Engineering Portfolio

Silver Eagles #21428

2023 - 2024

Meet Our Team

We are the **Silver Eagles** from Salesian High School in New Rochelle, NY. We first formed in 2021, starting with 4 members all new to the world of robotics. We've since grown to 13 members and have setup an infrastructure to be able to teach new members the skills they need to contribute in many ways. We're comprised of students, ranging from 9th to 12th grades, all from the NYC and Westchester areas.


David
Coach


Charlie
Captain


Michael
Captain


Jorge
Lead Builder


Andres
Youth Mentor


Brandon
Mentor

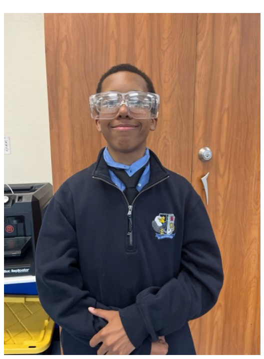

Curtis
Programmer


Michael
Lead Designer


Quincy
Operations


Aiden
Builder


Ms. Gomez-Botero
Mentor


Wilkin
Builder


Walter
Youth Mentor


Kai
Builder


Alex
Builder

Goals

Post-Competition Reflections

	What Went Well	Improvement Areas	Action Items
First Competition	• Drive train is intuitive and reliable • Push capability on robot came in handy to help score points	• No autonomous • No drone launcher • Can't pick up more than 1 pixel • Can't pick up pixels reliably	• Add autonomous functionality • Switch from passive intake to active intake • Add drone launcher
Second Competition	• Autonomous parking Active intake can pick up pixels • Able to reliably place pixels on board one at a time	• Autonomous program can't place pixel on board • Drone launcher can't clear the field reliably • Active intake sometimes takes a few seconds to bring pixel onto plate	• Add ability to pick up and place two pixels at once • Add more detailed autonomous capability Improve drone launching capability • Add hanging capability

Community Outreach

Our commitment to community outreach is at the core of our First Tech Challenge journey. Through programs like the Saturday Academy, collaborations with Edgemont Robotics, and engagement with Don Bosco Prep, we strive to inspire, educate, and empower the next generation of engineers. These initiatives showcase our technical prowess and exemplify our dedication to building a solid, inclusive robotics community.

Saturday Academy

One of the ways we reach out to the community is by holding a Saturday academy, a dynamic program designed to introduce young minds to the exciting world of robotics. Local kids from grades 6–8 can learn the fundamentals of robotics, coding, and problem-solving every Saturday. We aim to inspire the next generation of engineers and innovators through engaging hands-on activities and interactive sessions. They work directly in our lab, and most of the materials they use are 3D printed by our lead 3D designer, Matthew Carrasco, during our meetings.

School-Wide

Alternatively, we source our outreach through community held club fairs, in-school advertisements, as well as announcements relating to the team's success and status within competitions. This has attracted several new members, many of whom take leadership roles quickly. Such outreach has also provided an interest and cooperation from those outside of the program and realm of robotics, not only assisting in the development of already existing projects and ideas, but allowing new ones to be created through such collaborations. We also inform current students, that aren't yet involved in engineering, about *First* and various robotics + engineering opportunities in the school, through our school's morning broadcast, AM Salesian.

Collaborations

Our involvement with Edgemont High School's robotics team has led to notable achievements, including successful competition performances and increased student participation. The camaraderie built through this collaboration has created a robust support network within the broader robotics community, fostering an environment where knowledge and expertise are freely exchanged.

Our commitment to positively impacting students' educational experiences is at the heart of our community outreach. Our team actively engages with our brother school, Don Bosco Prepatory High School in Ramsey, New Jersey, who helped us with our process of building a team in our opening stages two years ago. This initiative introduced students to the world of robotics and aligns with our mission to promote STEM education and foster a passion for technology.

Through sustained efforts at Don Bosco Prep, we have witnessed a significant growth in interest and participation in STEM-related activities. By incorporating robotics into the school's educational landscape, we contribute to the holistic development of students, preparing them for the challenges and opportunities in the rapidly evolving technological landscape.

Sustainability

Funding

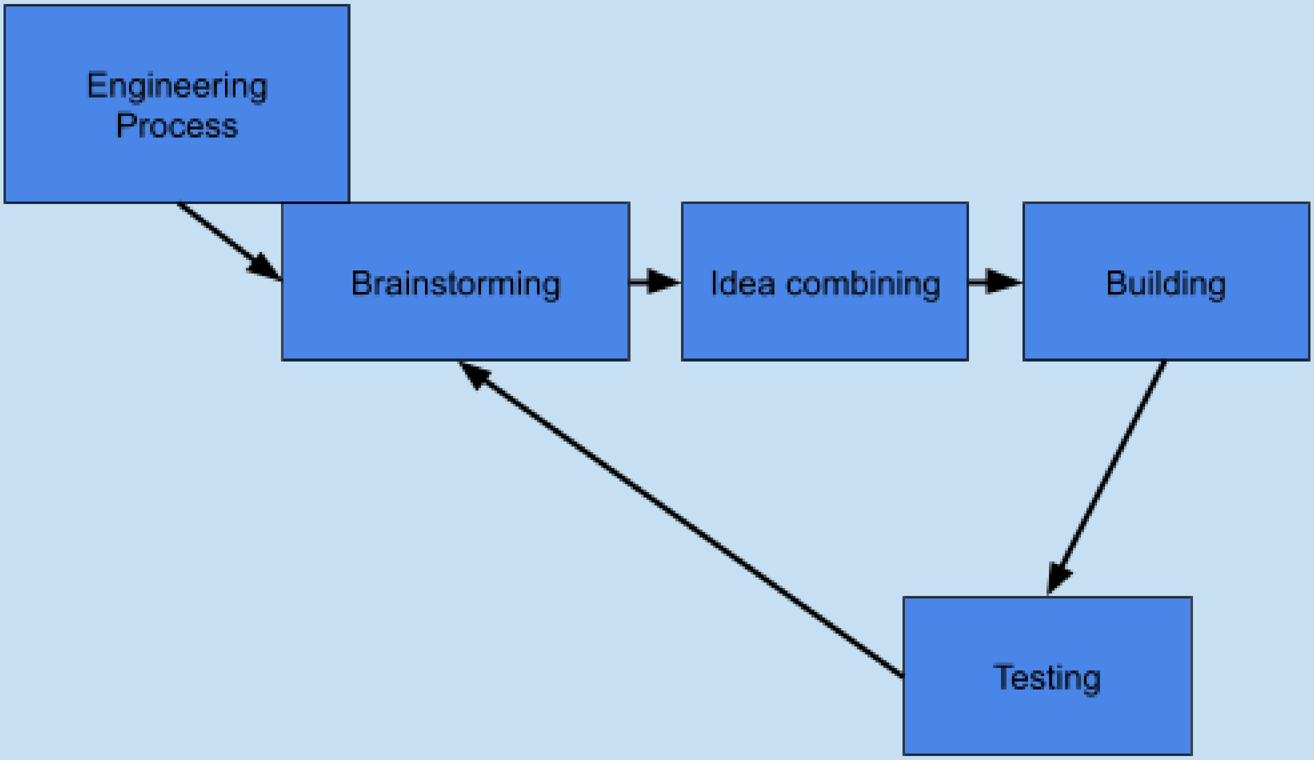
Silver Eagles would not be where it is now without the generous donors who sponsor our robotics teams. These sponsors are our school, **Salesian High School**, and its network of alumni donors: the **Boeing Company**, the **DEKA Foundation**, **Salesian Missions**, and **New Rochelle School District** (Title IV program). We also appreciate our brother school, Don Bosco Prep, in Ramsey, NJ, for helping us get started two years ago. Thanks to their tremendous support in training and providing us with much-needed supplies, we were able to compete in our very first competitions as our own team. These sponsors provided us with many expensive tools and equipment, including the GoBilda and Rev robotics starter kits and the new practice field every year specifically for the new game mode.

Mentorship

Recruitment

TODO:
add how we get our coaches

Our Process



Our engineering process consists of much brainstorming, building, testing, and iterating. Every team member has the chance to pitch their ideas and through collaborative discussion, we combined aspects of everyone's contributions into our comprehensive game plan.

We keep speed and efficiency in mind at every step of the build process, but our primary focus is communication amongst team members. Since our team is able to have a dedicated space in our school – our robotics workshop, we primarily have all the subteams (design, building, and programming) all in the same space at once. This makes it easy to collaborate all together. When we're not meeting in person or brainstorming from home, we utilize Google Meet for calls, and Google Docs and Classroom to collaborate.

Our build team has the most members out of our subteams. This enables us to plan multiple robot features at once. We split up our build team into groups, each focusing on an aspect of the robot. To ensure our work can come together nicely, our building and desing leaders, Jorge and Michael, oversee each of the groups and enable cross-group communication.

Our Strategy

Autonomous Phase

Our initial way of scoring points is to have our robot park during the autonomous stage. We created 4 programs, one for every starting position on the field, that when active, move our robot next to the appropriate scoring board to park.

Tele-Op Phase

Our primary way we plan on scoring points is to place pixels on the board. We have built our robot to be able to actively intake pixels. Our active intake works by having a rod with gekko wheels, controlled by a motor and two gears, rotating inward while we're driving.

TODO:
say our backup scoring method

End Game

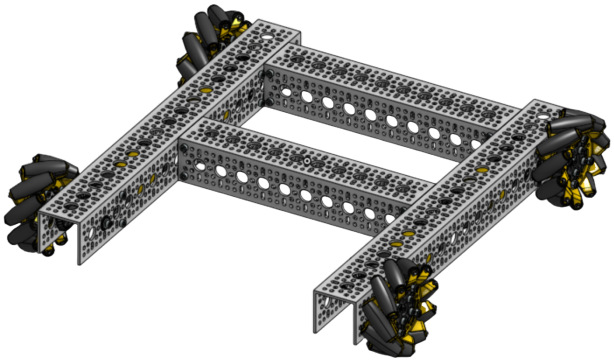
Our final way of scoring points is with our paper airplane launcher. We have a 3D-printed airplane launcher attached to the base of our drive train, next to the base of the turret motor. Using a goBILDA structure piece, we propped the airplane launcher up at an appropriate angle. Our team came up with a repeatable paper airplane design, so we can have more consistency. Towards the end of the driving phase, we will launch the paper airplane from the back half of the field.

In future iterations of our robot, we hope to modify our intake and out-take systems to handle working with two pixels at a time instead of one. We also plan to improve our autonomous functionality so we can place pixels as well as park. Finally, we are planning on adding hanging functionality to our robot. We plan on doing this by re-utilizing the arm that is currently used for intake and out-take.

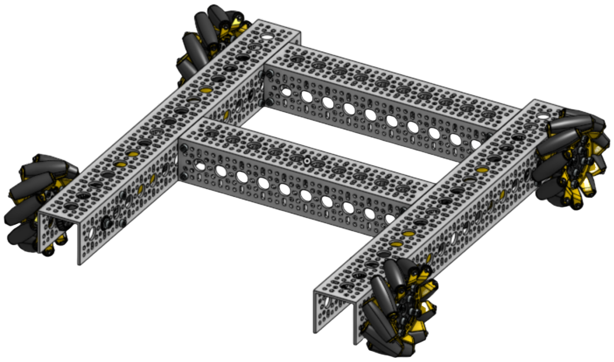
Build Process: Drive Train

Goal: Make a drive train that's light, and able to move and maneuver quickly

Version 1



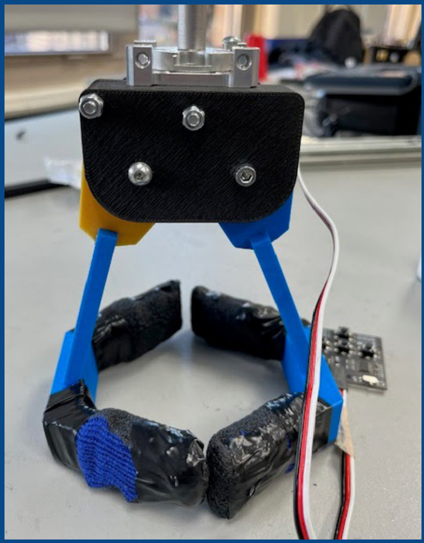
Version 2



Previous Ideas

Build Process: Pixel Intake + Out Take

Version 1

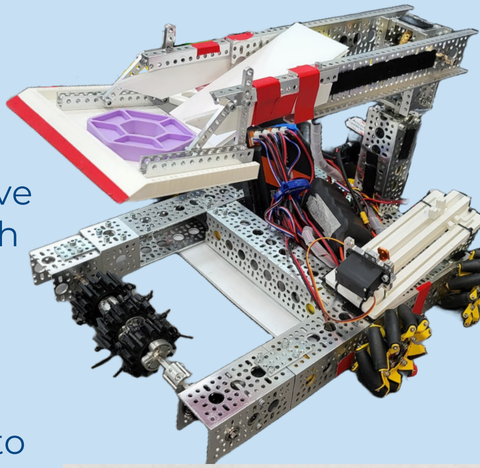


Our first design for intake (and outake) design was intaking passively. We had a 3D-printed claw, with two extensions with grips on them. The claw was designed to open, via a servo, and wrap around a pixel. Then can be rotated backwards, with a second servo and the claw can open again for pixel depositing.

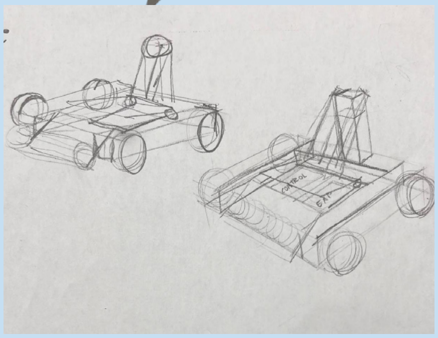
We chose not to go with this robot design for a few reasons. The primary reason was that we were only capable of picking up on pixel at a time, and it required a lot of precision. The next major reason was because the robot becomes inefficient when placing pixels on the board.

This design averaged ~2 pixels placed per match.

Version 2



For our second iteration, we had decided to go with an active intake as opposed to a passive one. We had not worked with active intakes before so it seemed like a challenge, but we pushed on. We started by drawing up some ideas, got to prototyping, and eventually made a proof of concept.



We designed a rod with gekko wheels, powered by motor, to intake pixels onto a 3D-printed plate. The plate is connected to a turret motor and a worm-gear motor, creating an “arm” that is capable of vertical and horizontal motion. When the pixel is on the plate, our drivers will drive to our team’s scoring board, rotate the robot, and have our robot’s arm rotate completely backwards. This lifting of the arm would then cause our pixel to drop backwards. To accurately deposit the pixel onto the board, we added a ramp, acting as a guiding slide, to minimize unwanted falling pixel movement.

This design averaged ~7 pixels placed per match.

Build Process: Pixel Intake + Out Take

Goal: Develop a system capable of picking up and placing two pixels

Build Process: Drone Launcher Overview

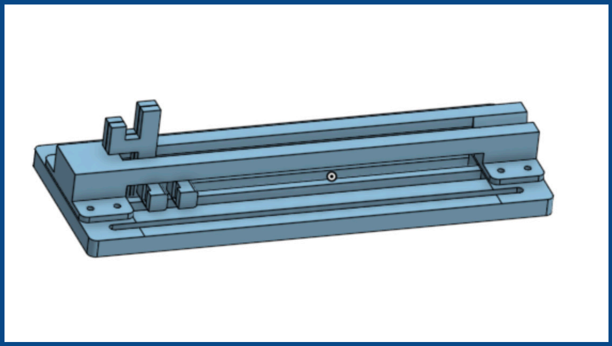
The paper airplane launcher proved to be a problem at first for our team, but eventually we landed on a design that worked for our robot.

Version 1

Our first design was composed of two Gobilda Rhino wheels, each attached to a motor. The components were then attached to Gobilda U-Channels: one for structure that will be attach to the robot and another as an "airstrip."

We found this design was too bulky and would have inconstitent results. Sometimes the plane would go far, other times it would get bent by the wheels when they spun.

Version 2



Our second iteration was much more effective. We found a design that Team 503 Frog Force kindly made public for other teams to use.

We 3D printed the design, and assembled accordingly. We mounted the plane onto the "arm" of our robot. Resistance is built with rubberbands pulling back a tab, held by a servo that can release the tab and fly the plane.

Build Process: Drone Launcher

We went through a few different ideas when trying to create a sustainable paper airplane launcher, but we didn't have one that truly stuck at first. Our most promising launcher involved two wheels with some motors. (the 'pop up') We took a Gobuilda metal plate and put motors in its biggest opening. That created the base for the launcher to mount onto the actual robot. On Top of those two motors were Mechnam Wheels which we used to get a grip on the robot as well as a steady push. Ultimately, we faced a few problems with this design:

With the design of our robot, finding a suitable placement for the launcher was very difficult. Our build was compact, and we needed enough room to move our arm and claw into intricate places. Attaching an Airplane Launcher this clunky would limit our already scarce space.

The Launcher was very inconsistent in itself. A big portion of the Airplane launching is the fact that it's not going to constantly give you the same results. There were multiple occasions where the plane wouldn't go as far as we needed, or even too far than necessary.

These were problems that we had faced during our first competition After much thought and consideration we had found a new way to work in the paper airplane launcher into our design.

Current Autonomous

Our Strategy

Our Strategy

Our Strategy

Our Strategy