarized Power Connectors**
Each power connector is polarized to prevent users from accidentally connecting power up backwards. This is a surprisingly common and damaging mistake.

VIII. **Don't Get Pushed Out of the Ring!**
Proper power delivery and motor control is the most important aspect in Sumo and Mini-Sumo competitions next to traction and weight. The MDRV Motor Driver is the best way to give your robot the edge it needs to win every competition.



WMS V.2 - Wheel Monitoring System Version 2

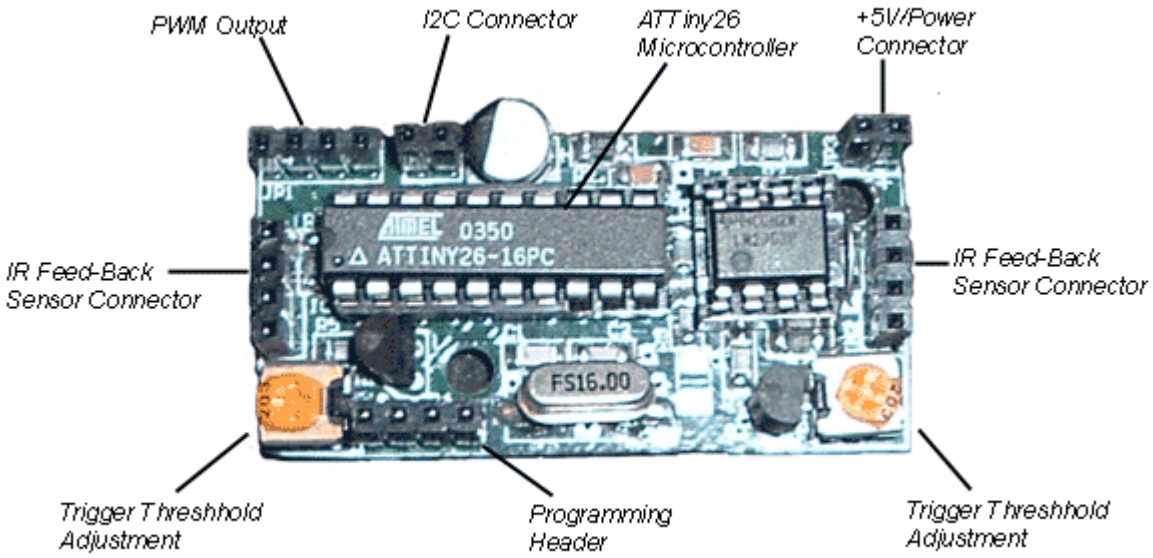


I. **Three Essential Circuits in One!**
The WMS is an odometer, DC motor speed controller, and dead-reckoning/wheel encoding system in one. The *Odometer feature* keeps track of the distance traveled in average and by each wheel. The *dead-reckoning/wheel encoder feature* uses the input from two Infrared sensors to monitor and track wheel speed. The *speed control feature* uses wheel encoder data as feedback, and adjusts its PWM output signal to maintain a steady, and extremely accurate speed which is set by the user. This allows better performance by allowing the motor driver to provide more or less power as needed.

II. **I2C Controlled**
The main microcontroller board communicated with the WMS via I2C protocol to get on-the-fly speed, rpm, power, efficiency measurements, distance traveled information, and more. This allows total control of the WMS with only two wires!

III. **Most Simple and Accurate Way to Control Robotic Travel**
With a few simple function calls, a user can set the robot to go at a very specific speed. As so often happens in hobby situations, if one motor requires more power than the other to maintain the same speed, the robot will not travel in a strait line. The WMS automatically monitors and adjusts for this.

IV. **Reprogrammable**
What's more, the WMS is reprogrammable via the MyRobot Mini-PC. If the user desires to make it do something else, add more features, or just finds a more efficient way to write the code, they can share it, and everyone can reprogram their WMS quickly and easily.



Future Products

After Sale Items

In the long run, the majority of our profit will come from the sale of various 'after sale items' to upgrade the consumer's robot. Our product line reflects this. However, we also plan on selling complete robot platforms as well. These platforms are not planned to bring us as much profit, but instead are designed to lower the barrier of entry for our consumer so that we can create a returning customer and profit from the sale of upgrades. With the exception of the Mini-PC, all our products will be patented, inexpensive to the consumer, and provide returns of 3x to 10x of the cost to us. The market shows a high demand for upgrades to robots. **35.5% of those surveyed (See appendix A) indicated they wanted upgrades and expansions to their robot.**

Robots

In the near future, we plan on carrying complete robot platforms that includes everything a person would need for competition or experimentation. This product line will be composed of three 'starter' robotic platforms in three different levels of price and features. The first level will be the lowest priced (around $50 – prototype pictured below) and have the least features. This platform will be for the beginner hobbyist to have fun and get started in robotics without having to spend a whole lot of money. However, this platform will still be competition ready for the Northwest Mini-Sumo and have a higher level of sophistication than any products currently in the 'Mini-Sumo' area of the market.

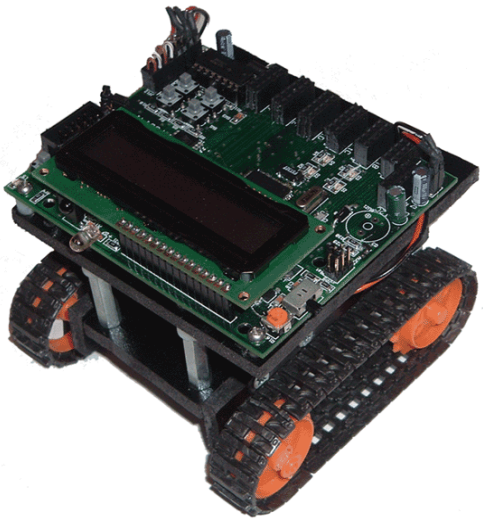


Figure 6 - Mini-T Prototype with Mini-PC Attached

The second platform (shown below) will be of moderate price (~$149), and be a great deal more functional than any other platform sold by competitors at that price level. This will be the next step up for the hobbyist/robot enthusiast, and will be the main focal point for our instructional products (tutorials, how-to's, etc.) and add-on modules.

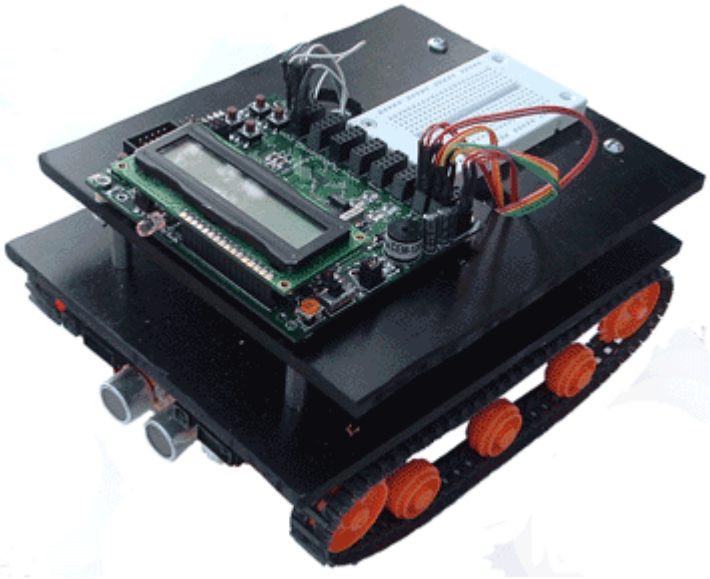


Figure 7 - Model-T Prototype with Mini-PC and Sensors Attached

The third platform will be for the hardcore robot enthusiast. It will be a super functional, streamlined, and professional body, combined with more advanced electronics and sensors. It will be the high end robotic platform (selling around $300-$400), and will be supported by all other products we sell. It will also be the most adaptable for custom modifications by the consumer.

Figure 8 - Star Wars R2D2

Just kidding! We won't be selling R2D2, but our high level platform may have the same shape.

Product Psychology

The point of creating three different platforms, is to create a product profit pyramid. The lower priced platform will allow those who are interested in robotics, but might not know much or have much money to spend, get started in the hobby (and our company). At the same time, it will create a firewall against new competition coming in and creating a lower-priced platform. The middle-priced platform will be our banner-platform, and the goal is for the majority of our consumers to end up buying it. The top-level platform will cater to the needs and tastes of those hobbyists who want the best, and have the money to spend. It will allow them to have a complete package - to get a superior platform, without having to take the time to build one. The product pyramid will cater to our consumer's different price sensitivities and experience levels (which will vary greatly), and allow us to tap into every level of potential consumer.

Custom Platforms

For our more technically competent consumers, we will also provide, on the website, the ability to create a custom robotic platform where the consumer can mix and match features between all three platforms to create their own unique robot. This entire process will allow even our most picky consumers to get the most bang for their buck. The entire process will be automated via the web and will provide consumers with information on the pro's and con's of each option in building their personal platforms. The selected parts will then be shipped to the customer for them to build their own personalized robot.

Since this method of building a robot will take the longest, and be the most technically challenging, we expect it to generally be used by returning customers who know what they want. The goal is to provide a whole new level of customer service to our repeat consumers - without confusing our new ones. This also allows us to cater to another quickly emerging trend of advanced robot hobbyists who demand massive quantities of accurate and customized information.

Mr. OS

Mr. OS (pronounced 'mis-ter oh-es') is an acronym for MyRobot Operating System. Specifically it is a form of Real Time Operating System (RTOS – pronounced 'ar-tos') for the Mini-PC. Robots (and any system using microcontrollers) tend to get very complicated very quickly as more and more sensors, software, and complicated tasks are added for it to do. Operating Systems are used to alleviate this problem in both computers and microcontrollers by allowing designers to focus on one small area of a project and then 'plug in' the module to the whole system.

There are a few RTOS's on the market for roboticists, some even for free, but they are all very complicated and very poorly documented. Several months have been spent analyzing the existing RTOS's and creating a completely new one that is small, efficient, and designed specifically for the Mini-PC. **Mr. OS is easy to use, well documented, and will be available in both the 'C' and 'Assembly' programming languages. It will allow both hobbyists and**

acedemians to write a small program for each sensor or action and 'plug it in' to the overall program.

Docking Bay

The Docking Bay will act as a charging station and computer interface with the robot. Special contacts will allow the robot to drive into the device and fully charge it's batteries within 15 to 30 minutes. An infrared transceiver built into the Docking Bay will wirelessly connect the robot directly to the user's computer. The robot can then download any data collected, or the computer can upload any new user instructions into the robot. Design and construction of this item has not yet begun, but the cost is estimated to be $15, and the sale price to be around $50 to $75. **As yet, docking bays for our competitor's robots are rare, expensive, and none of them allow the computer-to-robot connection.**

Speech Synthesis and Voice Recognition

The last few years have shown amazing leaps of technology in embedded speech synthesizers and voice recognition chips. A prototype for an extremely easy to use speech synthesizer is almost complete. There are currently two approaches to this area. The first is by using a synthesizer chip which would cost around $25 each to produce, and the other is using a software algorithm which can be downloaded into the Mini-PC. If successful, the second option will not cost anything to produce. Time has not allowed an in-depth study into voice recognition, but both hardware (embedded chips) and software solutions seem very viable solutions.

V. Competition

When looking at competition, it needs to be separated into two categories - Corporate and Small Business.

Corporate Competition

Lego

Lego is the largest player in the hobby robotics market. However, they are less of a competitor and more of a role model. They are a role model because they illustrate what a company can do with a limited product line in a market when you don't have any competition. Lego's entire robotics product line is termed 'Mindstorms' and is composed of only one main product with two versions of the same expansion pack.

People love Lego Mindstorms, as the support of a large organization like FIRST can attest to. However, many people want more. After playing with the Mindstorms sets for a while, they are eventually frustrated with the Legos limited programmability and power to interface to more than just a few sensors and motors. Several hobby groups attest to this. The largest and loudest is the lego-robotics mailing list (http://www.lugnet.com/robotics/rcx/) which is dedicated to hacking the limited RCX microcontroller board - the 'brain' of the Mindstorms kits. Some people have even created an open-source compiler for programming the RCX in the popular 'C' language (http://sourceforge.net/projects/brickos/).

Despite the large and growing demand for more sophisticated Mindstorms sets, Lego has not, and most likely will not, come out with a product to answer it. The reason for this is because Lego is a children's toy company. They continue to be reluctant to change their value proposition and abandon the younger age group by adding more complexity to their product line. MyRobot plans to move in to the gap left open by Lego. We plan on marketing our product to Lego users as the 'next step up'. It will be a product for people who liked the Mindstorms, but are ready to trade a little more complexity for more power and capability.

Products

 **Name:** Robotics Invention System 2.0 **Item#:** 3804 **Ages:** 12+ **Pieces:** 718 **Price:** $199.99	This lets you build three robots right away using the same pieces: a Candy Sorter, a Robotic Arm, and an Artbot that draws pictures. **Complete Set Includes:** ▪ RCX Microcomputer – the mind of the machine ▪ CD-ROM Software – "Big Blocks" system for programming the RCX ▪ USB Infrared Transmitter ▪ 3 Guided Challenges ▪ 6 Pro Challenges (Unguided) ▪ 2 Touch Sensors ▪ 1 Light Sensor ▪ 2 Motors
 **Name:** RIS 2.0 Basics Collection **Item#:** KB565 **Ages:** 12+ **Pieces:** 722 **Price:** $239.00	This is the same product as above with a few extra parts and a book. **It Includes:** #3804 Robotics Invention System 2.0™ #9916 Capacitor #9738 Remote Control #4176779 9-Volt Motor #B565 Jim Sato's LEGO® MINDSTORMS™: The Master's Technique book
 **Name:** Robotics Invention System Collection **Item#:** K9916 **Ages:** 12+ **Pieces:** 906 **Price:** $229.00	This is the same as above, but includes more parts rather than the book. **It Includes:** #3804 Robotics Invention System 2.0 #9738 Remote Control #4176779 9-volt Motor #9916 Capacitor #10049 Large Wheels and Axles #10072 Beams #10074 Cross Axles #10076 Gear Wheels

Table 11 - Lego Products (Taken from Lego's Website)

Parallax

Parallax is definitely more of a competitor, but still a role model. Here is another great example of a company cleaning up in this market. Their product line caters to educators, engineers, and robot hobbyists all at once. It is exhaustive, affordable, and well documented. However, they have left a few chinks in their armor.

Parallax's foundation is their original Basic Stamp microcontroller board. All of their products center around it. The core of the Basic Stamp is composed of a Microchip PIC microcontroller running an integrated BASIC interpreter. What that means is that users write programs in BASIC and upload them to the board. The microcontroller then decodes the BASIC program into assembly and finally into binary on-the-fly. The problem however, is that speed and size are the two biggest problems with microcontrollers.

The fastest PIC microcontroller that Microchip makes is more than three times slower than the microcontroller on the MyRobot Mini-PC. With on-the-fly

interpretation added, it makes the Basic Stamp much, much slower than our Mini-PC. The other problem is code size. The largest EEPROM for the Basic Stamp (which you have to buy separately) can only hold 16K (K = thousand) bytes of code (which is less than 16K lines of code), while the Mini-PC can hold 128K bytes of code (which is the same as 128K lines of code) without any extra expansion.

Another problem commonly run into by Basic Stamp users is the limit on interfacing. Due to the way the Basic Stamp is configured, different versions are limited to only certain types of interfacing. There may or may not be support for LCDs, I2C communication, speakers, or many other things. Also, interfacing to anything requires input/output lines (I/O). The version of the Basic Stamp with the most I/O only contains 32 I/O lines. Without any expansion, the MyRobot Mini-PC contains 48 separately programmable I/O lines, and comes with software support and example code for interfacing virtually anything you could possible want to connect to it. And if code has not been written for it yet, users will be able to download the code directly off our web site, a feature Parallax has never chosen to exploit.

There are several other differentiating factors between MyRobot products and Parallax products. ***However, speed, code capacity, quantity of I/O lines, and software support are the most important foundational factors in any embedded system, and MyRobot beats Parallax's products on each of these levels.*** As a result, Parallax products aren't powerful enough for many engineering projects, and their product line is very complex and confusing to hobbyists.

They do create a well defined product line for educators. Unfortunately, university and college professors are very picky about microcontroller architecture when deciding on an educational platform. When asked about their choice of microcontroller-based teaching platform, one professor at Oregon State University said "the PIC [microcontroller] architecture so confusing, it could almost be described as 'cute'. The AVR [microcontroller used on the Mini-PC] is much more elegant and powerful."

Products

	BASIC Stamp 2 WAM Kit (Parallax Summer Special)	Board of Education Full Kit	BASIC Stamp Discovery Kit	Boe-Bot Robot Kit
Product Image				
Qty. 1 Price and Part #	$79 #90005	$119 #28102	$169 #27207	$229 #28132
Resources	*What's a Microcontroller?* educational guide(315 pp.); CD-ROM with software and documentation	CD-ROM with software and documentation (no printed manual or text)	*What's a Microcontroller?* educational guide(315 pp.); BASIC Stamp Manual (351 pp.); CD-ROM with software and documentation	*Robotics with the Boe-Bot* educational guide(319 pp.); CD-ROM with software and documentation
Scope	Provides most cost effective approach to exploring the BASIC Stamp microcontroller. Not as flexible as BS2-IC and BOE yet still very powerful.	Best choice if you are using a modular approach to advance in the Stamps in Class curriculum or if you don't require any components or sensors.	Very complete and flexible introduction to the BASIC Stamp 2 module; includes the entry point guide to our Stamps in Class curriculum (WAM?).	Best introduction to the world of robotics and the BASIC Stamp microcontroller. Very expandable platform.
Featured Hardware	HomeWork Board project platform (includes surface mount BASIC Stamp 2)	BASIC Stamp 2 module; Board of Education carrier board	BASIC Stamp 2 module; Board of Education carrier board	BASIC Stamp 2 module; Board of Education carrier board; Robotics parts kit

Table 12 – A Few of Parallax Products (Taken Directly from Parallax Website)

Small Business Competition

Solarbotics

Solarbotics is a Canadian based company. They claim to have been in business for over ten years, but have really only appeared on the scene in the last year. *Their product line is split evenly between original products they have come up with and reselling of robotics products from other companies.* Originally, they began almost exclusively selling BEAM robotics products, but as BEAM technology is very limited, they are expanding their products into the realm of microcontroller based robotics. BEAM is a field of robotics dedicated to analog robotics. It was originally started by Mark W. Tilden to build robots that could

simulate insect intelligence via nothing but capacitors, resistors, and other simple electronic components.

This companies strength is not really in their product line, but in their dedication to the community of hobby roboticists. They host a server (solarbotics.net) to share documentation, news, and help hobby roboticists connect with one another. They even host two monthly columns on BEAM robotics. By creating strong community ties, they have created a significant differentiation between themselves and other bigger plays like Parallax and Lego.

Other Competitors

There are several other small companies that sell robot products, but none of them have clear differentiating factors or value propositions that set them aside from any of the others. They all re-sell the same products for the same prices. For those interested, here is short list:

- Mark III Robot Store - http://www.junun.org/MarkIII/Store.jsp
- The Robot Store – http://www.robotstore.com
- Acroname - http://www.acroname.com/

VI. Financial Need and Initial Start-Up

The statement of financial need below illustrates a few of the itemized costs that we will experience. It does not, however, include any overhead or advertising costs.

Statement of Financial Need

Table 14 to the right provides an itemized list of start-up costs. The section listed under 'Product' is the cost of manufacturing 100 of each of our three initial products: the Mini-PC, MDRV Motor Driver, and WMS. The item listed as 'Dongle' is a required part of the Mini-PC.

The section labeled 'Non-Recurring Costs' includes the cost of having an attorney set up the corporation. The cost for a laser cut solder stencil and reflow oven are also included here. These items are required for the manufacture of our products.

The 'Recurring Costs' section includes the cost of a starter kit of solder paste and equipment to manufacture the 100 of each product. Also included is the cost of 300 boxes for shipping, and a pack of 500 Anti-Static warning stickers for packing.

As an added protection, 15% of the total cost has been added back in to cover any unforeseen costs and create a 'buffer' of protection

Product (Qty. 100)	**Cost**
Mini-PC	$4,644.32
Dongle	$551.83
MDRV	$961.43
WMS	$858.60
Sub-Total:	$7,016.18

Non-Recurring Costs	
Final Prototypes	$300
1 Yr of Web Hosting	$300
Solder Stencil	$150.00
Reflow Oven	$100.00
Corporate Registration	$550.00
Sub-Total:	$1,400.00

Recurring Costs	
Starter Kit	$50.00
300 Boxes	$100.00
Stickers	$13.68
Sub-Total	$163.68

Sub-Total:	$8,579.86
+15%	$1,286.98

Total:	***$9,866.83***

Table 13 - Start-Up Costs

Return On Investment

Table 15 shows the estimated sale price of each of our initial products and gross profit once they are all sold. The estimated return on investment of start-up capital has also been calculated. It is estimated that all the products manufactured during start-up will be sold within 6 months. However, the ROI calculation is based on selling all the start-up products within a 12 month period as a worst case scenario.

Product	Sale Price	x100
Mini-PC	$99.95	$9,995
MDRV	$24.95	$2,495
WTS V.2	$24.95	$2,495
	Sub-Total	$14,986

Start-Up Cost	-$ 9,867
Gross Profit	**5,119**
ROI	**152%**

Table 14 - Gross Profit and ROI After Start-Up

Plans for Long-Term Operation

As MyRobot grows, it will go through three phases – Start-Up, Interim, and Long Term. Each phase will overlap and intermingle, but these phases show the goals for MyRobot in both the short-term and the long-term.

Start-Up (0-18 Months)

This is mostly what has been covered in the business plan. We focus on the hobby and educational markets. By advertising both the entrepreneurial side of our business model and superiority of our products, we can punch a hole into the existing market. Most importantly though, this phase is focused on generating operating capital through the sale of our products. This will allow us to get to the next phase.

Interim (3-24 Months)

This is where MyRobot starts to broaden our product line, market share, and customer base. While the start-up phase is focused on the sale of our initial products line, we will now focus on the development of a user-friendly GUI (Graphical User Interface), API (Application Program Interface), and a wide line of add-on software and hardware modules and upgrades (cameras, robotic-arm attachments, consumer electronics interfacing, etc.). We will also focus on creating the product pyramid described earlier - creating several different platforms that all have common hardware and software, but cater to the different price levels and needs of our consumers. This phase is where we begin to morph from a small start-up company to a medium-sized company.

Long-Term (2-5 Years)

This phase is where we really start to 'systematize' the company and solidify our brand power. Once the basic GUI and user friendly API IDE (Integrated Development Environment) is in place, we will really begin to focus on the educational market and start to branch out into other markets: home-automation, office-products, military, etc. It will depend on which markets present the greatest opportunity for profit. This is where we will perfect the user-friendliness and ruggedness of our product line so that ‘Grandma Suzy’ can buy her grandson a new robot toy, and we gain a new life-time customer.

Appendix A
Survey Results and Analysis

Summary

The following tables are the tabulated results from a survey sent out on January 14th. It should be noted from Table 1 that we received a response of 1.24% while most email advertising campaigns result in less than a .1% response.

Tables 2 through 5 show the results of those who did respond to the survey. It should be noted that almost 55% responded with a 'Likely' or 'Highly Likely' interest in purchasing our robotics products. The results also showed that our typical customer is older than 30 years, and makes over $50,000 per year.

Table 5 lists all the magazines those surveyed listed as reading. Each surveyor was asked to list the three most read magazines. The reader should notice that only a few magazines listed in Tables 9 & 10 are listed here. Future magazine advertising campaigns will reflect survey results.

Data Tables

Number of Survey Requests Sent Out:	2500	**Percentage:**
Visited Website:	80	3.20%
Survey's Received:	31	1.24%

Table 1 - Overall Survey Results

Interest in Purchasing Model-T	**Result**	**Percentage**
Highly Likely	3	9.68%
Likely	14	45.16%
Lukewarm	8	25.81%
Unlikely	5	16.13%
Highly Unlikely	1	3.23%

Table 2 - Interest in Purchasing the Model-T

Not Enough Technical Documentation	21	67.7%
Not enough Basic Information	8	25.8%
Cost	8	25.5%
Development Software	7	22.5%
Supply of Proper Parts	6	19.3%
Reliability	3	9.6%
Ruggedness	3	9.6%
Choice of Programming Languages	3	9.6%
User Friendly/Intuitive Interface	3	9.6%
Battery Life	1	3.2%

Table 3 - Common Frustrations

The Type of Technical Documentation Requested:
• How-To's • Schematics • Datasheets • Examples • Non-Windows Development Software & Code • Open Ended/General Purpose • Capabilities • Recommended Projects

Table 4 - Technical Documentation Requested

Expansions & Upgrades	11	35.5%
Cross Compatibility	3	9.6%
Competitions	2	6.5%
Chat Room, Discussion Board, etc.	1	3.2%
Prizes/Recognition	1	3.2%
Simulator	1	3.2%
Set a Standard	1	3.2%

Table 5 - Consumer Wants

Age	Result	Percentage
Unknown	12	38.71%
14 – younger	0	
15-16	0	
17-18	1	3.23%
19-20	1	3.23%
21-24	0	
25-20	2	6.45%
30-35+	15	48.39%

Table 6 - Age Results

Income (Thousand of Dollars)	Result	Percentage
Unknown	18	58.06%
50+	10	32.26%
40-50	1	3.23%
30-40	0	
20-30	0	
10-20	1	3.23%
5-10	0	
5-	1	3.23%

Table 7 - Income Results

Magazines	Result	Magazines	Result
Nuts & Volts	11	Electronic Products	1
SERVO	8	EDN	1
Circuit Cellular	6	QST	1
Popular Mechanics	2	Wired	1
Popular Science	1	Economist	1
Elektor	1	Business Week	1
Wireless	1	Science	1
EFY Electronics for You	1	Live Steam	1
Electronics Now	1	Robot Science and Technology	1
Scientific American	1	EE Times	1
Mac Addict	1	PC Magazine	1
New Yorker	1	Electronics Australia	1
C/C++ User	1	Dr. Dobbs Journal	1
Military Vehicles Magazine	1	Machine Design	1
Soldier of Fortune	1		

Table 8 - Magazines Read by Surveyors

Appendix B
UNEC Summary & Forecast

Source

United Nations Economic Commission for Europe - 2003 World Robotics Survey

http://www.myrobothq.com/UNECE_robo.pdf

Worldwide Growth in the Robotics Industry in 2003	+26%
North American Growth in the Robotics Industry in 2003	+35%
Autonomous vacuum cleaners and lawn-mowing Robots in 2002	50,000
Autonomous vacuum cleaners and lawn-mowing Robots by 2006	500,000
Service Robots in Use by Professionals in 2002	19,000
Service Robots in Use by Professionals by 2006	49,000
Service Robots for Personal and Private use in 2002	600,000
Service Robots for Personal and Private use by 2006	2.1 million

Excerpt from UNECE Report:

So far, service robots for personal and private use are mainly in the areas of domestic (household) robots, which include vacuum cleaning and lawn-mowing robots, and entertainment robots, including toy and hobby robots. Sales of lawn-mowing robots have started to take off very strongly, with sales in excess of 10,000 units, and should continue to boom. The market potential is very large. Vacuum cleaning robots were introduced on the market at end of 2001. The market expanded rapidly in 2002-2003.

Up to the end of 2002, it is estimated that some 54,000 domestic robots, all types included, have been sold. As for entertainment robots, it is estimate that almost 550,000 units have been sold up to the end of 2002.

It is projected that sales of all types of domestic robots (vacuum cleaning, lawn-mowing, window cleaning and other types) in the period of 2003-2006 can reach some 638,000 units. Although this number excludes the too optimistic forecasts of several millions of units made by some companies, **it might, in the light of sales recorded already in 2003, be far too low.**

The market for toy and entertainment robots is forecasted to exceed 1.5 million units, most of which, of course, are very low cost. One company expects sales of several millions of units within the next years. This estimate has been excluded from the numbers shown…

SERVICE ROBOTS FOR PERSONAL AND PRIVATE USE:		
	2002	**2003-2006**
Domestic robots	**53,500**	**638,000**
Vacuum cleaning		400,000
Lawn-mowing		125,000
Other		113,000
Entertainment/hobby/leisure time robots	**545,000**	**1,500,000**
Educational robots	**8,300**	**15,320**
Robots in marketing	**20**	**10,100**
Customized robots	**20**	**40**
Total number of units	**606,840**	**2,163,460**
Estimated value in $ millions	**960**	**2,750**

Figure 7 Service robots for private use. Stock at end 2002 and projected installations 2003-2006