

Mt. San Antonio College



Society of Physics Students

Rabid Robots!

Using Robotics to Encourage Students to Study Physics. Final Report

Participants:

*German Monroy
Carlos Leal
Vinai C.
Benjamin Chu*

SPS Chapter Advisor:

Professor Martin Mason

Prepared by:

*German Monroy, Carlos Leal, Vinai C.,
Benjamin Chu*

I. Abstract

Robotics competitions have dramatically increased interest in SPS on campus and resulted in increased participation in all activities. Over twenty high school students attended sumo robotics workshops at the Mt. SAC campus and to date more than fifteen sumo robots have been built. In addition the Mt. San Antonio College SPS mentored two groups of high school students in the Vex technical robotics competition that took second place in the Southern California competition and was able to compete in the World Championship.

II. Statement of Activity

Mt. Sac SPS expanded its robotics program to include more students and created an outreach program to local K12 schools. To be specific there were twelve robot sumo workshops each of which served between ten and twenty students.

Dates of workshops:

1st Series

- January 25, 2008
- February 1, 2008
- February 8, 2008
- February 15, 2008
- February 22, 2008
- February 29, 2008 (Leap Year!)
- Competition March 1, 2008

2nd Series

- May 2, 2008
- May 9, 2008
- May 16, 2008
- May 23, 2008
- May 30, 2008

- Competition June 6, 2008

Each workshop consisted of an introduction to robotics concepts followed by students building a robotics subsystem from provided components.

Mini Sumo:

The mini-sumo robot is a small autonomous robot that is designed to push other robots out of a ring. There are basically 3 stages of build. The 1st stage is the brain—microcontroller and wiring. The 2nd stage is the motor and gear—gear ratios and motor types. The last stage is the chassis—dimensioning and materials. The robotics lab culminates in a competition between the robots built by each of the participants. The mentoring of students is done by SPS members with limited support from the SPS advisor.

The mini-sumo robots develop and blend interest in the basic understanding of electronics and mechanics. The participants learn how to program picaxe microcontroller systems. The participant learn about electricity--circuit electronics, torque--gear ratios, and statics of structural design. In the circuit design, we employ the use of bread board, resistors, LEDs, wires, IR sensors, mechanical/switch sensors. The participants also gain the basic know-how of how to “power supply” any small circuits—for robots or science experiments. Next, the participants learn about torque and gear rationing--finding the right tires and drive train. Lastly, the participants build their own chassis. Since there are weight limitations, finding and using the right material and dimension is crucial.

Vex Robotics

The other component of the robotics program is the Vex robots. Our Vex teams mentor or assist high school student interested in competing high school First Tech Challenges. This year was extremely successful. Both of the high school teams that were mentored qualified for the Southern California finals and

one of the teams took second place overall. This qualified them to attend the world championships which happened to be held in Northridge California. At the world championship they had a chance to meet high school students from around the world and competed against the Asian league, South American league and European league champions. The team took 41st place out of field of almost 100 competitors. The team is looking to substantially expand next year as there is tremendous interest due to this success.

Outreach to Local Schools

We should take the opportunity to share our robots with local schools. We have prepared a video of our competition which has been a great marketing tool for SPS and was a big hit at the Southern California Regional AAPT meeting. Robots were demonstrated at an open house at Walnut High School. They were also used at the opening of a new planetarium in Los Angeles. Finally the robots were featured at a workshop that encouraged high school teachers to get involved in robotics at Orange Coast College.

III. BUDGET

- Requested 5 Mini Sumo Robot Kits \$150

In all 15 kits were purchased. The cost per kit broke down to \$59 each. Total Cost \$885. Additional funds were raised from the Mt. Sac Associated Students.

- Requested 1 Vex Explorer Kit \$125

Vex decided not to use the Vex Explorer kit for competition. Instead we purchased Gear Kits, Tank Tread Kits and Omniwheels. The total cost for this was \$65

- Requested Publicity Materials \$25

Black and White posters were produced and copying was donated by the physics department.

Total Grant \$300

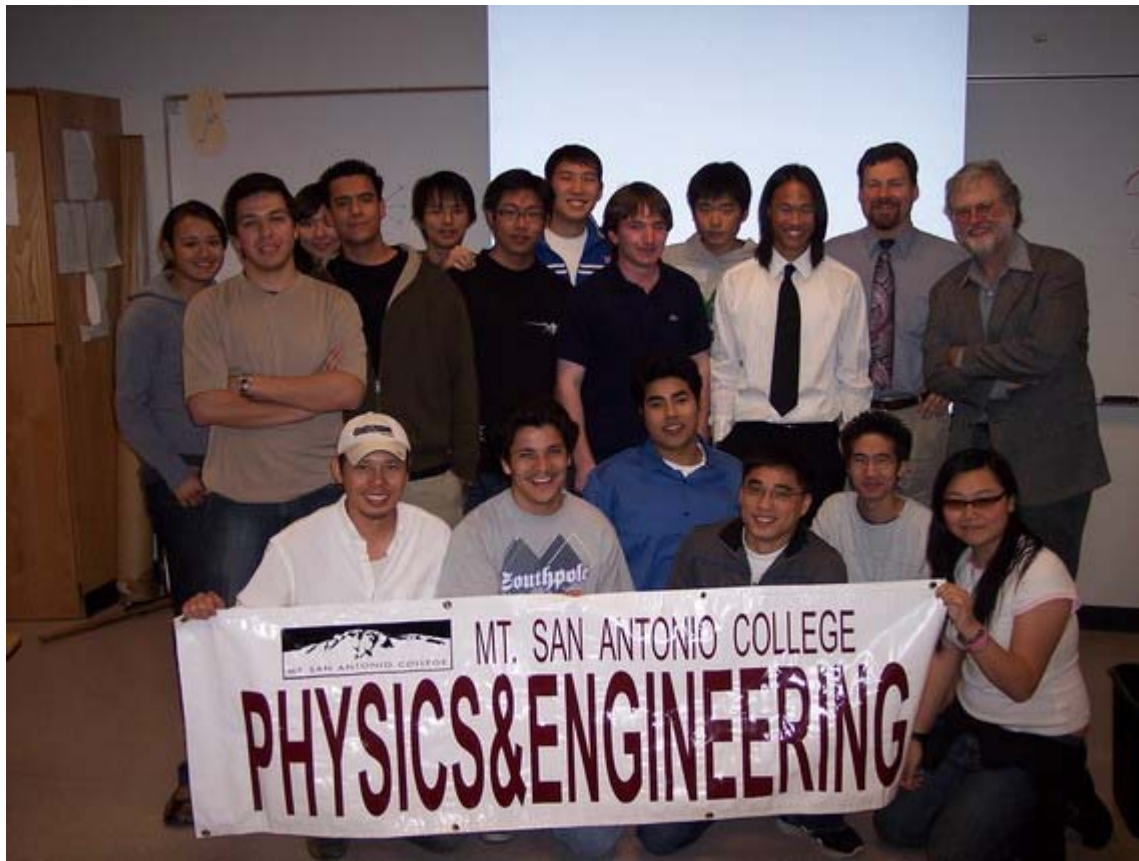
Total Spent \$950

The balance was provided by donations, and a grant from the Associated Students.

IV. Outcomes:

As a result of the SPS activities supported by the Marsh White award, the chapter is more dynamic than ever. The sumo robotics project gives us an opportunity to reach out not just to local schools (where it is a big hit) but to bring in the next generation of SPS leadership. As a two-year college it is extremely difficult to maintain a chapter from year to year. However, at least one high school student has elected to come to Mt. Sac and study physics as a result of this project. He wants to be active in the leadership of SPS next year. In addition, by getting many of the freshmen involved in the robotics project going on in late May, they are recruited into participating and serving as leadership in SPS the following year. The SPS activities have had a positive impact on the high school that we mentor. The Tech club there was struggling with just four members when we first started working with them, but now there are on the order of 20 students active in the club. At the Mt. Sac SPS level, we have been energized by this award. As a result, we have written four additional grant proposals, all of which have been funded. These include subsidizing our trip to the world championships, additional funding to buy robotics kits, money to support transportation to do the SOCK presentations (which were also lots of fun!) and a study block which provides snacks in the physics study room.

We would like to thank the SPS Marsh White Grant Award for giving us this opportunity and our SPS Advisor Martin Mason for helping organize all the events.



Mt. SAC SPS 2008



Here we have some of the Walnut High School kids learning about gear ratios.



The slow methodical Josh-bot faces off with the quick maneuvering Arrow-bot. The ponderous Josh-bot prevailed.



Award ceremony for the Mini Sumo Competition: (Left to Right) Angela, Emmanuel, Professor Mason, Andrew, Peter, Ernesto, Jacob, John, German, and Josh. More Pictures and videos are coming!