NASA SWARMATHON

OUTREACH REPORT

College of the Sequoias

(COS Team presenters in picture from left to right: **Paul Gonzalez-Becerra, Gerald Jumper, Aaron Johnson, Alexis Contreras , Cory Lewis, Isabel Lambert and Rachel Owens.** Other contributors not pictured: **Zachary Stafford, Sabin Adams, Davis Hang and Graham Frazier**)

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Report reviewed by: John Redden 3/27/17

Introduction

The College of the Sequoias NASA Swarmathon outreach was held in conjunction with the Tulare County office of Education's College and Career Expo. Here the team held a video game competition, set-up project exhibits, and offered two 30 minute Swarmathon presentations. Over 600 area HS students participated as well as the COS SETA membership. The event exhibits and Swarmathon presentations were considered an overwhelming success. This event led to another invitation to present our work at the monthly Google Developer Group (GDG) meeting.

Purpose

Working closely with the Tulare County Office of Education, we coordinated our outreach efforts to coincide with the College Expo. The stated goal follows:

"The College and Career EXPO provides students the opportunity to compete in college and career oriented competitions, spend some time on a college campus, and be recognized for achievements in their chosen field of study. College and Career Expo builds upon the momentum that students and schools are creating in college and career awareness, exploration and preparation. The event is open to all students in academies or pathways." (http://www.tcoe.org/CollegeCareerEXPO/)

This event provided the perfect platform for us to establish our outreach efforts. The goal was to promote our program and encourage further study in Computer Science to a multitude of interested local HS students. This event allowed us to expand our scope within the area.

Groups and Participants

Our outreach targeted three groups:

1. HS Student participants of the Career Expo (over 600).
2. COS Science Engineering Technology Association (SETA) students (over 150).
3. COS Friday Night Lab (FNL) students and GDG members.

The career expo was attended by over 600 HS students from around the county; of which, over 20 signed up for our game programming competition. These were the students that were specifically interested in the Swarmathon project and participated in the one-on-one interaction with our team; however, our exhibits were open to the general population of

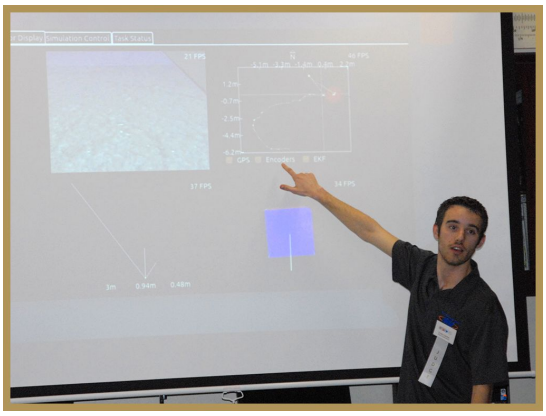
attendees. There were quite a few more drop-ins which included Directors, Deans, and local media. Our event was quite the attraction and the NASA Swarmathon project was our signature exhibit. After the HS students' presentations, our Swarmathon team gave a 30 minute presentation on the software and how our search algorithm works and then took questions. The event was a success and students on both sides took away a memorable experience.

College of the Sequoias runs a robust Science Engineering Technology Association (SETA) where STEM presentations are given once every two weeks. The SETA organization currently has a membership of 169 students. The Swarmathon team gave the project presentation where over 35 interested college students and staff attended. For this talk, our group ran a real time simulation and participants watched the search, pick-up and drop-off sequences while we explained the beginning, development and patching up process. In addition, the audience asked relevant questions, such as how our search algorithm works, what factors we had to consider when programming for the rovers, and why we chose the search pattern we chose. This talk was well received with students, with some wanting to participate next year.

Students were involved in the presentation by asking questions and introducing their own ideas of search patterns. Furthermore, this event led to an invitation to present at the next local Google Developer group (GDG) meeting.

Outreach Activities

The Career Expo being held at College of the Sequoias consisted of many mini activities. We showcased our Oculus Rift game, our Game table projects, and allowed the HS students to use the HTC Vive headset. The Swarmathon group held a judging competition between



several of the HS students from the outreach. The HS students were competing over video game design. After their presentations were finished, we presented the Swarmathon project and helped the students to understand the concepts behind programming the swarmie's algorithm. Most students that attended were familiar with virtual 3D environments, as they had to use a virtual 3D game engine to make their games for the competition, which allowed us to give a more in depth and detailed explanation of the process we went through and how our algorithm works. As we gave our presentation we also encouraged the participants to pursue computer programming and learn as much as they can both outside and inside of school. Our efforts included:

1. Set up a College and Career Expo NASA Swarmathon exhibit.
2. Interacted one-on-one with interested area HS students.
3. Gave a presentation on the NASA Swarmathon project and fielded many questions.
4. Explained software and project requirements to interested students at the exhibit during the event.
5. Recruited members to join in on our SETA and FNL programs.

Participation and Inspiration

The team volunteered for participation in the College Career Expo. They set up a Swarmathon exhibit for attendees to inquire about and gave a presentation at the event. Each member was assigned a particular area to cover in the presentation and the talk lasted about 30 minutes. After the presentation, the team had some one-on-one interaction with the interested HS students and answered their questions regarding the

Swarmathon project. This proved to be invaluable for the HS students and was a quality learning experience for all involved. Our outreach activities included:

1. Volunteering to exhibit the Swarmathon software at the expo.
2. Swarmathon project presentation to HS expo participants.
3. Swarmathon project presentation to COS SETA members.

Every member of the team had a role in the presentation and was able to contribute. The team members were also judges in the game programming competition. This provided the eminence for us to be considered as potential mentors. The HS students were interested and many conversations were enabled. In particular, we stressed the concept of iterative development. We made it very clear that our progress was a step-by-step learning process where persistence to continue in a seemingly impossible task was important. For example, we first had to learn how to move the rovers, then move them to a particular point, and then from there assign a path for them to follow programmatically. They were particularly receptive to this idea as they just worked through the same process in making their games. By showing the HS students that the project we did in terms of the learning process was exactly the same as to what they did for their games, they were visibly interested in how we got the Swarmathon project up and running. After the presentation, we encouraged the HS students to keep programming and participating in projects in an effort to maintain or improve their interest in computer science.

Activities

Many of the HS student game programming competitors had Unity or Unreal Engine experience. They were very much interested in the R.O.S/Gazebo user interface and code because we explained to them that the R.O.S and Gazebo worked in the same way that Unity or Unreal Engine did. This gave the HS students a sense of familiarity and made them want to know more. The HS game programmers were very much interested in the technology and had lots of questions and ideas. In fact, ***it seemed that everybody had an idea for a different search routine!***

Running a real time simulation during the presentation allowed the team to pull up and show specific code blocks. It was very interesting to note that many of the HS student suggestions incorporated the very same issues we were working on. In particular, one student suggested a waypoint system and the team was able to show him how we implemented exactly that idea. In other words, the HS students themselves were thinking in the same manner as we were when we began working on Swarmathon competition.

Conclusion

The outreach events were, by any measure, a complete success. The interest in the NASA Swarmathon project was very high and will hopefully add to our SETA and Friday Night Lab programs where programmers are at a premium.

For future outreach events, we have learned that the real-time display of the simulation is of particular interest; this and the code will be focused on a bit more. In addition, we have the idea of passing out blank paper with rover initial positions on it and asking attendees to sketch out their own idea for a search pattern. This would make the talk a bit more interactive and pull the audience in a little more. Beyond that we hope to be a bit further along than we are now if we are chosen to participate again.

Furthermore, this outreach opportunity led to three quality contacts. We were able to connect with HS CS teachers from Lindsay, Orosi, and Mission Oaks. These teachers have partnered with Mr. Redden and Mr. Baig and committed to a joint meeting at COS at least once a semester to share ideas and curriculum. This marks the beginning of a true community CS partnership and coordination of efforts in the CA Central Valley. Hopefully, by next year, we will be able to increase our CS community three-fold.

Thank You,
College of the Sequoias
NASA Swarmathon Team - 2017