TAMIU DustySWARM 2.0

Outreach Paper

NASA Swarmathon 2017
Physical Competition

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This document has been reviewed by the faculty advisor prior to its submission to NASA and verified that the document reflects the design used for the 2017 NASA Swarmathon Physical Competition.

Introduction and Purpose

Following the trail blazed by our predecessors, DustySWARM 2.0 has taken the helm as Texas A&M International University's Swarmathon team. Last year, our team participated in the virtual competition of NASA's Swarmathon. After a successful run, the group secured third place while also acquiring first place in the outreach paper. This year the team was asked to compete in the 2017 physical competition. Over the course of the last few months, this year team worked tirelessly to construct, optimize, and develop all of our tools for this competition. We sat down for four hours together in one room and assembled each rover together. The current Swarmathon team owes its success to professors, TAMIU, donors, and student organizations around TAMIU such as DustyTRON Robotics, DustyMOTOR, and the Society of Hispanic Professional Engineers (SHPE). Team members dedicated their time to develop a finished product for the Swarmathon competition while also reaching out to the community with events organized by TAMIU, and high schools around Laredo. The outreach activities consisted of various presentations with the STEM Alliance, First Tech Challenge (FTC), and other presentations within Laredo and United ISD communities. DustySWARM has taken great pleasure in promoting NASA's Swarmathon competition and STEM. This report will serve as a summary of DustySWARM's community outreach.

Figure 1: DustySWARM 2.0 Team Members

Outreach Activity Designs

Throughout the whole project, DustySWARM did a good amount of community outreach, where they participated in several events both on and off campus, these events were organized by TAMIU's school of engineering and both of Laredo's school districts. Our team's goal was to demonstrate what exactly our project is, how we managed to get to where we are, and what plans we have moving forward. In the end, our goal would hopefully be successful in raising awareness of TAMIU's DustyTRON Robotics teams (DustyTRON, DustySWARM, DustyCIM and DustyQUAD) and their steps to help NASA future Exploration plans, by attracting and engaging young generations to ask and explore the science and technology behind all of this state of art technology. Some of the planned activities are expressed in details in the following sections.

1. STEM Alliance

Congressman Henry Cuellar (D-TX28) and TAMIU host a week-long STEM Alliance, where local high and middle schools' students, parents and teachers come to explore all the different activities and presentations from STEM teams in TAMIU as well as other national companies. Students within the school of engineering presented all of their senior projects including each team underneath the DustyTRON Robotics umbrella, as well as DustyMOTOR, DustyCIM and DustyQUAD. The visiting schools were able to learn about every project's goals, what milestones they have achieved, and how they managed to achieve them.

Figure 2: DustySWARM 2.0 members next to their display during a presentation for STEM Alliance

The members of DustySWARM had each rover on display and gave a short rundown of the competition, the rovers, and what our throughput has been since we have begun working. We then handed the floor to other teams including DustyTRON's NASA RMC mining robots, DustyQUAD's Unmanned Arial Vehicles (UAV), and DustyMOTOR's made from scratch Formula 1 racecar to give a rundown of their project. The objective of this event was to promote STEM, and hopefully spark an interest in a STEM related career in the students.

2. FIRST Tech Challenge - Laredo League

In collaboration with the TAMIU Society of Hispanic Professional Engineers (SHPE) student chapter and TAMIU DustyTRON Robotics student organization, DustySWARM members volunteered with the local for Inspiration and Recognition of Science and Technology (FIRST) Tech Challenge (FTC) league for both school districts in the area. FIRST is an organization dedicated to bringing science and technology to the youth. The FIRST Tech Challenge competition is robotics competitions where different high school and middle school students build a robot to compete in game tasks. The alliance that scores the most points at the end of the game wins that match. TAMIU was responsible for organizing and running the league meets and the championship meet. Members volunteered in a plethora of positions ranging from inspectors to referees. The league included 6 competitions at various High Schools and concluded with a qualifier championship which was held in our campus. Throughout each leg of the league, swarm members promoted their project to the youth present, and let them know what it is they can look forward to if TAMIU was in their future. In this year computations, we had 360 students age from 13-18

Figure 3:DustySWARM, TRON, MOTOR, SHPE members, and TAMIU Faculty all posing for a group photo at FTC regional qualifier

years old, and 75 adults who were parents, mentors, couches and teachers from the local districts and university professors and staff.

3. TAMIU Society of Hispanic Professional Engineers (SHPE)

TAMIU SHPE is a chapter of the national organization, the Society of Hispanic Professional Engineers. This group of individuals promotes professional and personal development for anyone interested in the field of engineering. Due to the fact that SHPE is a national organization, several conferences are available to its members. In these conferences, members get to develop professional skills and even network with some of the nation's biggest companies. TAMIU SHPE has worked non-stop to lay a foundation of which all organizations in the school of engineering can build on. Three of the five DustySWARM members are currently involved with the local chapter. With the chapter's help we have been able to fundraise, host events, and grow as individuals.

4. Society of Women Engineers

The newest organization to be established in TAMIU is SWE, The Society of Women Engineers. SWE is also a national organization, like SHPE, whose main goal is to empower women and promote equality in both genders. There are no female members of DustySWARM currently, but each member does support women in STEM. SWE currently has worked in tandem with the engineering clubs to fundraise and promote STEM careers.

5. Professional Events

Some of the events that DustyTRON robotics members presented their projects are:

1- TAMIU LBV Student Conference: 5 team members presented their project and code development to TAMIU students and faculty members.
2- TAMIU Student Fall Conference: 6 team members presented for an audience of university level students and faculty members
3- STEM Alliance Week presentation: DustyTRON Robotics and other engineering organizations presented their work to the Laredo with an audience consisting of ages around 12 to 50 years on average, where we got 395 middle and high school students, their teachers, parents to attend our presentations.
4- Daybreak Rotary: Members present to the local Laredo Rotary which is a group dedicated to the growth of the community by promoting education and STEM projects.
5- Laredo Rotary: DustySWARM members presented to the local Laredo Rotary where we presented our progress and update them that the team had been selected for the physical competition of this year NASA Swarmathon.

6. Educational Events

A. KGNS- TV interview

Our mentor Dr. Tariq Tashtoush was interviewed by the local news station for his effort to promote a future in engineering and robotics within Laredo community. Dr. Tashtoush used his time on the air to bring awareness to not only how he became the man that he is today but to promote all the projects he supervises here in TAMIU. He shed light on DustyTRON, DustyQUAD, and especially our project DustySWARM and that the team is working to program small robots to mimic ant behavior and how that can be helpful in advancing Mars Exploration mission. He explained what each project sought out to do and what teams have done in the past. Thanks to Dr. T, engineering is one of the fastest growing majors at TAMIU.

B. Preview day

Preview day is an event where high school students who are interested in joining TAMIU, come to campus visit, and learn about all the opportunities present in here. Two events occurred on November 12, 2016 and January 21, 2017, The School of Engineering, SHPE, DustyMOTOR and DustyTRON Robotics members were all present showcasing their projects, all while attempting to recruit incoming freshmen. Each member was responsible for answering any questions raised to by the students. In the end, most students wanted to learn how to become involved in these projects as freshmen, and what it takes to make projects come to fruition the way each organization had.

One thing that stood out the most about this event is that not a lot of kids had any interest in a STEM career until they saw all the great things that a STEM field can bare. In fact, most high school kids overlook TAMIU when it comes to our engineering program and go elsewhere, but because of the strides the school has been making to reach out to the community, our school has had more and more kids coming in and staying.

C. Mary Help of Christian Middle School Robotics Presentation

The morning of February 16, 2017, the team was asked to introduce Mary Help of Christian Middle School's student body to TAMIU's school of engineering and its robotics teams. Middle school level students are usually in a transitional stage where they decide what they want to do when they go into high school and college. In this case, it is crucial that we present things that capture their interest. To do this DustyTRON robotics came together for a presentation uniting both the NASA RMC and NASA Swarmathon teams. Both DustyTRON and SWARM explained to the students what their project set out to do and described the steps it took to get to current level of advance robotics is available within few miles from their school. In the end, the kids were active asking questions about the rovers, what parts had been sued, what process had been used to create all required parts and components and our school. Each SWARM member was tasked with answering questions when they were raised to keep the students engaged and hopefully lead them to embrace a career in a STEM related field.

D. Blessed Sacrament Elementary School Robotics Presentation

On February 16, 2017, the team was invited to promote TAMIU's School of Engineering by reaching out to Blessed Sacrament Elementary School. The event was an eye opener for most attendees due to the fact that such young students were so engaged in the material presented to them. They were still too young to comprehend most of the topics discussed during our exposition; however, they were quite interested to learn about robotics when a TAMIU Robotics summer camp opportunity was mentioned to them. It is expected that at least half of that group will be attending the summer camp to expand their knowledge of robotics.

E. 2017 USHS Career and Technology Showcase

On February 22, 2017, the TAMIU School of engineering was once again invited to display our projects to the youth. This time it was at the United South High School's Career and Technology Showcase. The event brought in several companies, clubs, and schools that all had one thing in common: STEM. TAMIU School of Engineering had its own show table

Figure 4: DustySWARM, DustyTRON, DustyMOTOR, and Dr. Tashtoush all at the 2017 USHS Career and Technology Showcase

where we set up our different senior projects and even had brochures ready to hand out. We approached students with swarmies in an attempt to strike up a conversation and bring more eyes on our school. The audience consisted mainly of high school students interested in a STEM career so naturally they raised several questions to us members. One thing that was interesting about this event was that the FTC team from United South recognized us and we had a long conversation about the DustySWARM team and project, creating a full circle from our earliest events to our most recent.

F. Paradigms and Process: Research and Development of Knowledge

On March 3, 2017, Dr. Tashtoush presented the current research methodology and knowledge gather that is required to be successful in engineering projects. DustySWARM was used to explain the process of engineering thinking to solve new challenges by utilizing the available information and literature that is discussing and describing the ant's behavior and how can we utilize the current technology in the robotics field to build and control collaborative robots that can assist in the NASA in their endeavor.

G. Discover TAMIU

Discover TAMIU is a university wide event where kids, parents and local community of all ages are invited to attend and visit TAMIU's campus. The purpose is to present all opportunities and programs that TAMIU and the School of Engineering can offer. DustyTRON Robotics Teams had been working to promote technology and engineering. On April 1st, 2017, all members will be introducing DustySWARM swarmies and demonstrating their developed code in real scenario for all attendees including parents and young students. In addition, members will show the simulation of the code that was developed by high school students for the Swarmathon HS Division competition.

High School Outreach

When we found out about the opportunity to mentor high school students in a search algorithm based programming competition, we immediately decided to be involved. The FTC competitions were where we did most of our advertising for the competition due to the fact that most kids there already possessed a background in coding. The day of the qualifier at TAMIU was when both halves of the Laredo league were under one roof. Given this opportunity, our outreach leader walked around talking to different robotics club sponsors about the opportunity are extending their students. DustySWARM team was able to create High School branch, which is a medley of students from different schools in Laredo. Each individual member was excited to get through the modules as fast as possible in order to begin drafting their own code.

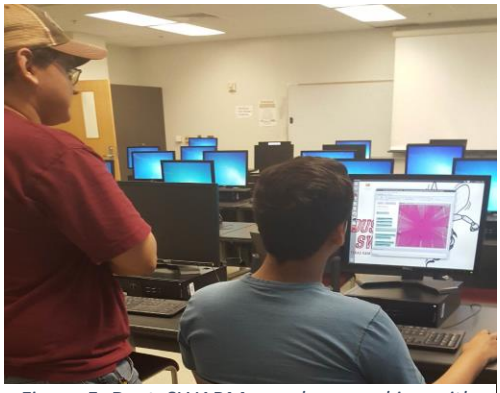

Figure 5: DustySWARM members working with high School students on HS student Swarmathon

Long-Term Outreach

Thanks to the endeavors of our predecessors, DustySWARM 2.0 had groundwork laid out for it. We even had the old members available to mentor us whenever necessary. That being said, we wish to do the same for DustySWARM 3.0. For the future, we will make sure that any DustySWARM team will always be involved in community outreach so that the organization can continue to grow. DustyTRON Robotics will always be an organization focused on bringing robotics and STEM awareness to the youth of Laredo. That is why DustySWARM 3.0 will be responsible with reaching schools that we were unable to reach this year.