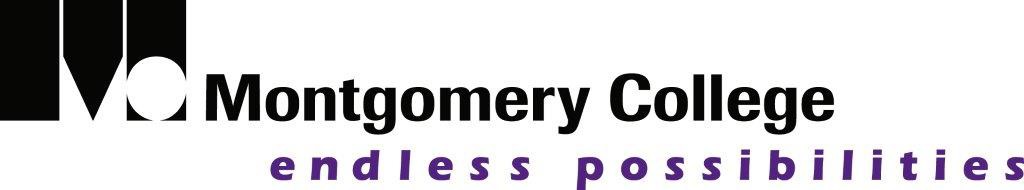
Group: Windows 97

Outreach report-2017



By:

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| Ajamian, John | Orellana, Samara | Piedra, Fernando |  |
| Roa, Michael |  |  |  |

\*Outreach and outreach report reviewed and approved by Dr. David Kuijt

**Abstract:**

Our group went to a programming class at a local high school, Damascus High School, in which we explained and presented to the class the fundamentals of the swarmathon software, the purpose of swarmies, general questions related majoring in STEM and programming fields in college, as well as gave them an opportunity to ask us any questions they had at the end of the session. With this plan laid out for our roughly 30 min time slot, we also incorporated ideas into our PowerPoint presentation to teach them the fundamentals of working in a group efficiently.

**Background info on us:**

We thought it important to start our outreach with giving the class information about us, and what we’ve done with our STEM education thus far through college. This information not only created a more personal relationship between us and the students, but more importantly motivated them to go into STEM, specifically programming, and showed them the exciting projects that can be done even at a sub associates degree level. The experience of our group members included working at a robotics company with bomb defusal robots, working in a nuclear physics internship with an electron beam, teaching middle schoolers STEM subjects, working on mathematics research projects, and even interning at NASA.

**Purpose of Swarmathon:**

Seldom is the person outside of NASA that has heard of a “swarmie”, so we explained to the class the importance of the robots and search algorithms to the future manned mission to mars. We explained to them the difficulty of shipping return fuel to Mars, and even presented them with Tsiolkovsky’s rocket equation to shown them analytically how much fuel it takes to launch fuel. Next, we explained roughly the chemical process of the Sabatier reaction, in which rocket fuel could be produced on mars from water deposits, reducing the overall amount of fuel required to get to mars and back, and how NASA wants robots to be mining for these water deposits.

**Algorithm:**

We presented the class with the opportunity to create their own algorithm. We printed out a bird’s eye view of a map of deposits with a power law distribution and put the class into groups of 3. We asked that in 5 min, they think of an algorithm, draw out a path for 3 of the swarmies on the map as well as writing any general comments, then present it to the rest of the class at the end of those 5 min. We then presented our search algorithm and explained why we thought it was extremely efficient.

**Software:**

The high schoolers were very amused by the simulation, the class had a few students with background knowledge in Linux, but the class was focusing on basic python programming. Our group showed the class our pseudo code and emphasized its importance in the project. We presented to them how a large programming problem should be solved, by breaking it up into smaller goals that can be tested and coded individually then combining them together to get the final code. Because python is similar enough to C++, we were able to pull up our code that we wrote, walk them through the variables and some of the logic, then proceeded to show them the code implemented in the actual simulation. For fun, we set gravity to zero to show them the robots going haywire.

**Questions:**

This may have been the most engaging, valuable part of our presentation to the students. We were initially extremely worried that the students wouldn’t ask us any questions and that we would be left standing in the front of the classroom waiting in complete silence, but luckily, we got the complete opposite response. Questions ranged from general college questions, to programming and engineering specific questions, then finally to what we thought was the most important question, how they could get involved in anything similar to the swarmathon competition. Finally, after all of our time spent getting them excited about their future careers in STEM, we told them how they don’t have to wait because NASA does a very similar competition for high school students. The teacher of the class we presented to asked us for the link when we were done presenting, and told us that he was going to try and start an after-school club next year to compete in the high school competition.

**Future Goals:**

Next year, we hope to be competing in the physical competition and to have access to real swarmies. Bringing in a swarmie to the school would inspire so many more students to become a STEM major. If we could set up a real-life simulation either in a gymnasium or a parking lot, then we could expand our outreach from a single classroom to the entire school.