

# SUMMIT

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Engineers of the Future Program of  
the New York State Education Department

Polytechnic University  
Mechanical Engineering

**Project URL: [mechatronics.poly.edu/summit/](http://mechatronics.poly.edu/summit/)**

# ORIENTATION

# Project Director



- Professor Vikram Kapila
- Associate Professor
- Room: RH 508
- Phone: (718) 260-3161/3160
- E-mail: [vkapila@poly.edu](mailto:vkapila@poly.edu)
- URL: [mechatronics.poly.edu/vkapila/](http://mechatronics.poly.edu/vkapila/)

# Project Instructor

- Name: Nathan (Sang-Hoon) Lee
- Room: RH 514
- Phone: (718)260-3791
- E-mail: [sparknate@yahoo.com](mailto:sparknate@yahoo.com)

# Teaching Assistants

- Anshuman Panda
  - E-mail: [apanda01@utopia.poly.edu](mailto:apanda01@utopia.poly.edu)
- Padmini Vijaykumar
  - E-mail: [pvijay01@utopia.poly.edu](mailto:pvijay01@utopia.poly.edu)
- Daniel Remiszweski
  - E-mail: [dremis01@utopia.poly.edu](mailto:dremis01@utopia.poly.edu)
- Billy Mak
  - E-mail: [bmak01@utopia.poly.edu](mailto:bmak01@utopia.poly.edu)
- Kwok Kei “Keith” Ching
  - E-mail: [kching01@utopia.poly.edu](mailto:kching01@utopia.poly.edu)
- Valentin Siderskiy
  - E-mail: [vsider01@utopia.poly.edu](mailto:vsider01@utopia.poly.edu)
- Jared Frank
  - E-mail: [afrank01@utopia.poly.edu](mailto:afrank01@utopia.poly.edu)
- Shing Lik Wong
  - E-mail: [swong10@utopia.poly.edu](mailto:swong10@utopia.poly.edu)

# Laboratory Etiquette

- E-mail checking, chatting, web browsing, listening to music, singing, and running around not permitted in the lab
- Do not touch experiments unrelated to your work
- **No Food and drink**
- Keep this room as clean as the work allows
  - after experiments, put all components in their original place with the same original condition
- Sign on the attendance sheet

# Laboratory Safety Guidelines

- Do not work alone or unsupervised
- Do not operate any equipment with indication of damage
- Do not let wires hang loose
- Do not touch unshielded wires
- Do not subject components to power higher than their ratings
- Do not touch components subjected to excessive power
- In the case of safety hazards or serious injury:
  - Warn others
  - Inform instructor or technician
  - Remove yourself from danger

# Schedule

Start Date	July 16, 2007 (Monday)
End Date	August 10, 2007 (Friday)
Period	4 weeks (Monday–Friday)
Time	8:30am–5pm
Lunch Time	12:30pm–1:30pm
Location	RH514B



	<b>Mon</b>	<b>Tue</b>	<b>Wed</b>	<b>Thu</b>	<b>Fri</b>
<b>1<sup>st</sup></b>	July 16	17	18	19	20
	Registration & Opening	Lecture, Lab, and discussion			
	Orientation	Lecture, Lab, and discussion			
<b>2<sup>nd</sup></b>	23	24	25	26	27
	Lecture, Lab, and discussion				
	Lecture, Lab, and discussion				Brain storming for project
<b>3<sup>rd</sup></b>	30	31	August 1	2	3
	Building the project, report preparation, and presentation slides				
<b>4<sup>th</sup></b>	6	7	8	9	10
	Building the project, report preparation, and presentation slides				Presentation

# Lecture Schedule

	Topics		Topics
Lecture 1	Resistor	Lecture 10	Thermal sensors
Lecture 2	Mechatronics	Lecture 11	Robotics
Lecture 3	LED	Lecture 12	Infrared sensor
Lecture 4	Button	Lecture 13	Transistor
Lecture 5	Capacitor	Lecture 14	Relay
Lecture 6	Optoelectronics	Lecture 15	H-Bridge
Lecture 7	ADC	Lecture 16	DC motor
Lecture 8	Servomotor	Lecture 17	RC filter
Lecture 9	555 timer	Lecture 18	Op amp

# Making Groups

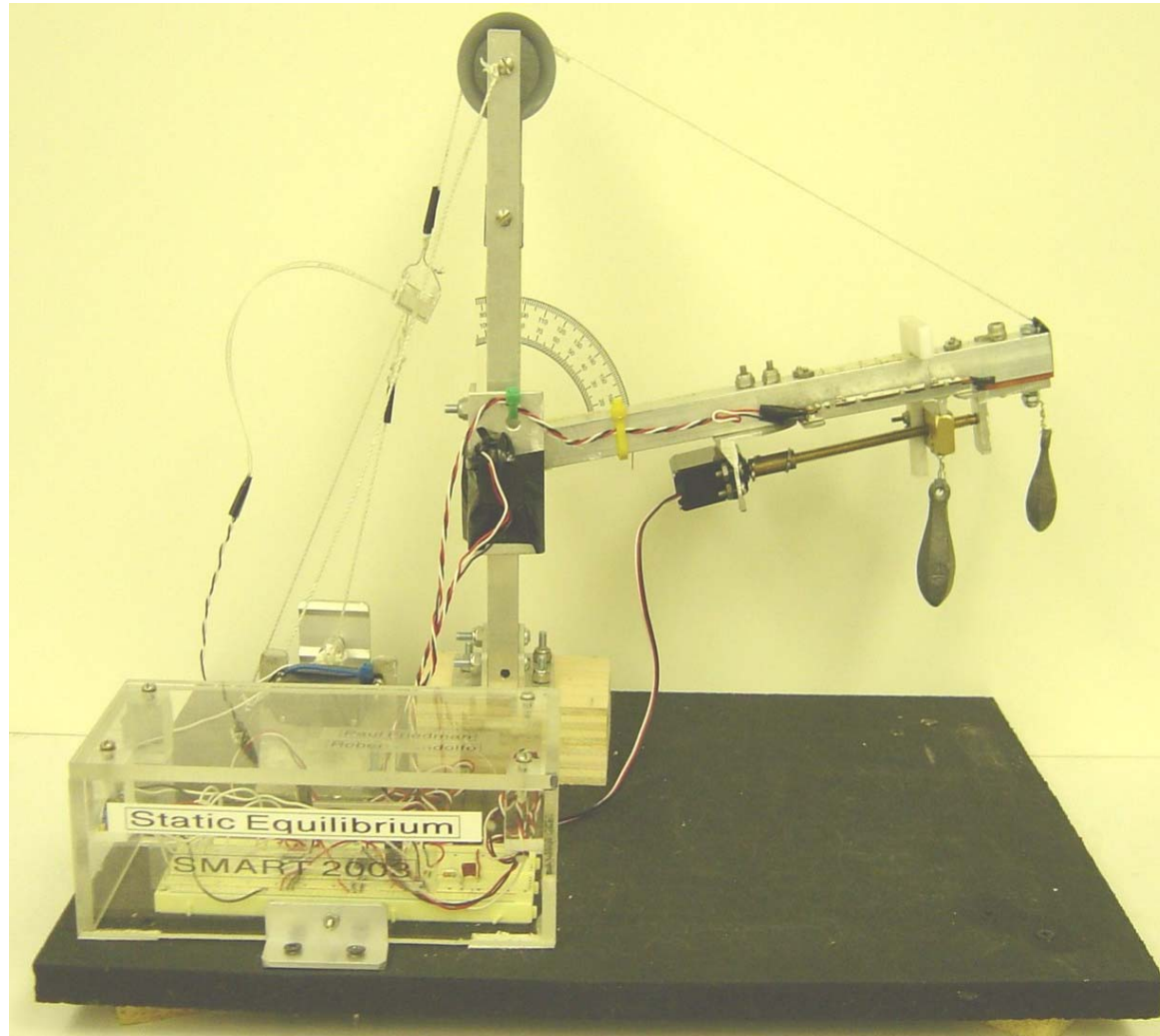
- Make 10 groups
- All structured projects and final projects will be done in the same teams

# Ice Break

- Name
- School
- Specialty
- Hobby
- Goal for the SUMMIT program
- Others

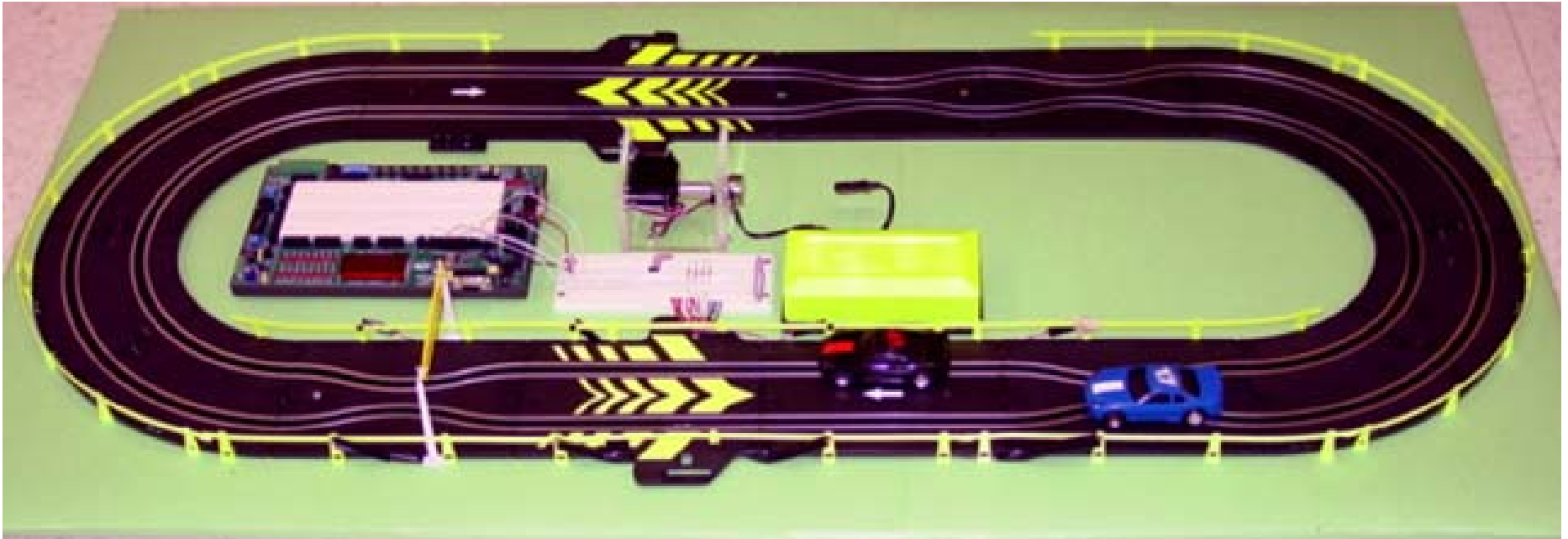
# **SMART 2003 Projects**

# Static Equilibrium



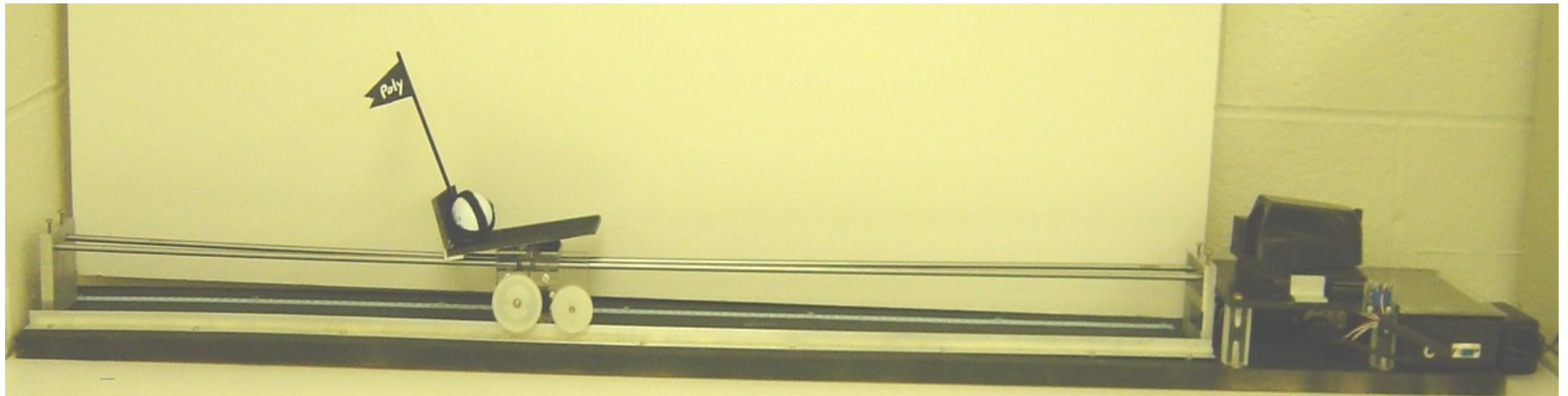
Teachers: Robert Gandolfo & Paul Friedman

# The Smart Road



Teachers: Clay Davis & Richard Balsamel

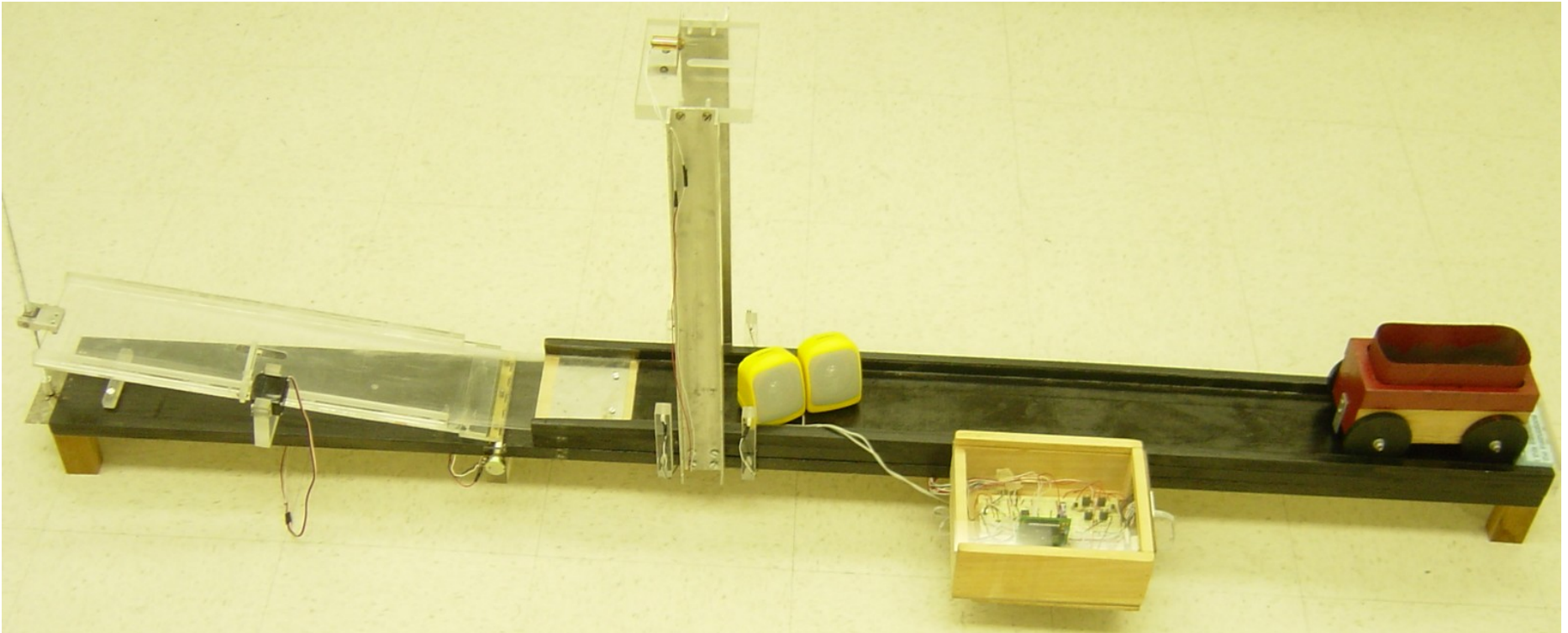
# Catch Me If You Can



Teachers: John Luvera & Michael McDonnell

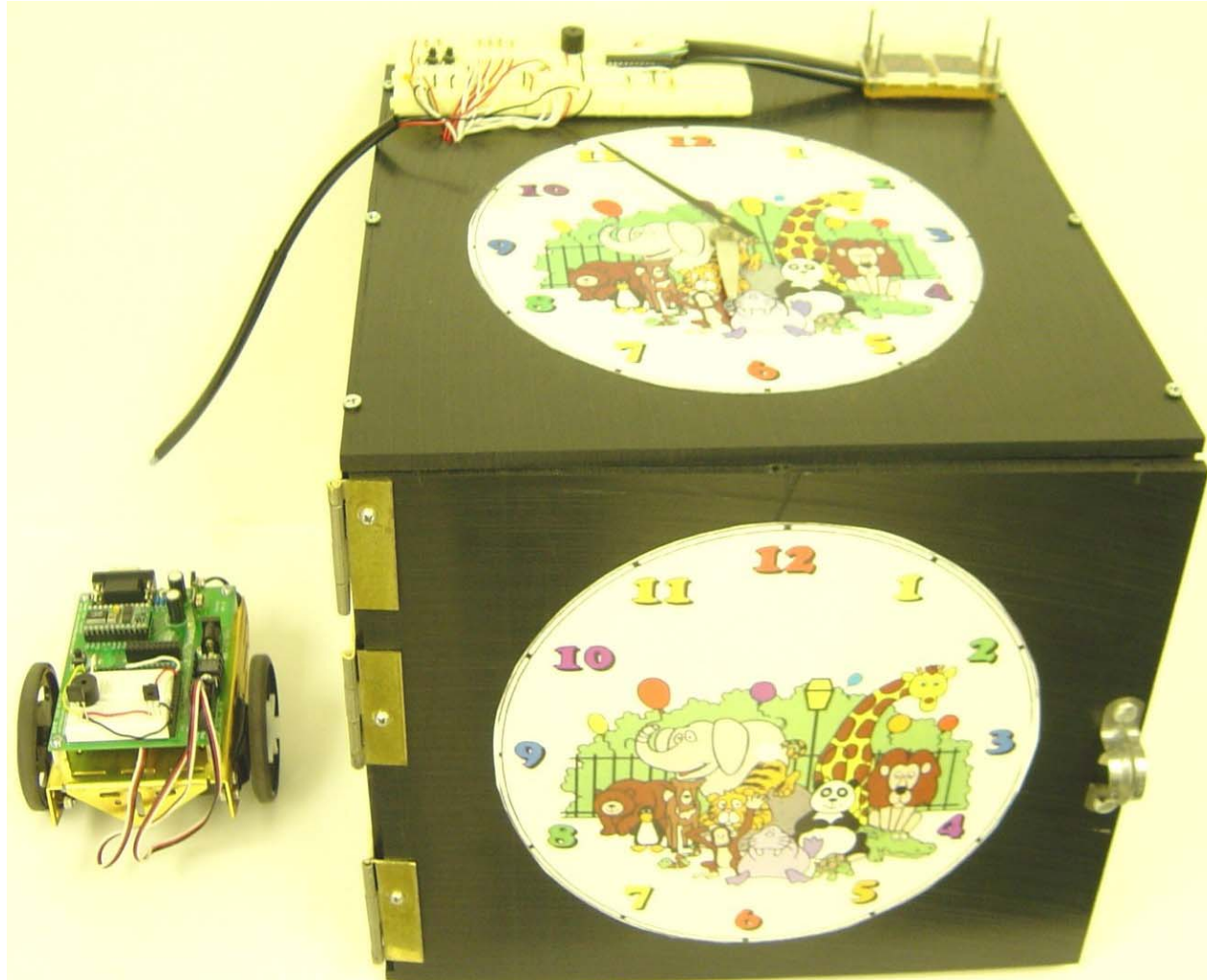


# The Physics of Projectile Motion



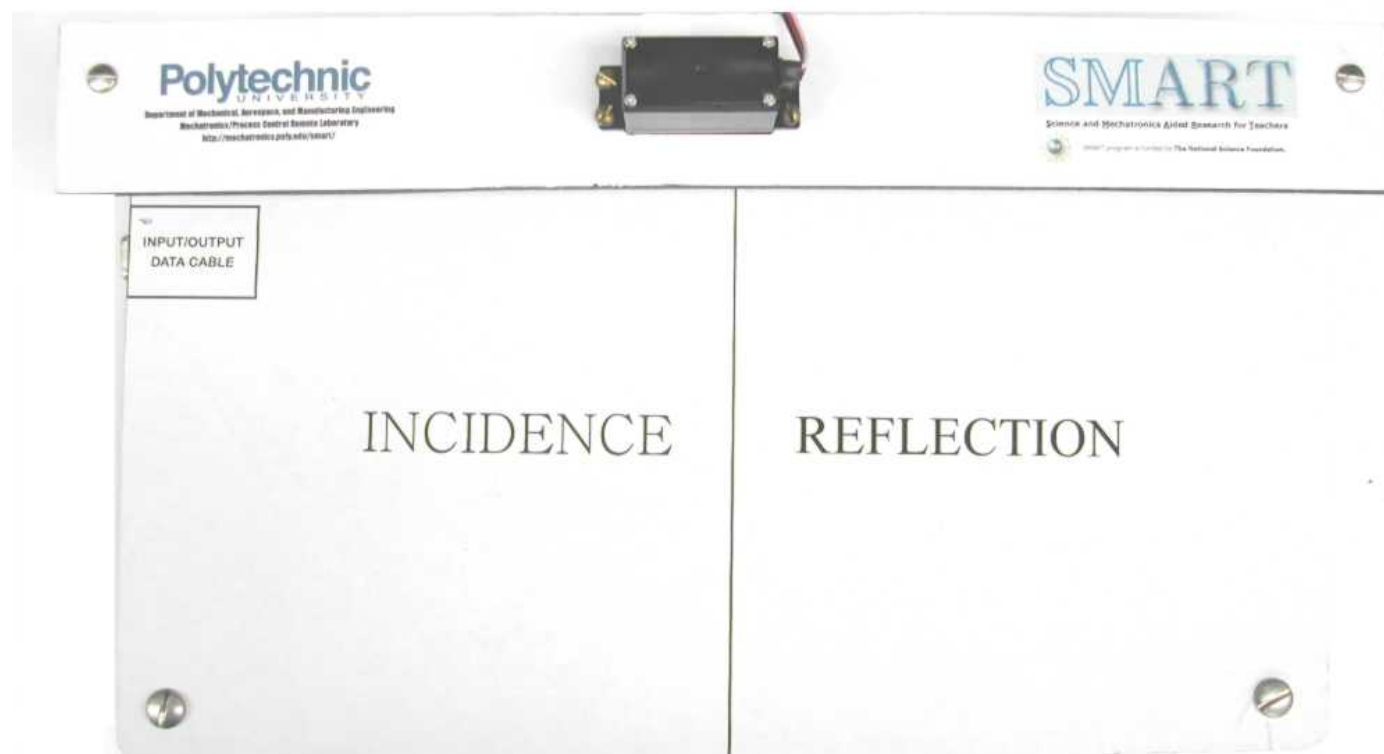
Teachers: William Leacock & Marlene McGarrity

# The Ro-Boe-Clock

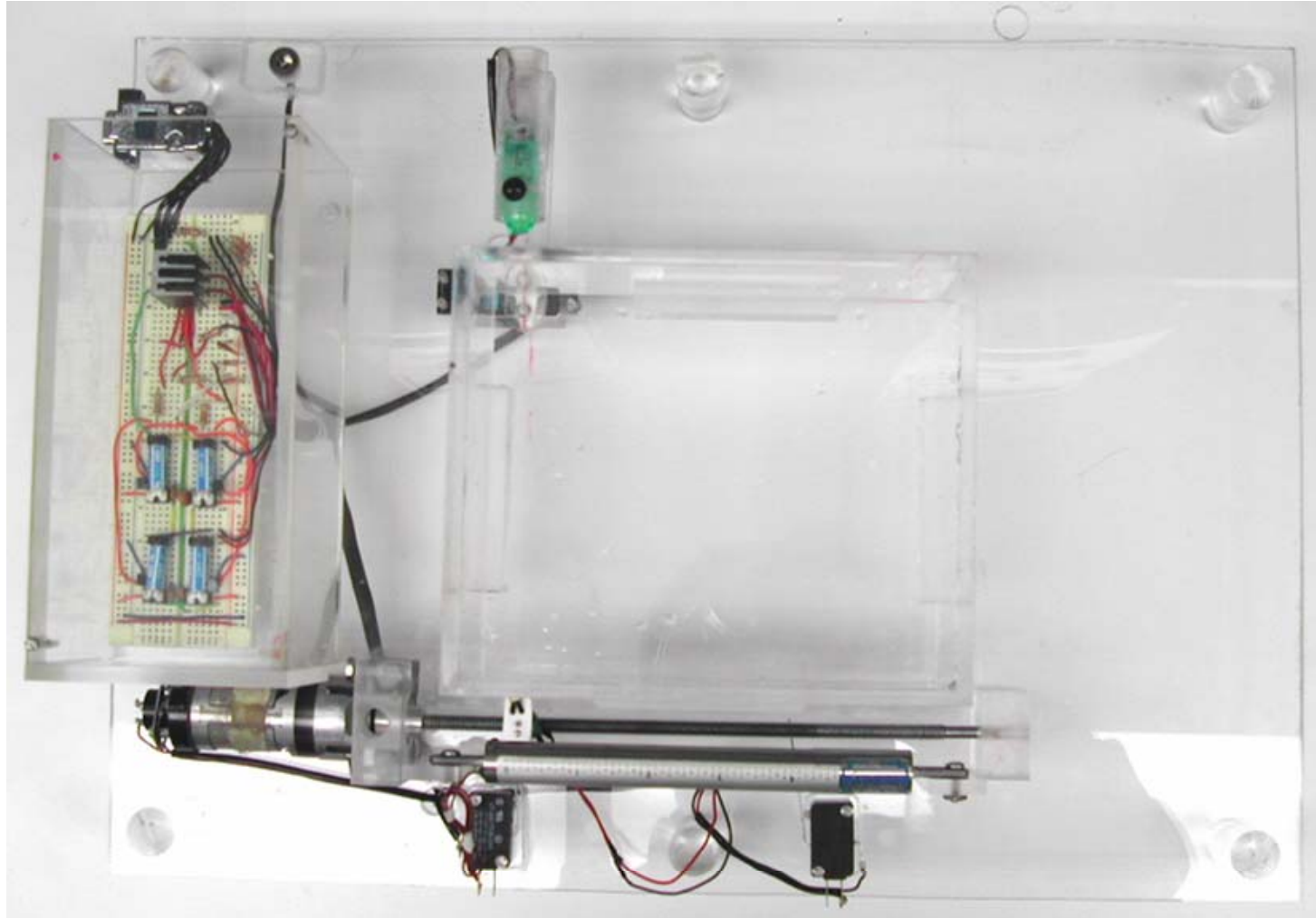


Teachers: Michelle Carpenter-Smith & David Deutsch

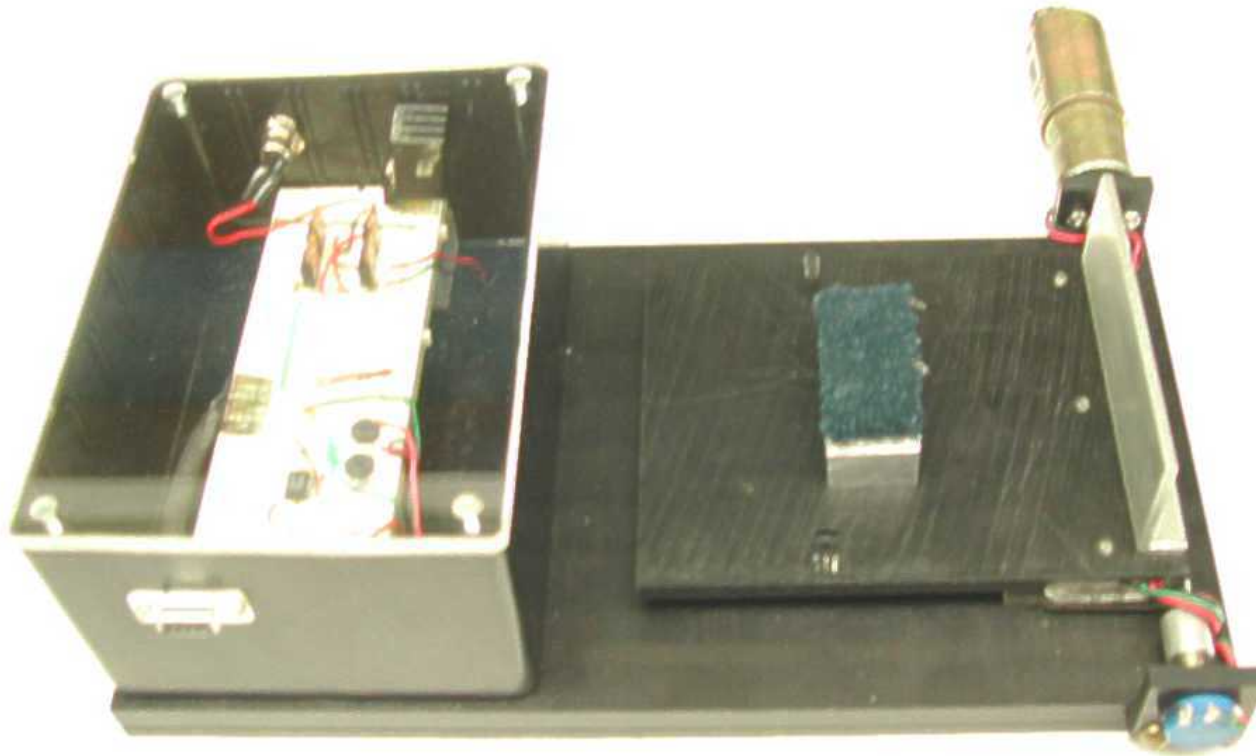
# Reflection Experiment



# Refraction Experiment

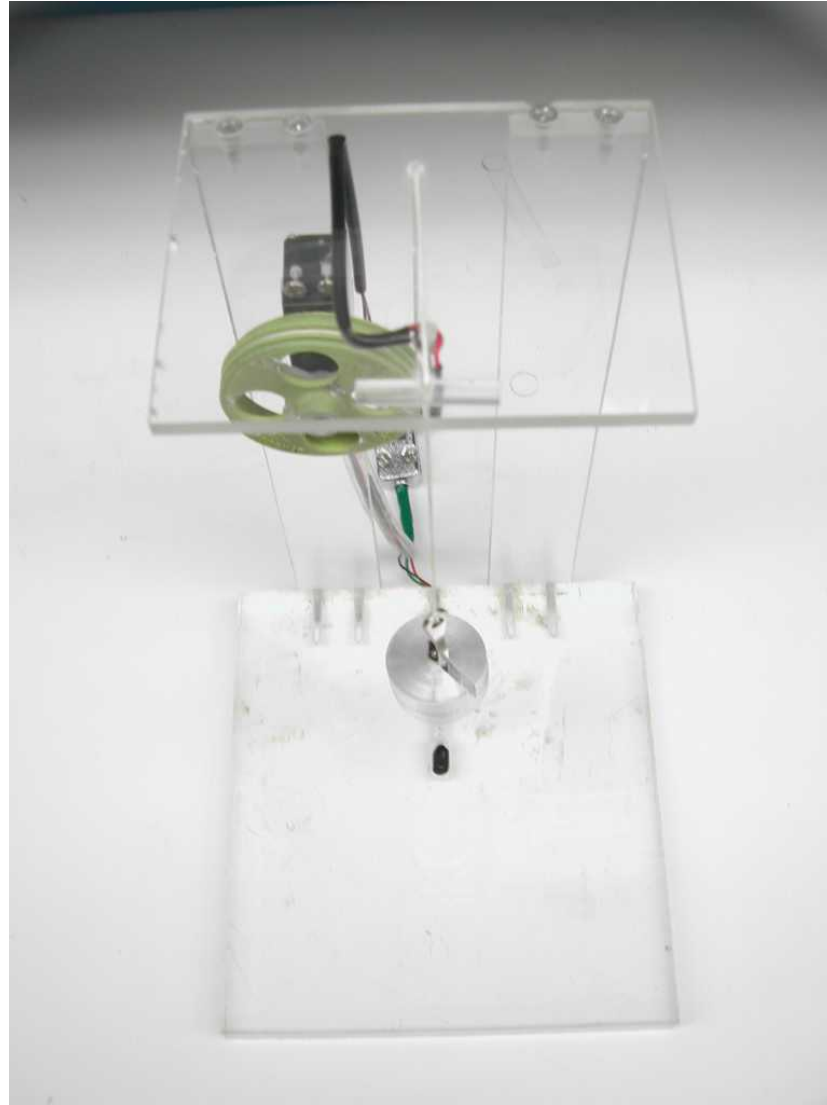


# Static Friction Experiment





# Pendulum Experiment



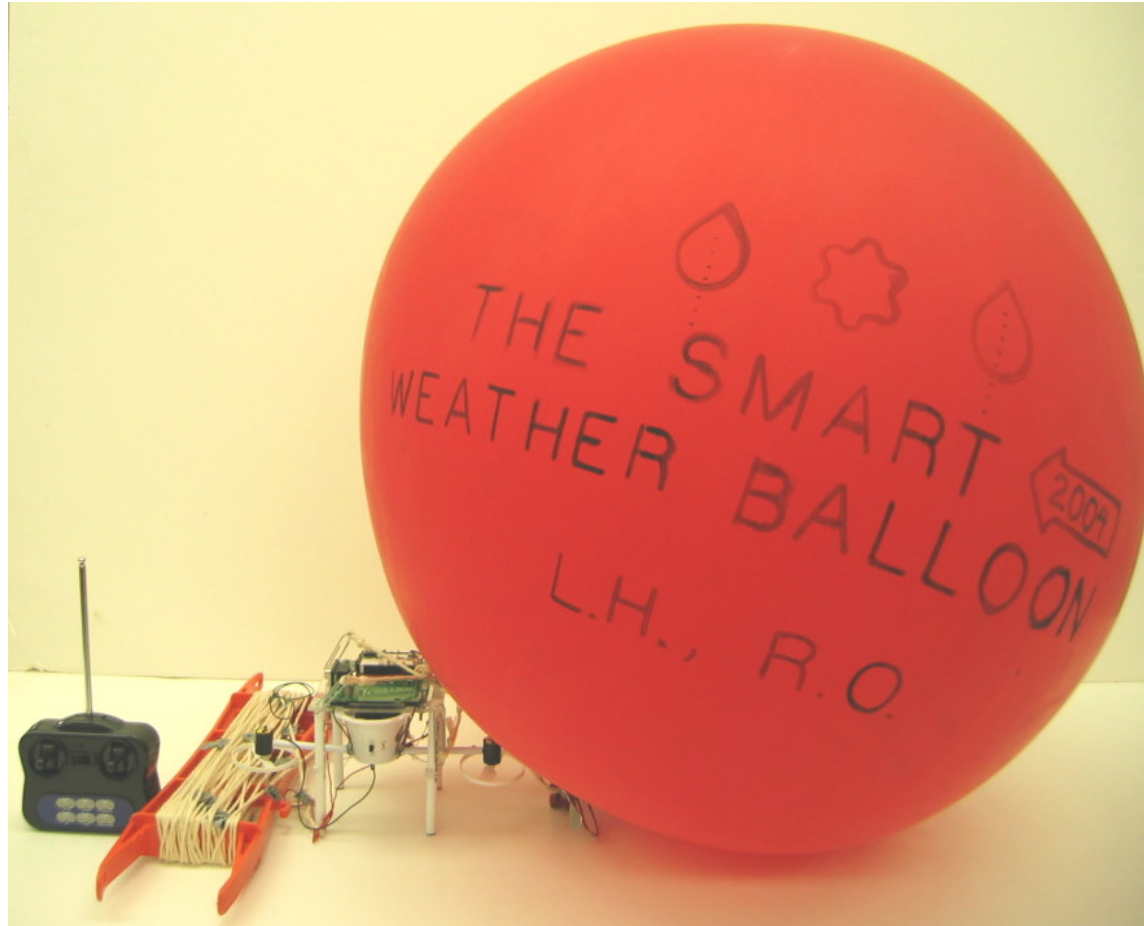
# Heat Conduction Experiment



# **SMART 2004 Projects**

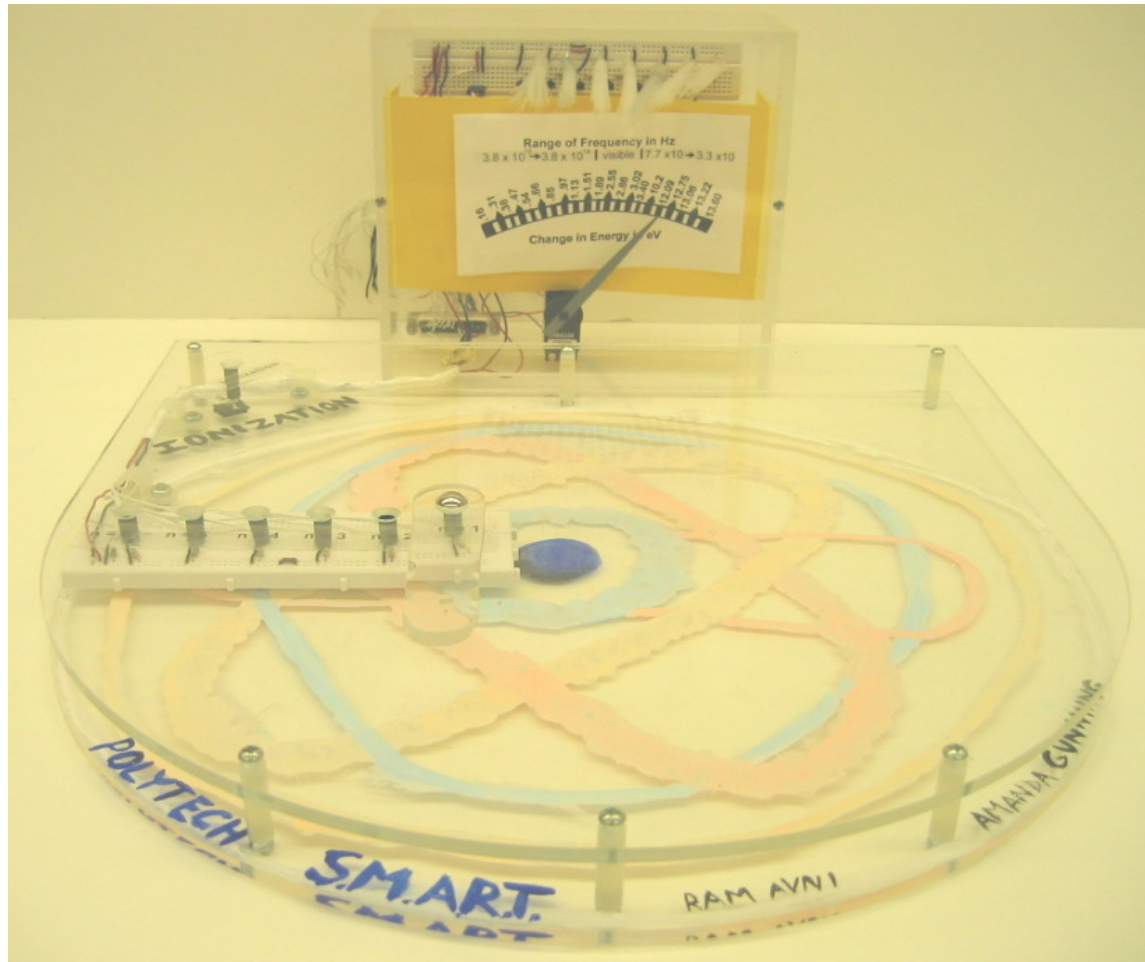


# The SMART Weather Balloon



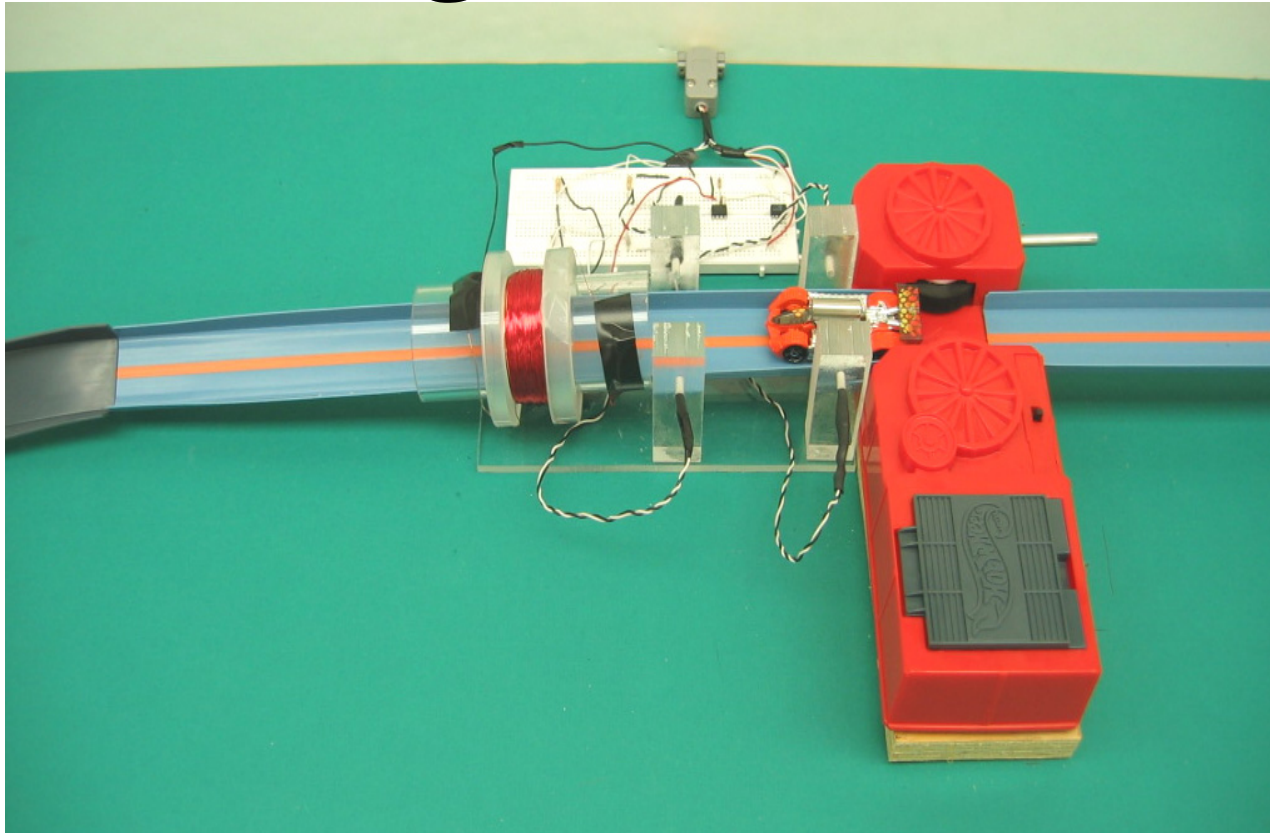
Teachers: Ronald Occhiogrosso & Lennox Henry

# Quantum Leap



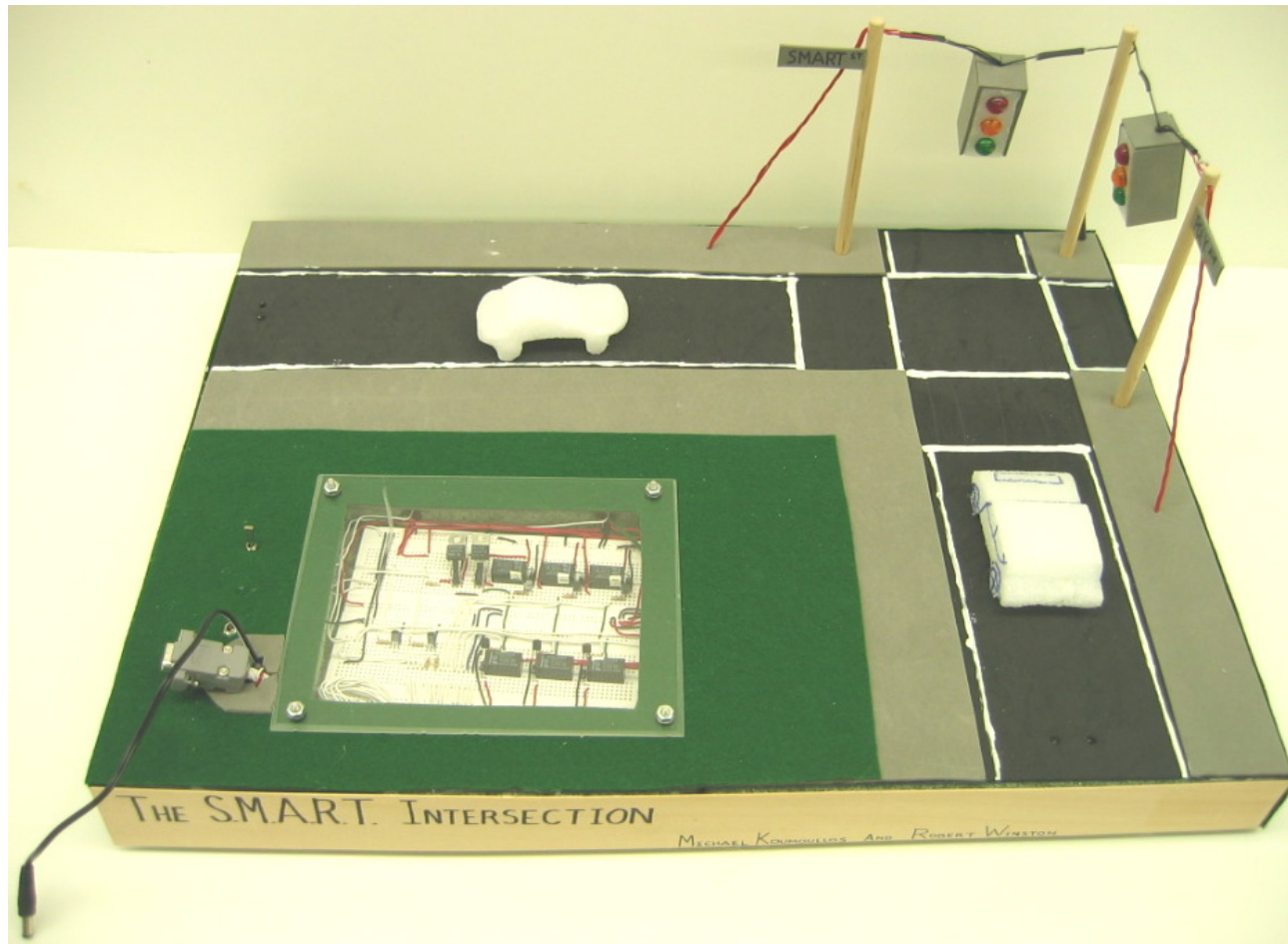
Teachers: Amanda, Gunning, & Ram Avni

# Velocity Monitoring via Magnetic Interaction



Teachers: Vincent Pereira & Steven Scharf

# The SMART Intersection



Teachers: Michael Koumoulllos & Robert Winston

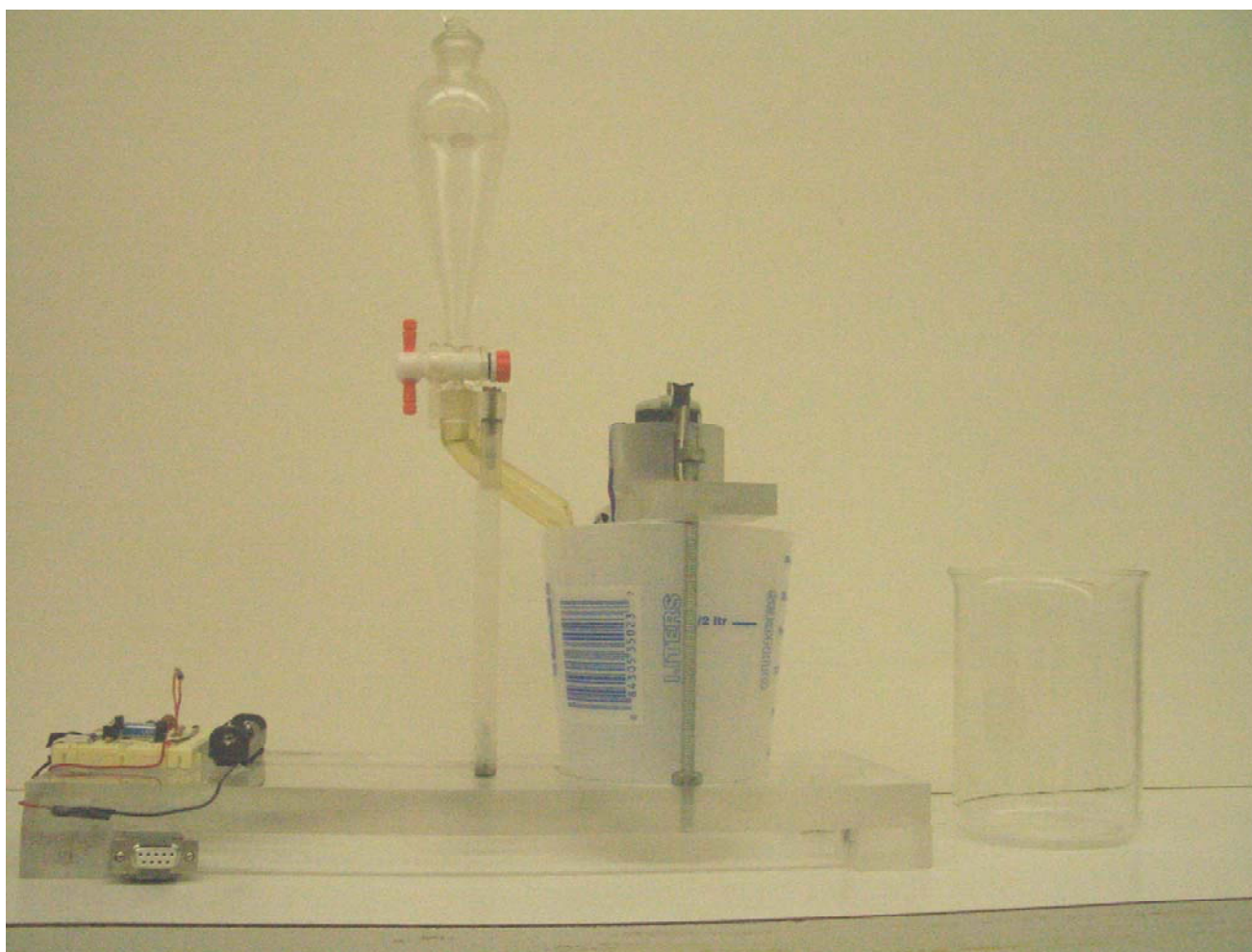


# **I Push! You Push Back!: Newton's 3rd Law in Action**



Teachers: Dvora Geller, Ed Gruber, & Denise McNamara

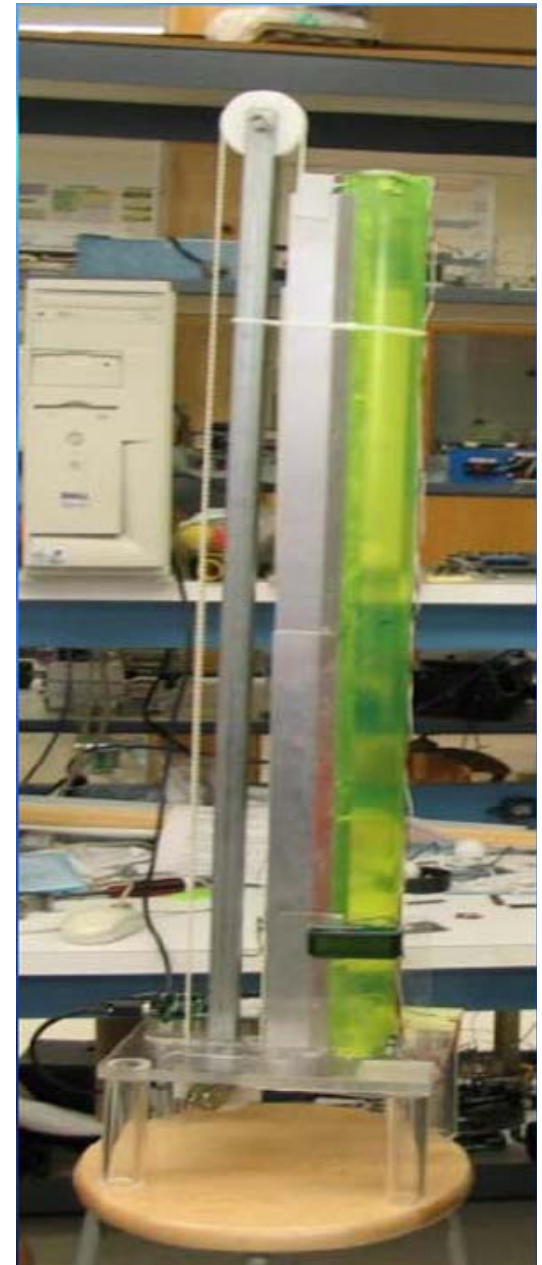
# Conductivity Experiment



# **SMART 2005 Projects**

# Coefficient of Restitution the Bouncing Ball

Teachers: Lennon Safe and Carol Obler



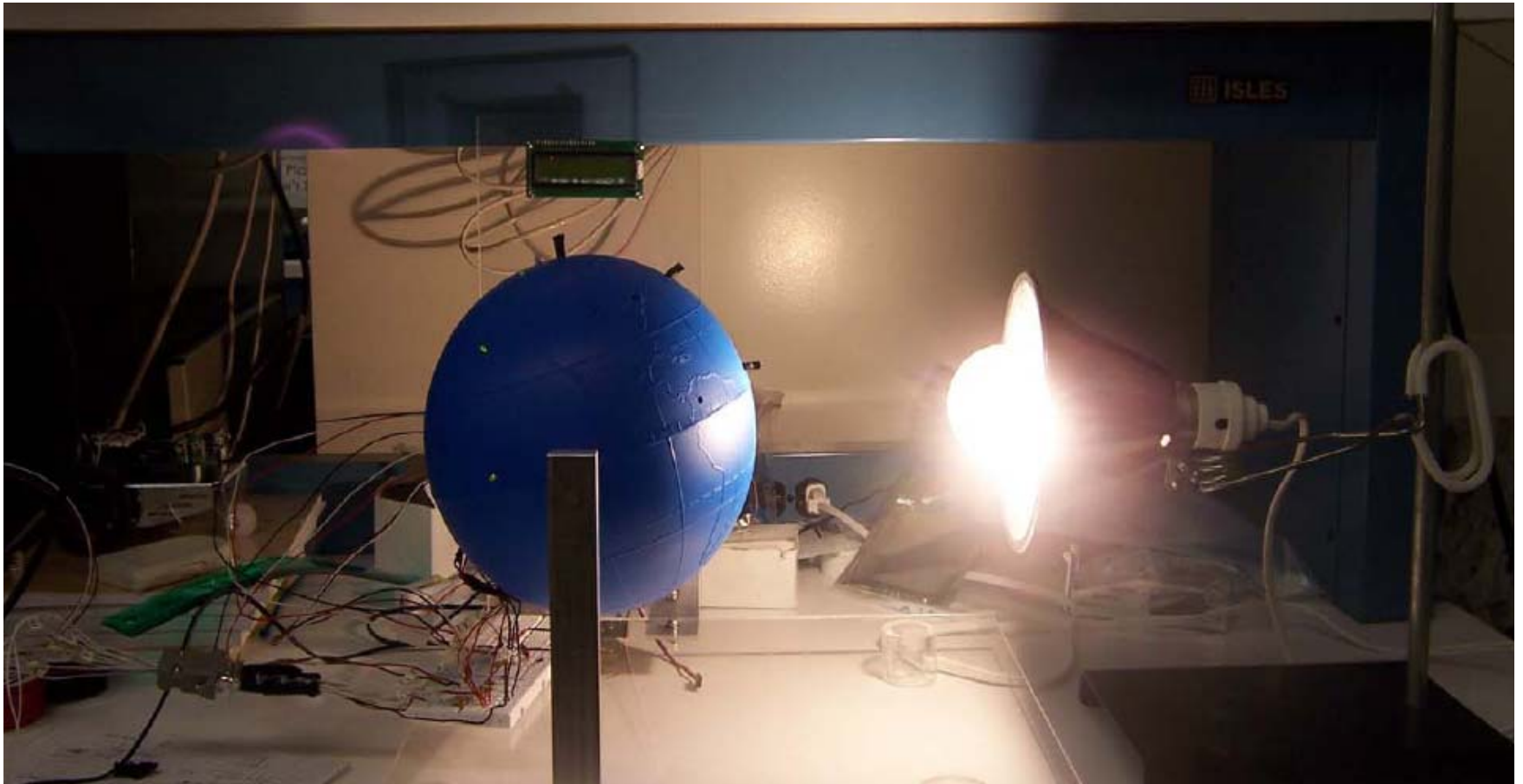


# Vehicle of Revolution



Teachers: Henry Penna, Michael Fishenfeld, and Douraine Stewart

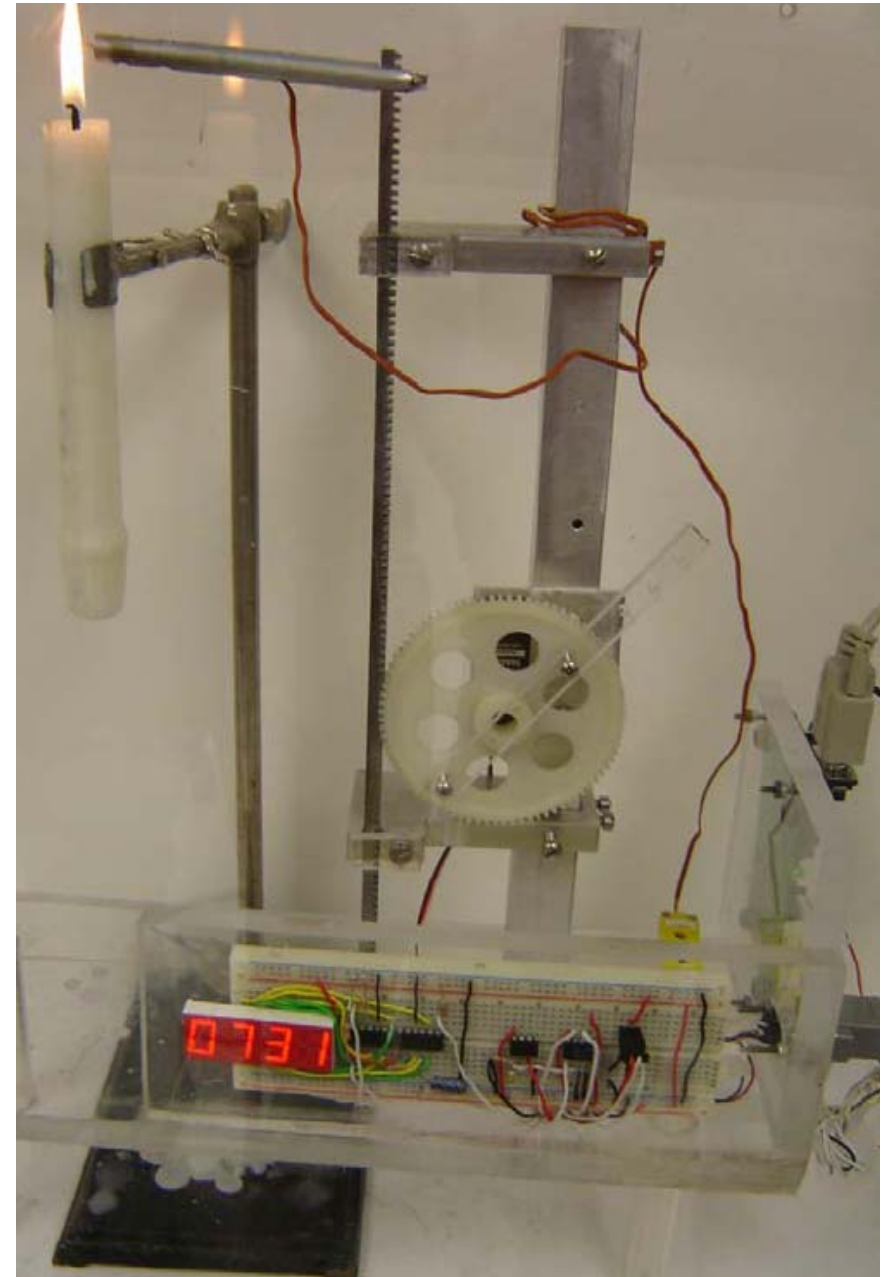
# Earth's Seasonal Heat Absorption and Climate Regions Model



Teachers: Joseph Renna and Rodolfo Vera

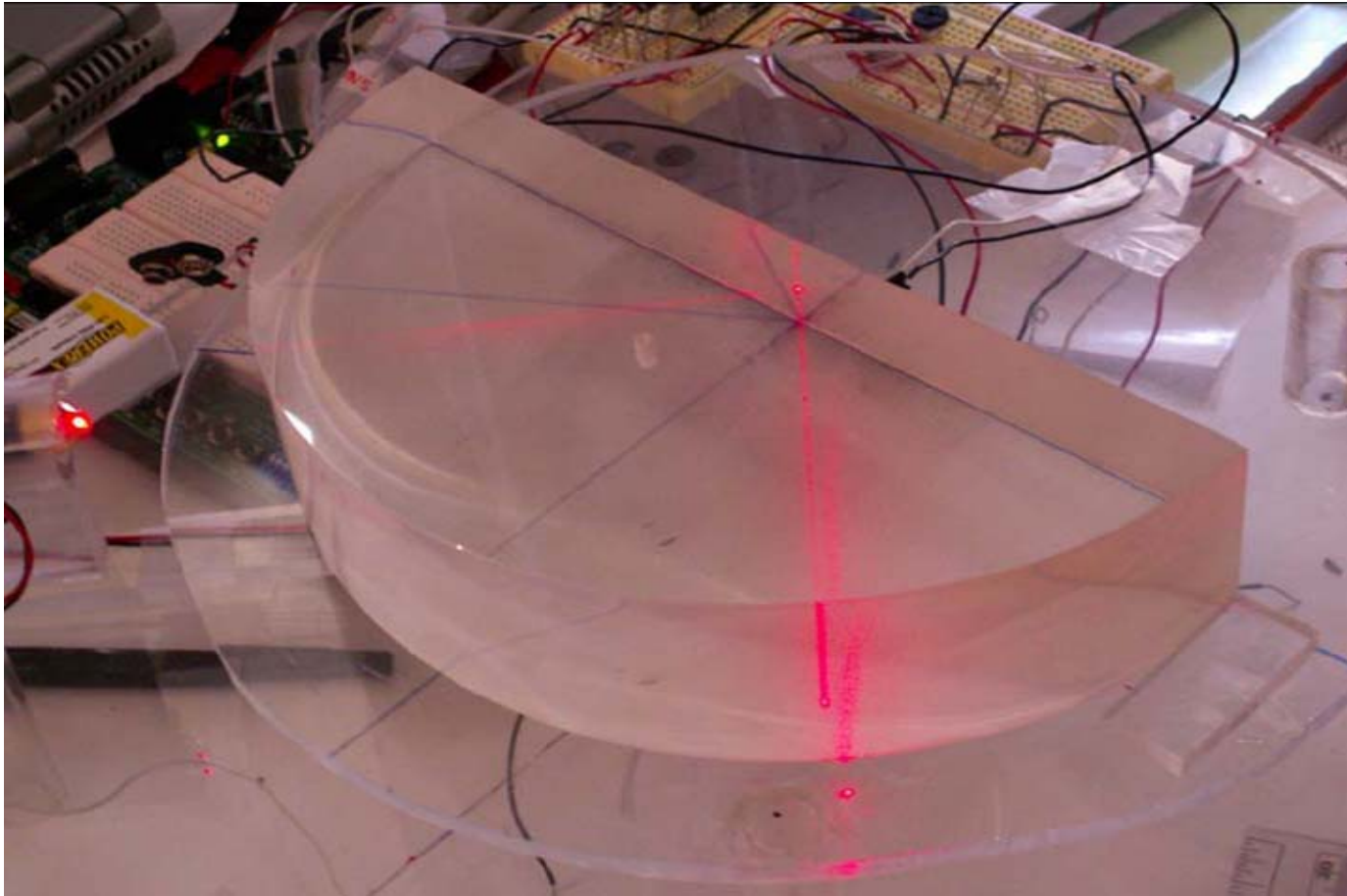
# The Heat Seeking Flame Probe

Teachers: Michael Francesco and  
Fady Ishak





# Finding the Critical Angle of a Prism



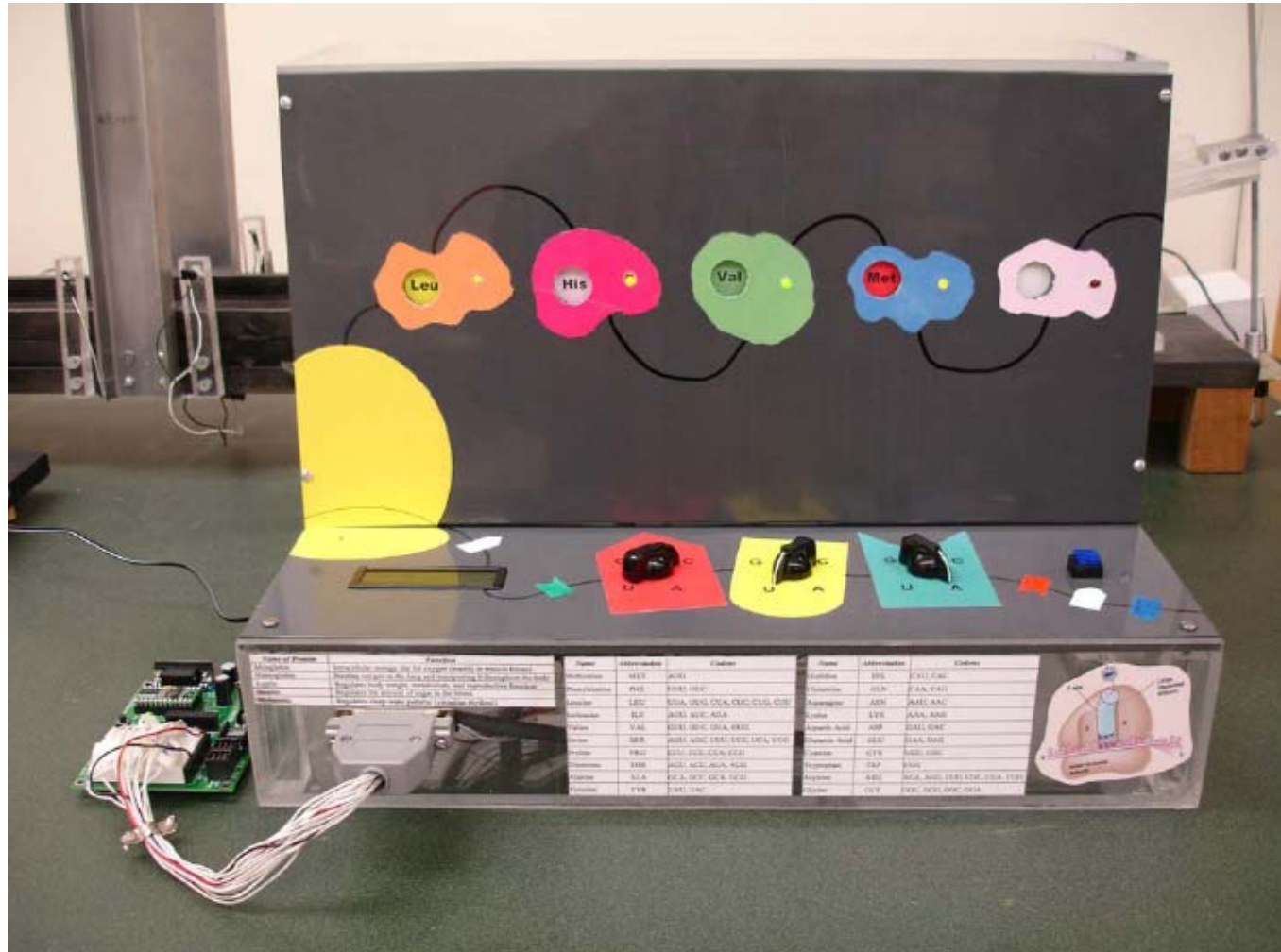
Teachers: Mustafa Kilic and Thomas Byrne

# The Smart Resonance Tube



Teachers: Joe Rodichok and Robert Morris

# The Codon Decoder



Teachers: Vera Mihalcik and Cameron Jahn

# Robo Submarine

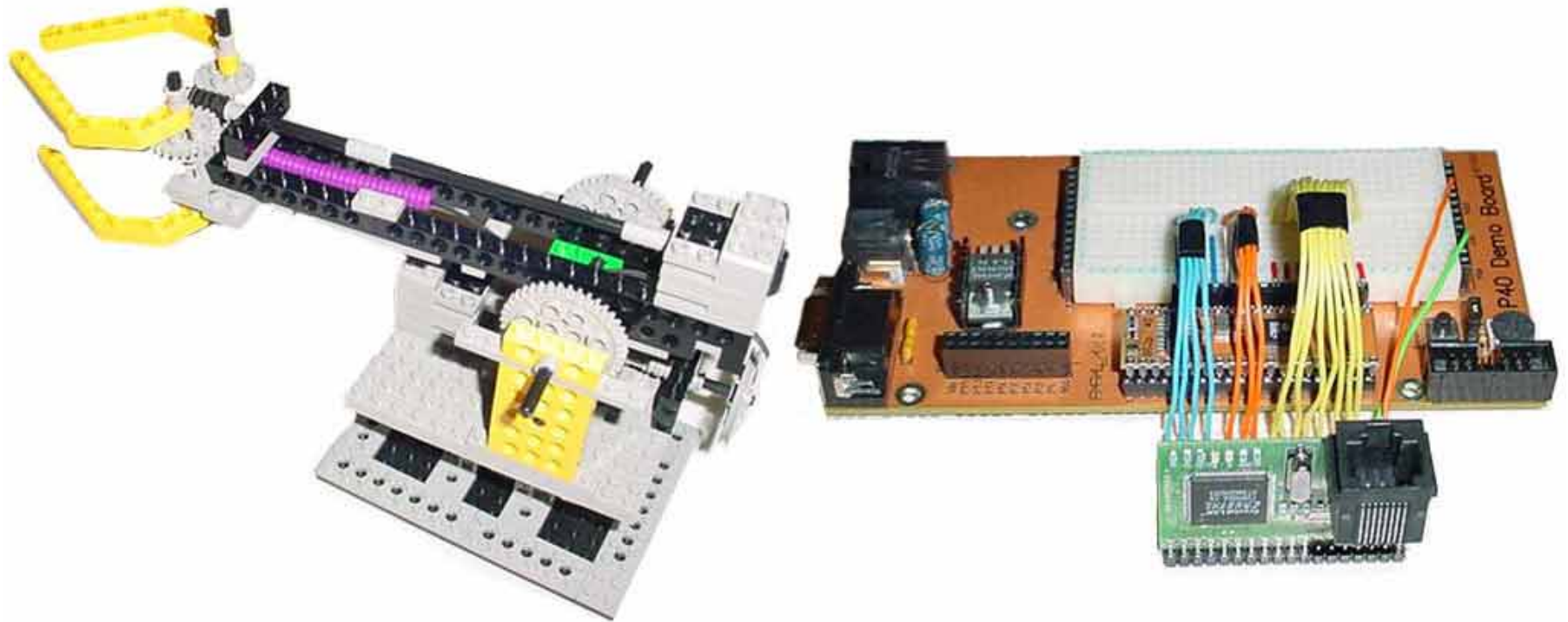
Teachers: Joy Hinds and James  
Kevin McMahon



# **Sample Mechatronics Projects**



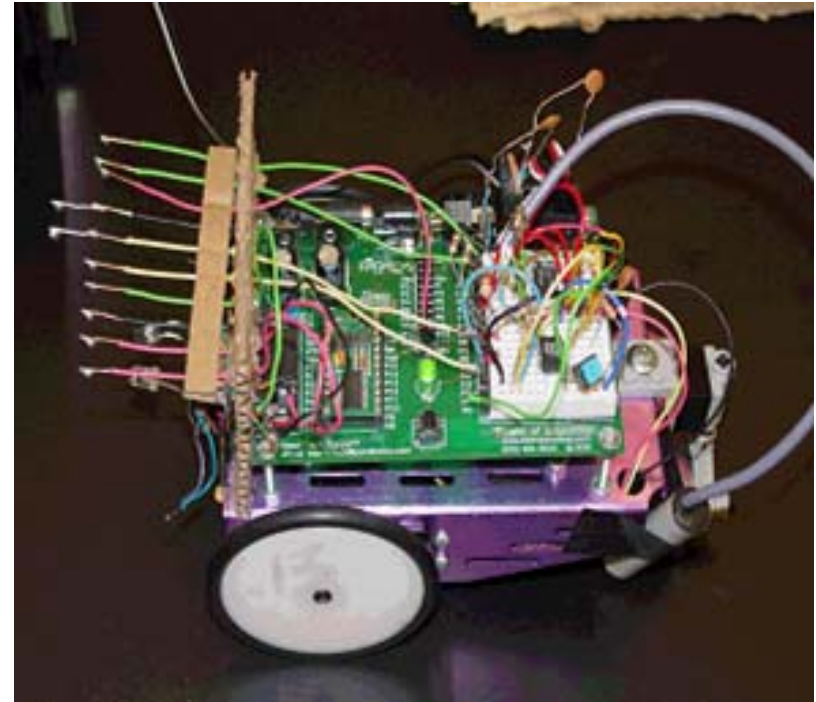
# Remote Robot Arm Manipulation



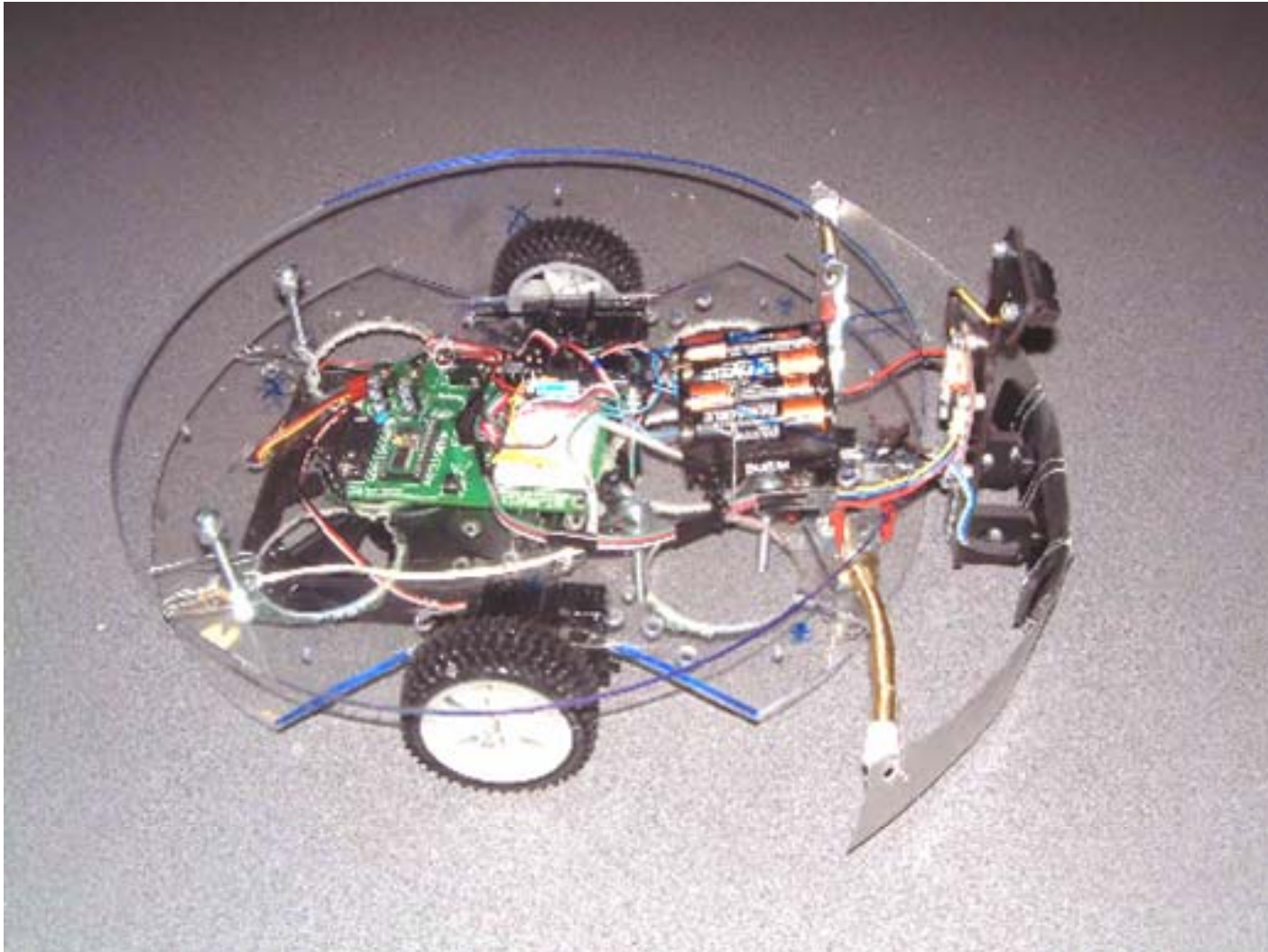
# Remote Emergency Notification System



# Smart Irrigation System



# RoboDry

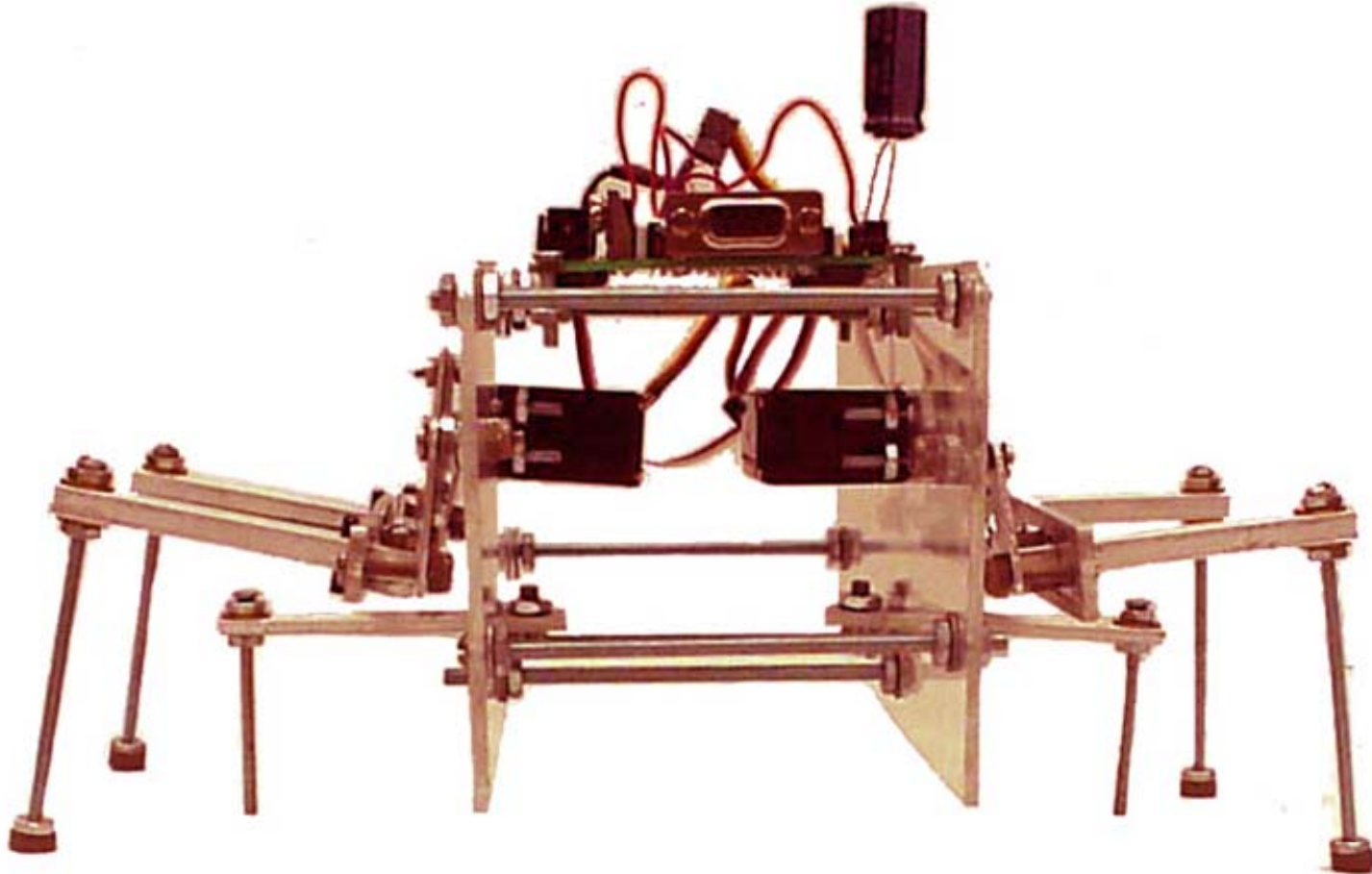




# Smart Cane



# Four-Legged Hexapod

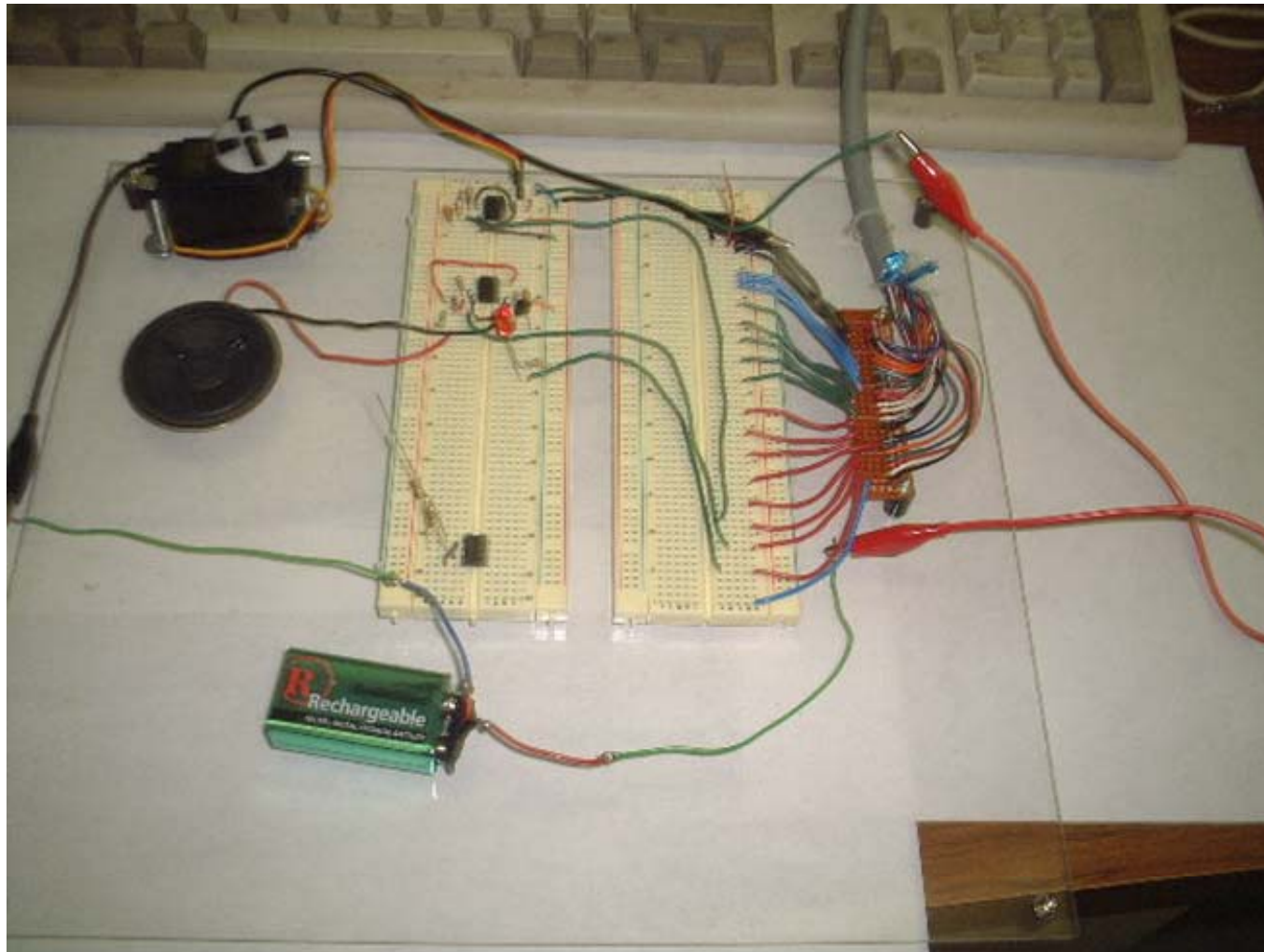


# Robotic Vacuum Cleaner

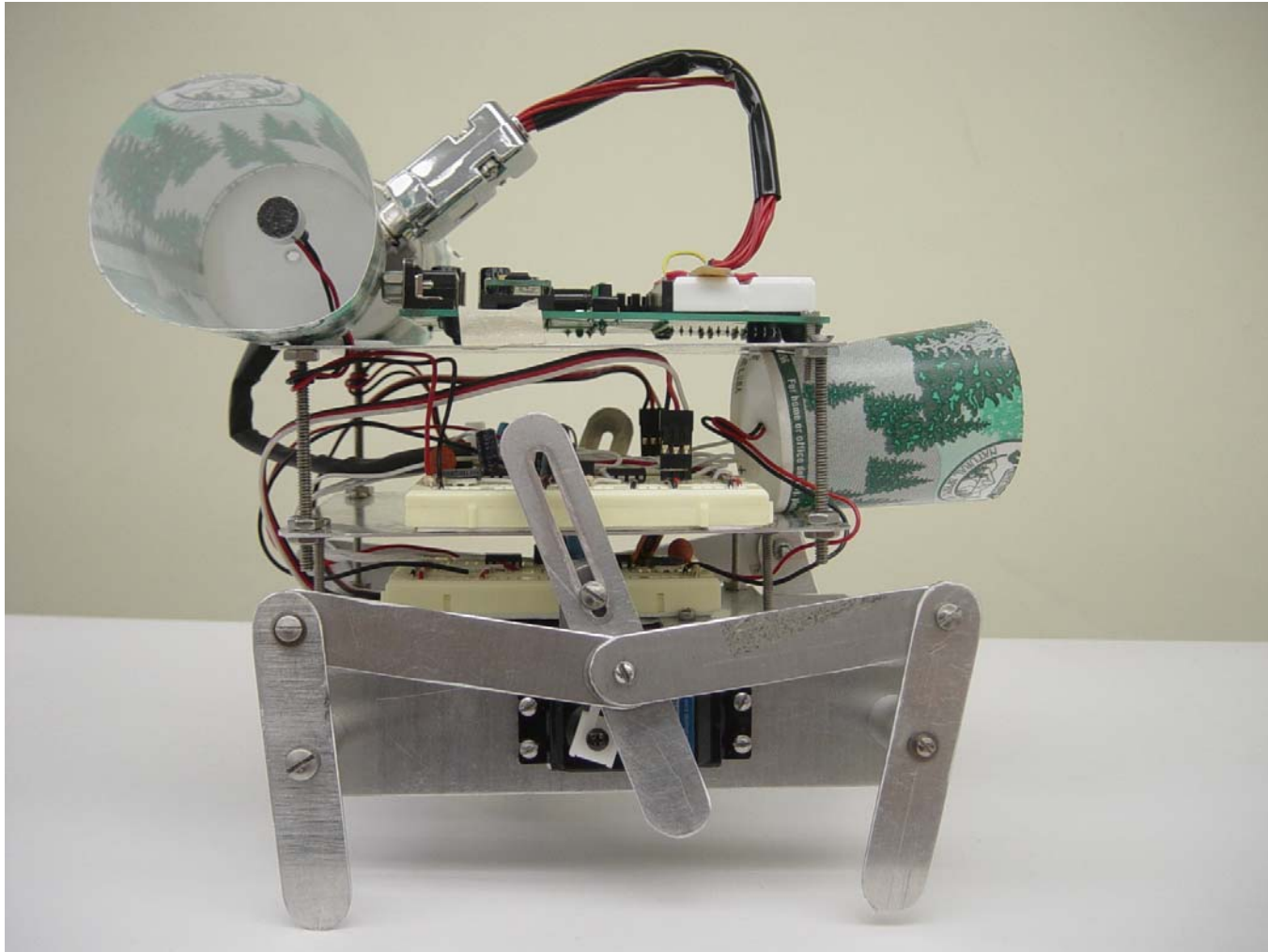




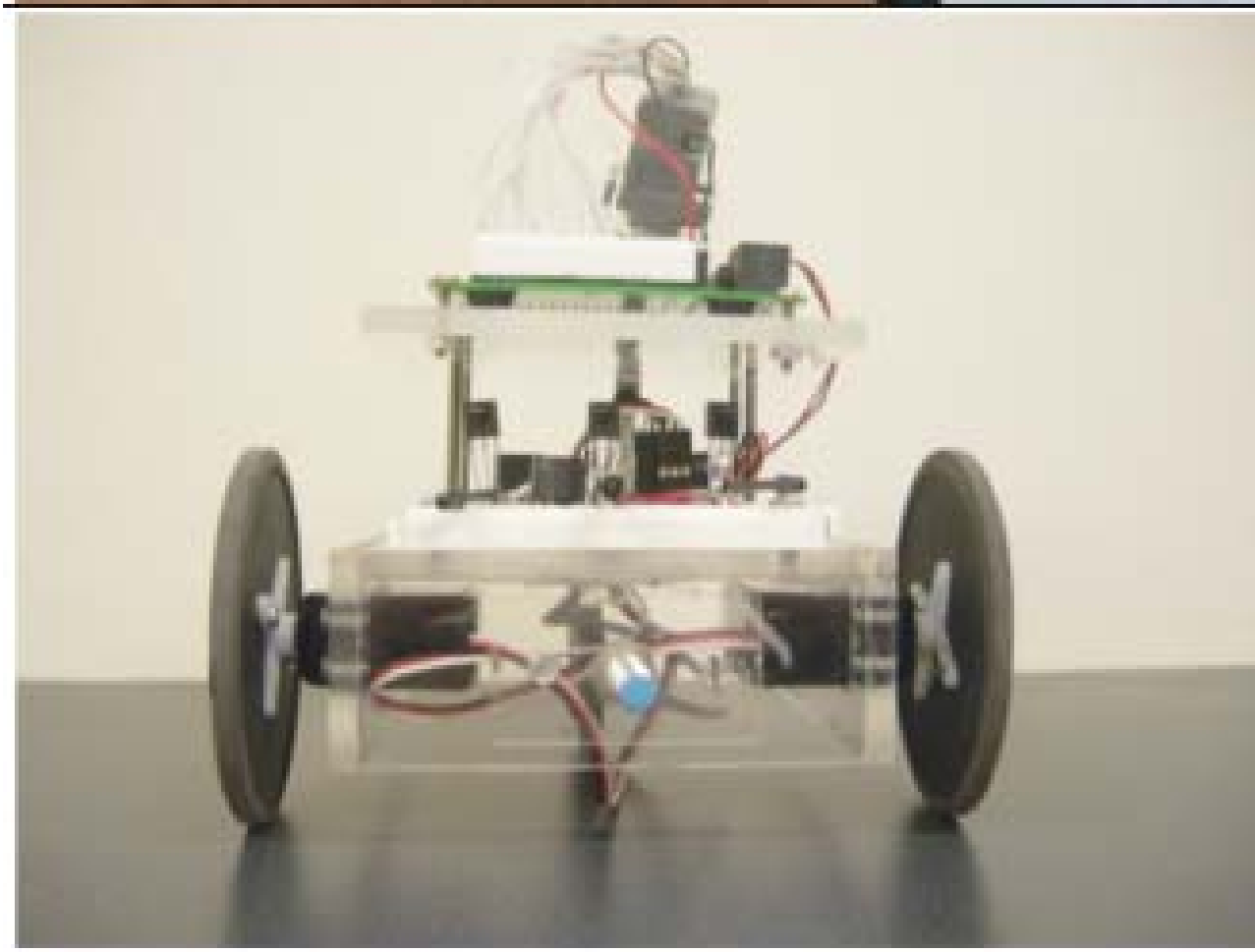
# Remote Control using the Parallel Port of a PC



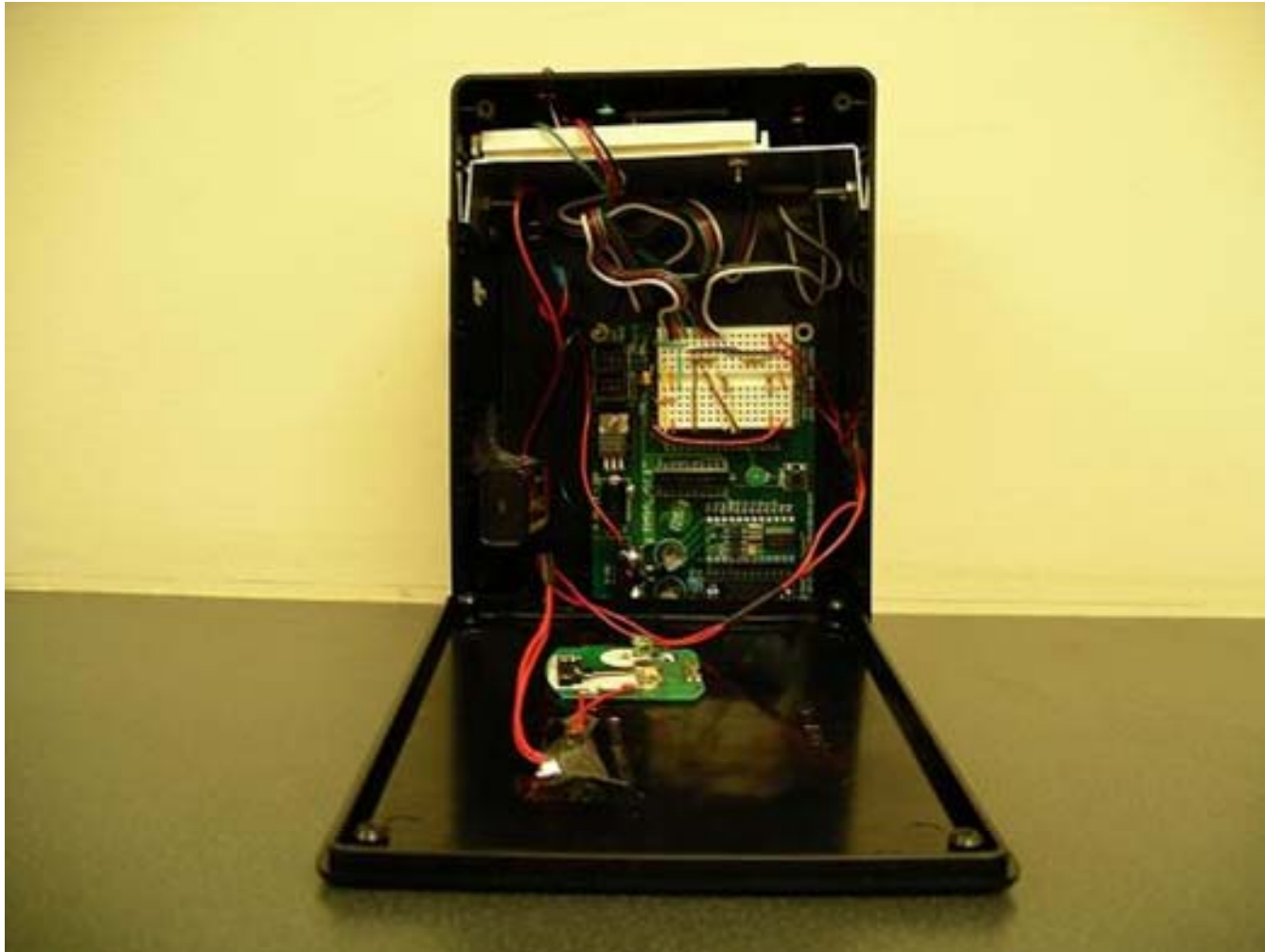
# Audio Enabled Emergency Hexapod



# Automated Distinguisher



# Local Navigation System

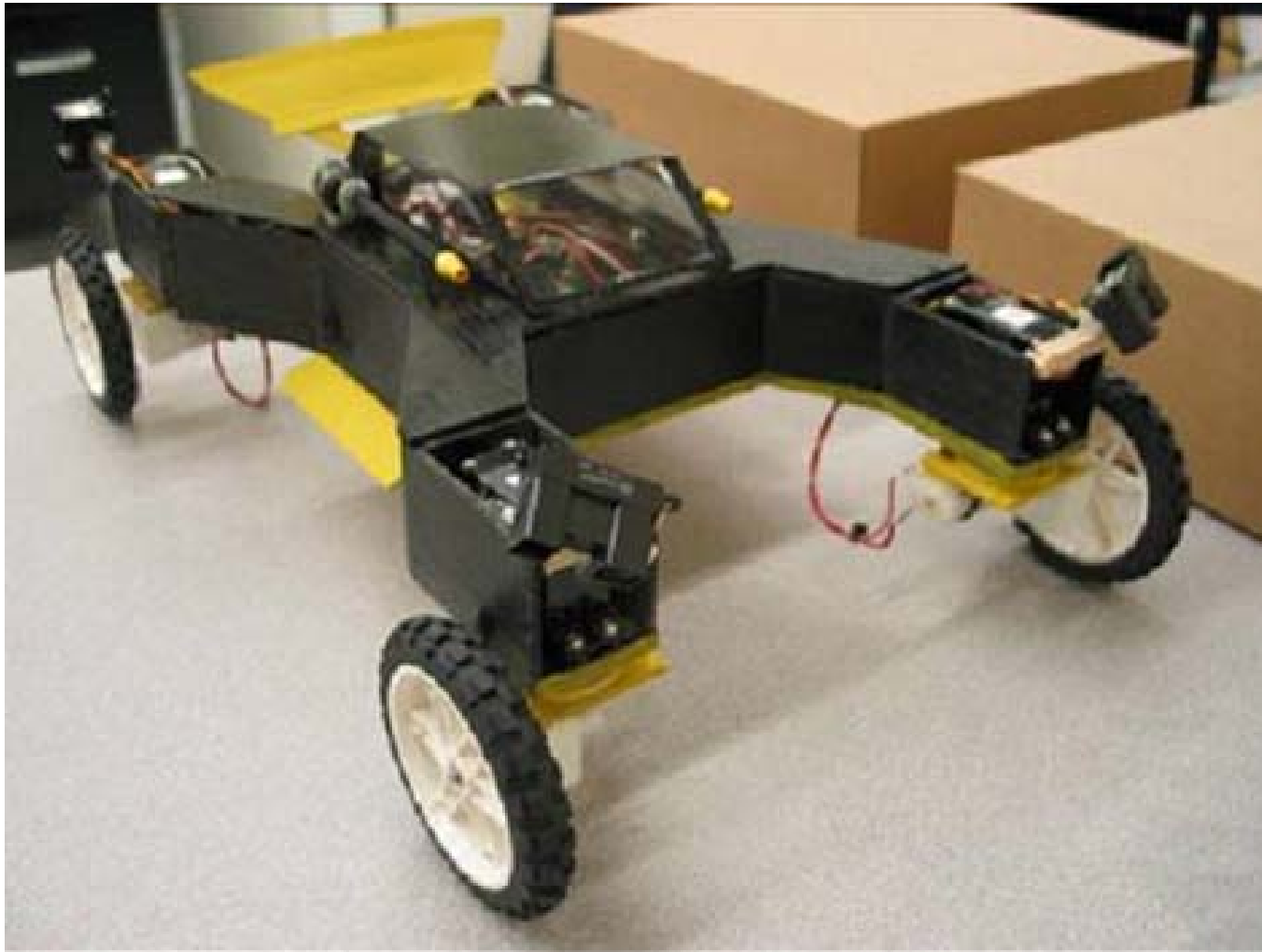


# The Safe 'N Sound Driver





# Type X

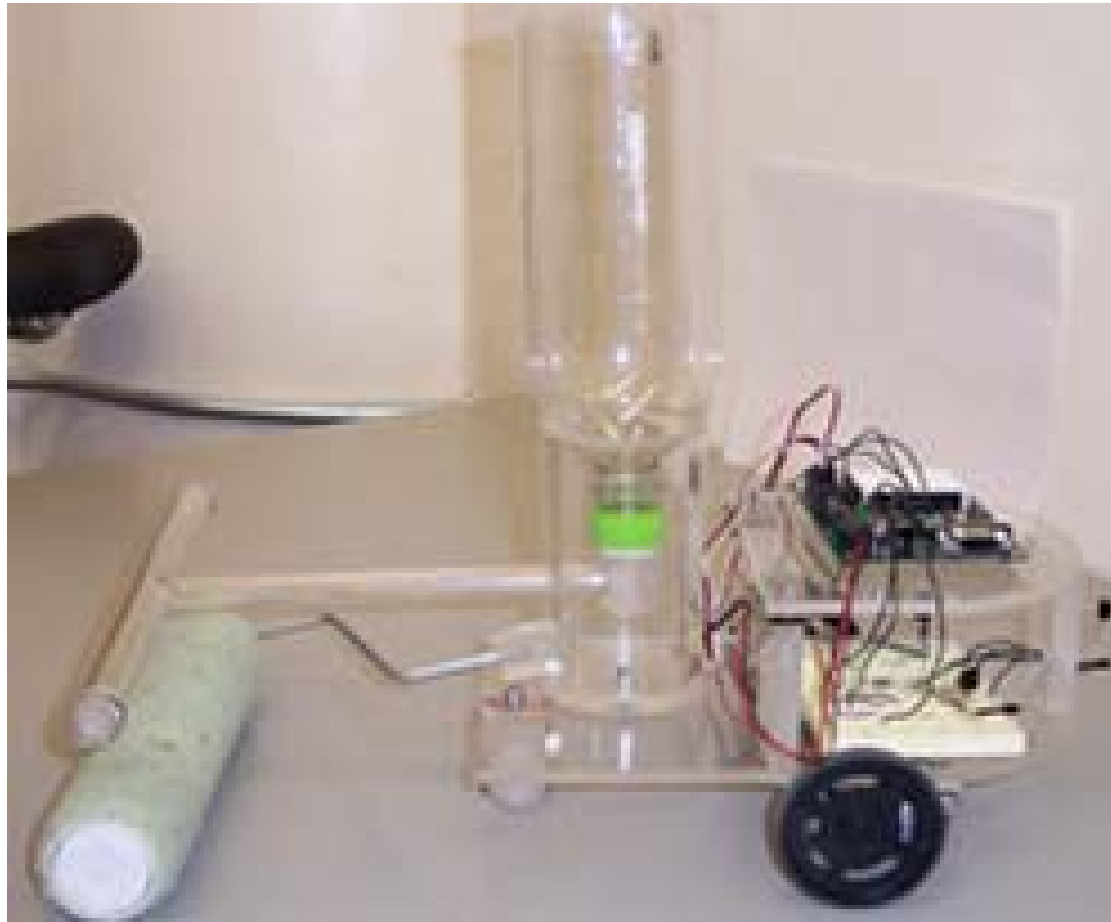


# The Smart Walker





# Autonomous Polyurethane Applier



# SMART Teachers' Accomplishments

## Grants

<b>Richard Balsamel</b>	<b>Science High School</b>	<b>Newark, NJ</b>	<b>\$4,000</b>	<b>School district</b>	<b>Mechatronics research club</b>
<b>David Deutsch</b>	<b>Manhattan Center for Science and Math High School</b>	<b>New York, NY</b>	<b>\$3,000</b>	<b>School and through the Children's Aid Society</b>	<b>After-school mechatronics club</b>
<b>Paul Friedman</b>	<b>Seward Park High School</b>	<b>New York, NY</b>	<b>\$1,500</b>	<b>School's alumni association</b>	<b>After-school program</b>
<b>William Leacock</b>	<b>W. C. Mephram High School</b>	<b>Bellmore, NY</b>	<b>\$1,500</b>	<b>School district</b>	<b>Hands-on activity in AP Physics class</b>
<b>Marlene McGarrity</b>	<b>The Christa McAuliffe School</b>	<b>Brooklyn, NY</b>	<b>\$1,500</b>	<b>Online grant agency</b>	<b>7th Grade class</b>
<b>Michael McDonnell</b>	<b>Midwood High School</b>	<b>Brooklyn, NY</b>	<b>\$300,000</b>	<b>VATEA</b>	<b>Robotics curriculum</b>
<b>Denise McNamara</b>	<b>High School for Health Professions and Human Services</b>	<b>New York, NY</b>	<b>\$1,600</b>	<b>School</b>	<b>Obtaining LEGO Robotics and Parallax Kits</b>

## Articles

<b>Robert Gandolfo</b>	<b>Plainedge High School</b>	<b>Massapequa, NY</b>	<b>SMART experience in his school district newspaper</b>		
<b>William Leacock</b>	<b>W. C. Mephram High School</b>	<b>Bellmore, NY</b>	<b>Article, "A SMART Program for Teachers," on TechLearning</b>		



## Teachers Use High-Tech Methods To Help Students Pursue Engineering, Electronics Careers

*JULY 21ST, 2003*

*Some New York City teachers are hoping to bring all sorts of high-tech concepts into their classrooms next school year to inspire more students to pursue careers in engineering and electronics. As NY1 Tech Beat reporter Adam Balkin explains in the following story, students won't just be hearing about those concepts, they'll be building them too.*

Classrooms have certainly come a long way since the abacus and the quill. How far? Polytechnic University in Brooklyn is running a new program this summer, educating area high school teachers on how to bring mechatronics into the classroom. It's a program funded by the National Science Foundation called SMART.

"SMART stands for 'science and mechatronics aided research for teachers,'" says Vikram Kapila of Polytechnic University. "Mechatronics is marriage of mechanical engineering, electrical engineering, electronics, computer science and computer engineering to make smart products."

These projects aren't just designed to look neat or be like high-tech erector sets - they're built to actually do something eventually in the real world. A hexapod, for example, could be used for disaster recovery. After a building collapse it could be sent in to look for possible survivors.

"These could be robots, smart jet engines, automotive hybrid systems, rockets, missiles, or what have you," says Kapila.

"This is like a simulator for a jet pilot, and what they'd do before they actually become jet pilots, but most of it has to do with the fact that I'm controlling the helicopter basically by using sensors," says Clay Davis of Manhattan Comprehensive Day/Night High School.

The teachers all agree, students are more eager to learn when they can use concepts and equations to actually make something they can touch and use.

"It's tangible," says Paul Friedman of Seward Park High School. "You look at a differential equation and it's a differential equation. It just sits there, and this is real. It's live, and it has applications."

Michelle Carpenter-Smith of Packer Collegiate Institute says, "I think this is a way for me to bring projects back that will interest females as well as male students so that hopefully more female students will go into engineering, go into math and science professions, and they'll bring their way of viewing engineering from a creative perspective, from an artistic perspective, so that there can be more representation from both genders."

The program runs for four-weeks. After it's over, each teacher is given supplies to build some of these projects back at their high schools. For more information on the program, including a list of which high schools are participating, visit [mechatronics.poly.edu/smart](http://mechatronics.poly.edu/smart).

- Adam Balkin

**COVER STORY**

# Brooklyn Daily Eagle

Volume 46, No. 141, MONDAY, OCTOBER 27, 2003 E-mail: [edit@brooklyneagle.com](mailto:edit@brooklyneagle.com) & DAILY BULLETIN

Founded in 1841 by Isaac Van Anden

## Science-Oriented Kids from Across The U.S. Gather at Polytech Conference

Gathering Held in NYC for First Time; Students Housed at Marriott

By Raanan Geberer  
Brooklyn Daily Eagle

DOWNTOWN BROOKLYN — What are 16- and 17-year-olds interested in? Usually dating, sports, music, movies, homework, friends. The teens who were at the National Consortium of Specialized Secondary Schools in Math, Science and Technology conference at Polytechnic University this past weekend are no doubt interested in these things, but they're also interested in biotechnology, engineering, computer technology, robotics, physics and more. And they're part of a select group of about 300 that were sent from high schools around the country to the conference.

While the conference has been around for many years, this is the first time it's ever been held in New York City. The kids were housed at the New York Marriott at the Brooklyn Bridge, four to a room.

For many, it was the first time they were in New York City. "Things we take for granted, they're amazed at," said Shmuel Alamed, a Bronx High School of Science student.

"One girl, from Alabama, was surprised that the cars keep honking their horns. And the slang is different. One person said, 'I feel you,' and I said, 'what?' He soon figured out, of course, that it means 'I understand you.'"

The goal isn't necessarily to recruit the students to Polytechnic, said Dr. Noel Krilichev, former superintendent of Brooklyn/Staten Island High Schools and one of the organizers of this year's conference. "We just want to get them to New York City and see what it has to offer."

The topics of the seminars would be daunting even to most adults. Here are just a few: "The Role of Sampling Stations in Water Quality"; "The Physics of Optics"; "Lego Robotics as a Learning Strategy"; "Redevelopment of the Manhattan Waterfront Using Recycled Plastic Pyrolysis"; and even "Prepare for Mars Travel."

This reporter sat in on two seminars. In the first, "The Internet and Recorded Music," a Polytechnic student demonstrated how he recorded a CD onto his computer hard drive, using Windows Media Player. He played it at its normal size, about 20 MB.

He then played it at different levels of compression until he reached the smallest, 8 KB. By this point, it sounded like mud, recorded underwater.

In another seminar, Sang-Hoon Lee, PhD mechanical engineering student at Polytechnic, showed the teens some robots he had constructed. One of these was the six-legged, radio-controlled "Hexapod." Another ran on a track, similar to the slot cars of yesterday.

For student Kristin Beck, of High Tech High School, Lincoln, N.J., this was her second year at the conference. "Last year, at school, I did a project that was based in part on one of the seminars I saw here."

"This year, I'm sure I'll also be able to work on a project inspired by

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Plainedge Union Free School District  
Volume XXXXI, Number 2

November 2003

# Plaintalk

Plainedge Public Schools Community Newsletter

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**Engineering Teacher Constructs Mechatronics Device**

Plain Talk • November 2003 • 4



*Introduction to Engineering teacher Robert Gandolfo demonstrates a mechatronics device operated by computer commands, that he and another teacher built as part of a summer research program.*

Plainedge teacher Robert Gandolfo demonstrated a mechanism that combines concepts of mechanical, electrical and computer science engineering to his students in the Introduction to Engineering class. The device was designed, built and programmed by Mr. Gandolfo and Mr. Paul Friedman of Seward Park HS as part of a summer research program at Polytechnic University.

The device is a visual demonstration that simulates the motion of a crane or a human elbow and has applications to the engineering problem solving activities that the Introduction to Engineering students will be doing over the school year.

The mechanism, a cantilever beam supported by a cable (string) at one end, is operated by a programmable micro-processing chip. Servomotors driven by the chip set the angle of the beam to the desired value. All of the measured and calculated data is displayed on the computer screen allowing the student to make changes and instantly see the effect.

During the summer Mr. Gandolfo and nine other teachers from Long Island, New York City and New Jersey spent four weeks participating in a National Science Foundation funded research program at Polytechnic University in Brooklyn under the direction of Professor Vikram Kapila. The goals of the program are to train teachers in the area of engineering called mechatronics enhancing high school instruction and thereby attracting more students to the engineering profession.

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Plainedge Public Schools Community Newsletter  
[www.plainedgeschools.org](http://www.plainedgeschools.org) Alice Mateos, PlainTalk Editor 516-992-7452

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Christine P. Simer, 9927-660; Section 504 Coordinator (handicap discrimination) Mona Tobin 9927-680.



**SUMMIT**

**Funded by The New York State Education Department**



# BROOKLYN HeightsPress & COBBLE HILL NEWS

BROOKLYN HEIGHTS PRESS & COBBLE HILL NEWS

## Robots Are Part of New Instruction at Polytechnic

By Ramon Guber

Teachers, remember, says Dennis Geller, a physics teacher at the New York Heights School in Manhattan, are not intimidated by technology — cell phones, computers, CD and DVD players, and more.

But when they go to school and attend science classes, the way they frequently are taught the same way they would have been taught 100 years ago. Clearly, a new type of technology is needed to make high school science lessons fun.

That's why Polytechnic University is now teaching, with funding from the National Science Foundation, the Science and Mathematics Assisted Research for Teachers (SMART) Program, to help teachers from public high schools learn more about robotics, mathematics and related disciplines. It is provided once by Prof. Vikram Kapila, associate professor of mechanical engineering at Polytechnic.

The teachers, in turn, will be able to impart what they have learned to the students, some for the first time.

Some of the robots used as examples and teaching tools were on display last week when the reporter visited. One, a small robot with the face of a cat kept on the floor, but never moved. It is called "Robbie." If someone or something touched against him, the "cat" walked the other way.

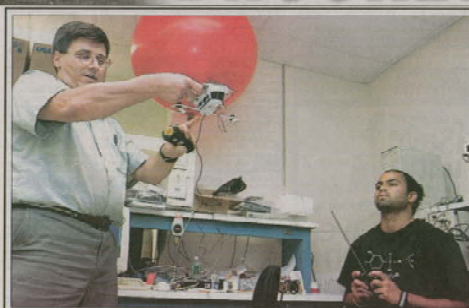
This technology, said Prof. Kapila, can be used in science, when military vehicles have been maneuvered in the field of sight. A similar robot using military sensors can also be on display or someone speaks loudly or sings his or her fingers apart in the "cat." Actually paper cups, the robot will move to avoid the sound.



Teacher Ramon Guber of Middle College High School demonstrates a "cat" robot that has sensors in its "whiskers."

THURSDAY, JULY 22, 2004, PAGE 15

# YOUR NEIGHBORHOOD BROOKLYN



Science teacher Ramon Guber (left) and Lennex Henry, a biology and Earth science teacher at Washington Irving High School in Manhattan, build a remote-controlled weather station at Polytechnic University science program.

## Teachers go hi-tech

Taking Poly U science know-how back to HS

BY ELIZABETH HAYS

PHOTO BY NATHAN SANCHEZ

While this is to do things with things that move," he added as another teacher demonstrated a remote-controlled weather station in Queens — learned how to build "smart" robots that do everything from wiping up spills to making doors open the program at Polytechnic University in Manhattan, Brooklyn, funded by a \$450,000 grant from the National Science Foundation.

The three-year program aims to expose teachers to cutting-edge technology so they can take the skills back to their classrooms.

"It's great," said Robert Widen, a biology and physics teacher at Central who has been teaching for 20 years.

Widen said the program is a great way to learn about new technology that could be used to teach science, math and engineering.

Henry, who hopes to use his new-found skills to launch a robotics program at his school, said other teachers could build the sophisticated contraptions with their students for less than \$150 in equipment costs.

Polytechnic will begin accepting applications for next month's program this summer and mechanical engineering Prof. Vikram Kapila, who advised the program last year.

Kapila said the project aims to ensure that city schools and students have access to cutting-edge technology as they can improve new generations of students who are sometimes more technologically advanced than their school's aging faculty.

"These teachers become my ambassadors about what it is that scientists do," said Kapila.

Polytechnic officials said the program is part of a broader campaign to open the university's high-level research and labs to public school students and teachers.

Teachers are getting up to speed on a \$1.5 million program that will fund a dozen graduate and postgraduate students in the city's public schools to study innovative research plans.

PHOTO BY NATHAN SANCHEZ

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## Polytechnic Program Helps Teachers Integrate High Tech into the Classroom

They Build Robots To Demonstrate Scientific Concepts and Laws

By Ramon Guber

Brooklyn Daily Eagle

BROOKLYN — Teachers remember, says Dennis Geller, a physics teacher at the New York Heights School in Manhattan, are not intimidated by technology — cell phones, computers, CD and DVD players, and more. But when they go to school and attend science classes, the way they frequently are taught the same way they would have been taught 100 years ago. Clearly, a new type of technology is needed to make high school science lessons fun.

That's why Polytechnic University is now teaching, with funding from the National Science Foundation, the Science and Mathematics Assisted Research for Teachers (SMART) Program, to help teachers from public high schools learn more about robotics, mathematics and related disciplines. It is provided once by Prof. Vikram Kapila, associate professor of mechanical engineering at Polytechnic.

The teachers, in turn, will be able to impart what they have learned to the students, some for the first time. Some of the robots used as examples and teaching tools were on display last week when the reporter visited. One, a robot with the face of a cat kept on its feet, but never moved. It is called "Robbie." If someone or something touched against them, the "cat" walked the other way.

This technology, said Prof. Kapila, can be used in science, when military vehicles have been maneuvered in the field of sight. A similar robot using military sensors can also be on display or someone speaks loudly or sings his or her fingers apart in the "cat." Actually paper cups, the robot will move to avoid the sound.

## Polytechnic Program Helps Teachers Integrate High Tech into the Classroom



Then New York area high school teachers are taking the SMART Science and Mathematics Assisted Research for Teachers program at Polytechnic University.

PHOTO BY NATHAN SANCHEZ

Continued from page 1

ry sensors was also on display — if they speak loudly or sing his or her fingers apart in the "cat." Actually paper cups, the robot will move to avoid the sound.

One interesting example of high-tech, showed last year by a teacher from Washington Irving High School who took the seminar, demonstrated the Law of Physics: Newton's. A miniature golf programmed for distance and trajectory of the angle. There is a robot that moves against them, a "cat" should be the first sign — and usually does.

Another device under test of a dot-on track, but with a speed limit programmed in and speed sensors on the track. If the car exceeds the speed limit, the sensors pick it up and the computer shuts them down.

Teachers who are taking part in the SMART seminar come not only from the five boroughs, but also such nearby locations as Rockland and Westchester Counties.

One teacher, Lennex Henry, who teaches high science, says he was one to learn most about using micro-processors, programming languages and robotics. Mr. Geller, the aforementioned physics teacher, said the school is starting a new elective applied robotics and programming.

But only do the teachers use these techniques in their classes during the



Prof. Vikram Kapila of Polytechnic University demonstrates this robot with military sensors in its "ears," amplified by paper cups.

PHOTO BY NATHAN SANCHEZ

Teacher Ramon Guber of Middle College High School demonstrates this "cat" robot, with sensors in its "whiskers."

The idea of fund-raising by teachers may sound unusual, except when one considers the amount of budget cuts and lack of sufficient funding for city schools in today's world.

With the SMART program, says Prof. Kapila, "Science labs can become fun."

Polytechnic UNIVERSITY

SUMMIT

Funded by The New York State Education Department

# SMART Participants



2003

People: PI, graduate students, and undergraduates partnered with 21 New York city metropolitan area pre-college STEM educators for 4 weeks in 2003 (10 teachers), 2004 (11 teachers), and 2005 (17 teachers) summer to develop projects demonstrating concepts of projectile motion, speed, time, static balance, mobile robotics, etc.



2004





FEATURE

## Science and Mechatronics-Aided Research for Teachers

The "SMART" program provides teachers with training and workshops

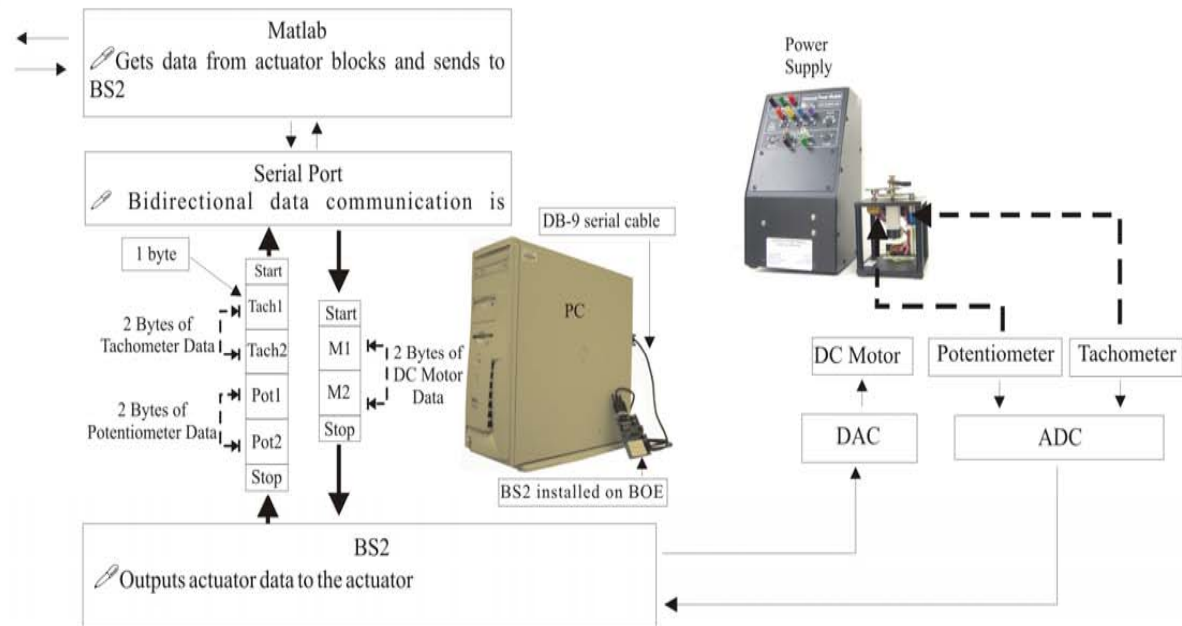
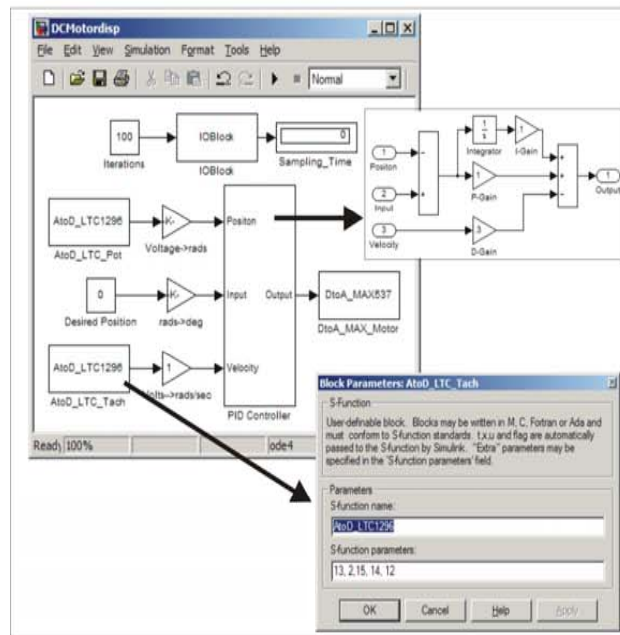
### "Smart" Teachers

**M**r. Richard Balsamel of Science High School, Newark, NJ, raised over US\$4,000 from his school district for mechatronics kits and supplies and began a mechatronics research club. In addition, he is introducing mechatronics in his physics classes by integrating four sample activities for students. Mr. David Deutsch of Manhattan Center for Science and Math High School, New York, NY, has raised over US\$3,000 from his school and the Children's Aid Society for mechatronics and robotics kits. He is training students in an after-school mechatronics club. Mr. Paul Friedman of Seward Park High School, New York, NY, has raised over US\$1,500 from his school's alumni association for robotics kits. He has partnered with a colleague to train students in an after-school program. Mr. Robert Gandolfo of Plainedge High School, North Massapequa, NY, reported on his SMART experience in his school district newspaper [12]. Mr. William Leacock of W. C. Mepham High School, Bellmore, NY, received a US\$1,500 minigrant from his school district for mechatronics kits. Every other day, during a single class period of AP physics, he teaches a short lesson introducing his students to a hands-on activity planned for a double class period

the following day. Mr. Leacock wrote the following to us: "The students are enjoying it so much that, even though I allow them a break in between the double periods, almost all of them stay and work right through the break. It is wonderful to see them learn and enjoy themselves so much." Mr. Michael McDonnell of Midwood High School, Brooklyn, NY, used over US\$5,000 funding from his school to obtain robotics kits and taught robotics to over 200 students in the Fall of 2003 and Spring of 2004 through robotics and advanced robotics courses. Furthermore, with colleagues, he applied for and received a three-year US\$300,000 grant from his school district under the Vocational and Technical Education Act (VATEA). The VATEA grant will enable him to develop and implement a four-year robotics curriculum in his school. Finally, Ms. Marlene McGarrity of the Christa McAuliffe School, Brooklyn, NY, raised over US\$1,500 for a project titled "Young Engineers are Made in Brooklyn Through Robotics and Mechatronics," through an online grant agency. From this grant, she obtained wheeled robots and Mars rover kits, and is using these in her seventh-grade classroom. She also wrote an article [13] on her SMART experience.

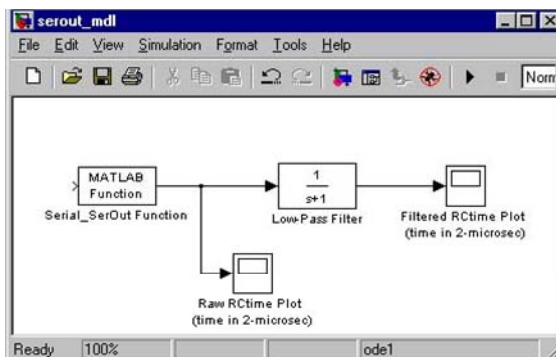
# Matlab Data Acquisition and Control Toolbox for Basic Stamp Microcontrollers

## BS2 and Matlab Serial Communication

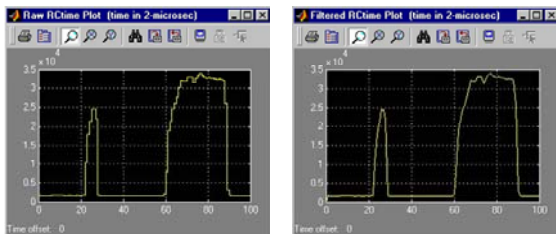


Anshuman Panda, Hong Wong, Vikram Kapila, and Sang-Hoon Lee

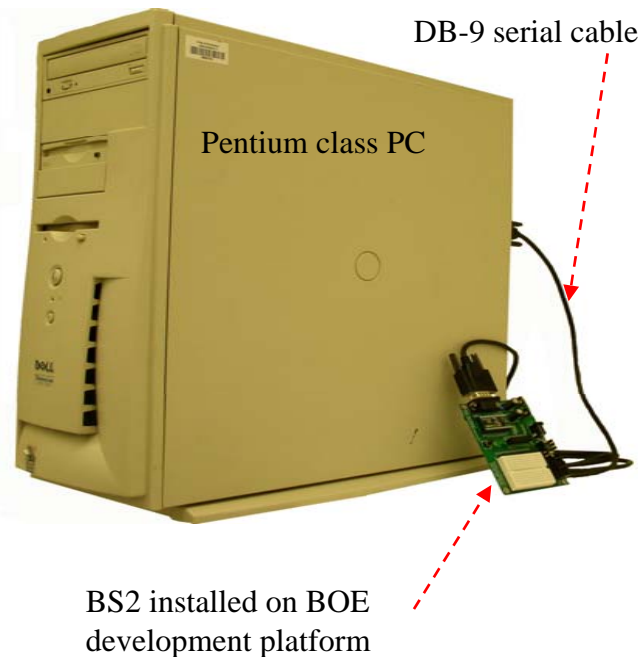
# Matlab-Based Graphical User Interface Development for Basic Stamp 2 Microcontroller Projects



Simulink block diagram used for PC to BS2 serial communication



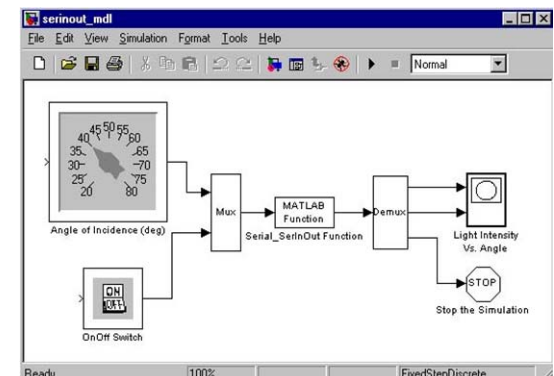
Unfiltered and Filtered plot of rctime



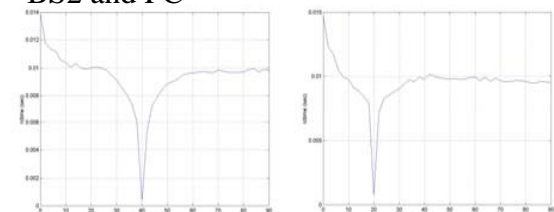
DB-9 serial cable

Pentium class PC

BS2 installed on BOE development platform



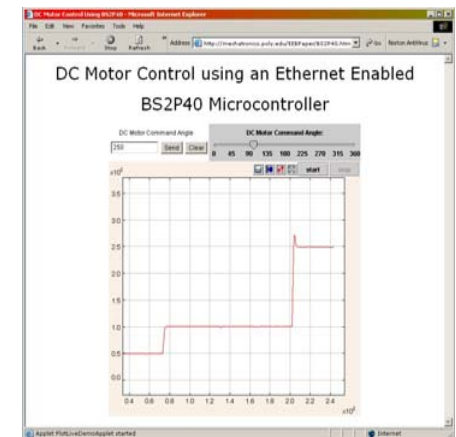
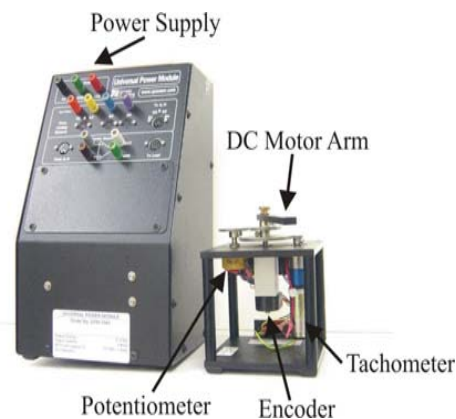
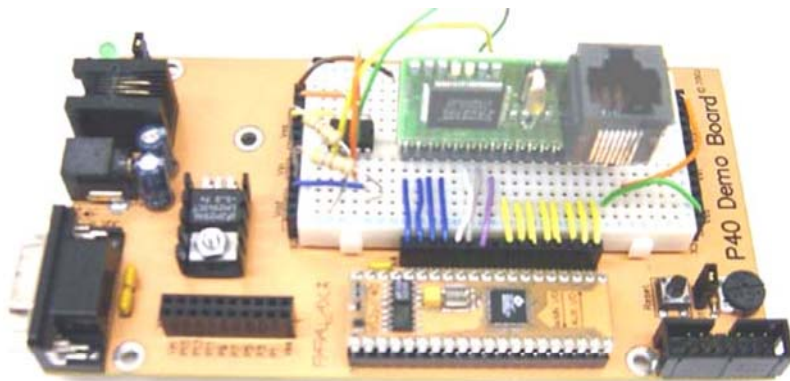
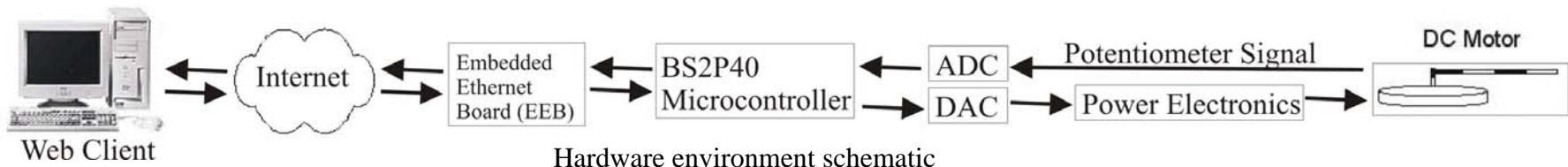
Simulink block diagram used for bi-directional serial communication between BS2 and PC



Plot of rctime vs. angle of light sensor

Yang-Fang Li, Saul Harari, Hong Wong, and Vikram Kapila

# Internet-Based Remote Control using a Microcontroller and an Embedded Ethernet Board

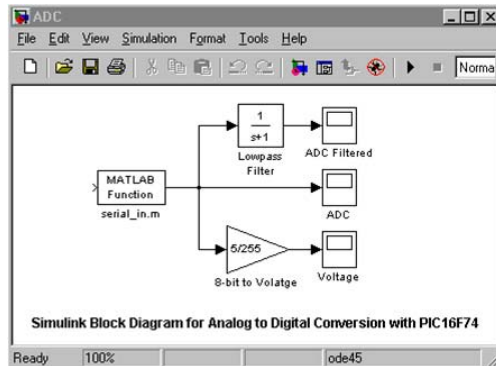


Java applet GUI screen capture

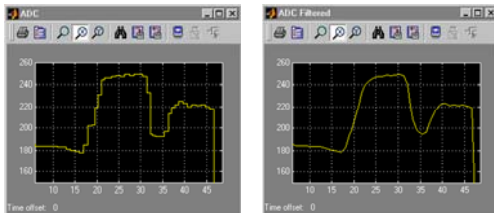
Imran Ahmed, Hong Wong, and Vikram Kapila



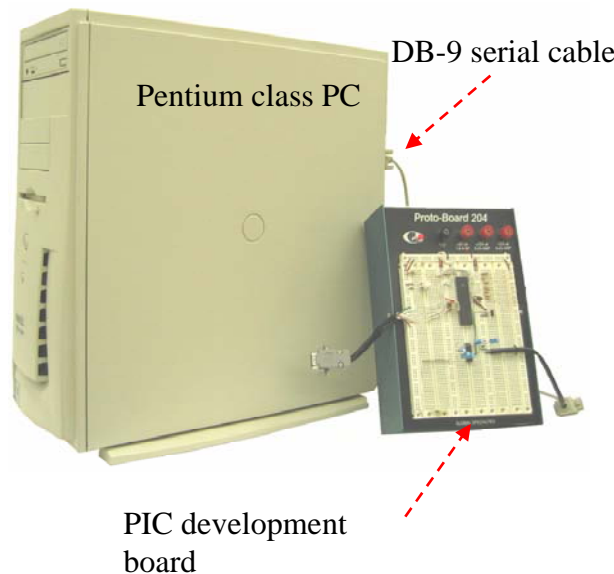
# Matlab-Based Graphical User Interface Development for PIC Microcontroller Projects



Simulink block diagram used for PIC to PC serial communication



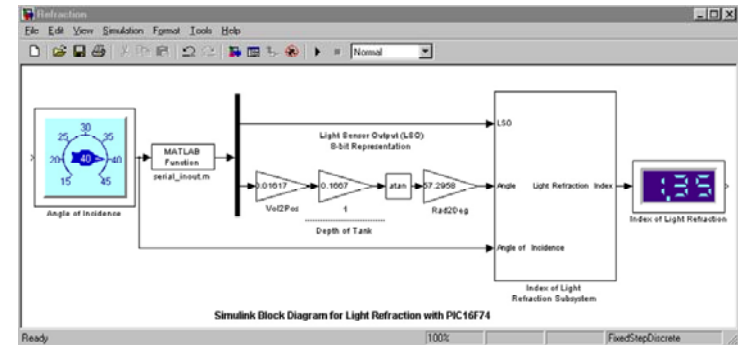
Unfiltered and Filtered plot of ADC



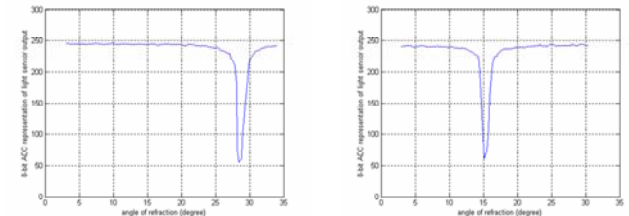
Pentium class PC

DB-9 serial cable

PIC development board



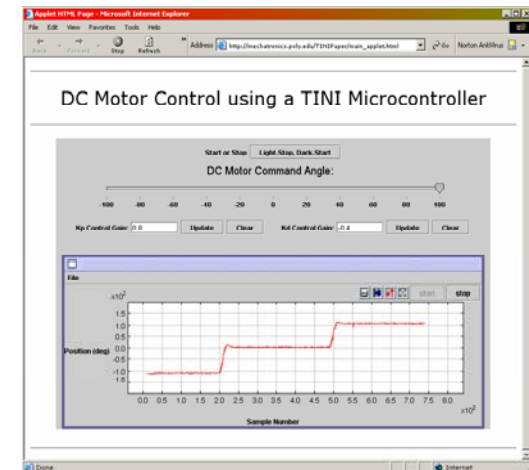
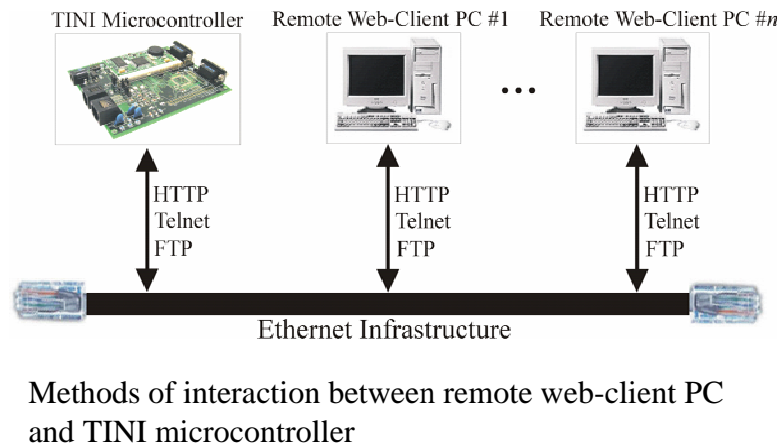
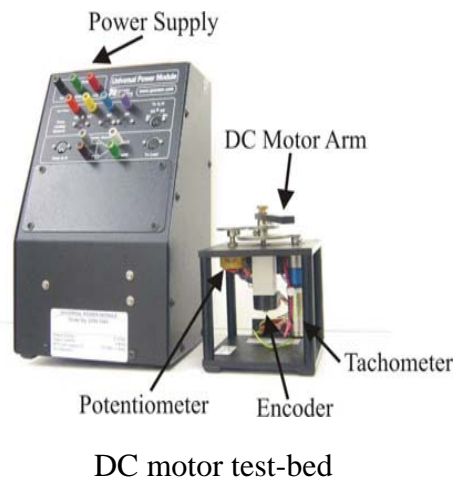
Simulink block diagram used for bi-directional serial communication between PIC and PC



Plot of angle of refraction vs. light sensor output

Sang-Hoon Lee, Yang-Fang Li, and Vikram Kapila

# Internet-Based Remote Control of a DC Motor using an Embedded Ethernet Microcontroller



Java applet GUI screen capture

Hong Wong and Vikram Kapila



# MPCRL Demonstration

- Web-enabled **M**echatronics/**P**rocess **C**ontrol  
**R**emote **L**aboratory (MPCRL)
- URL: <http://mechatronics.poly.edu>
- Person in-charge: Mr. Nathan (Sang-Hoon) Lee