



IEEE Southeast Con 2019 Team Presentation

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Department of Electrical and Computer Engineering
Department of Mechanical Engineering



FAMU-FSU
Engineering

Southeast Con Team members

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Captain

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Lead Control System Engineer/Financial Advisor

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Kyle Voycheske

Lead Mechanical Engineer

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Lead Software Engineer

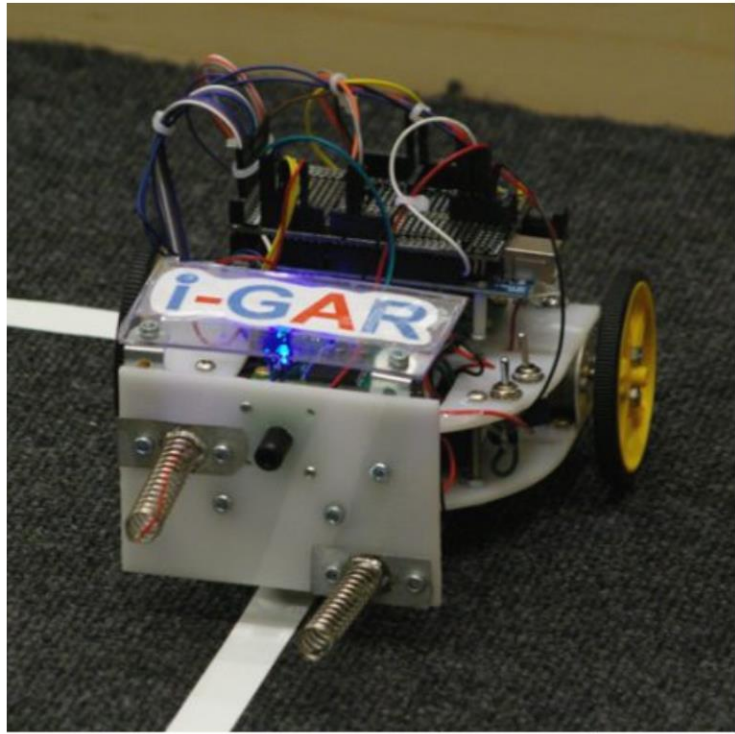


Southeast Con 2019

- IEEE Region 3 for: Technical, Professional, and Student conference
- Focuses on sharing ECE latest Information
- Events
 - A technical program with seminars, tutorials and workshops
 - A student program with student competitions
 - Exhibits
 - IEEE regional meetings
- Conference Location: Von Braun Center in Huntsville, Alabama
- Thursday, April 11th, 2019 through Sunday, April 14th, 2019



Lethal Simplicity, That actual Worked



[2] "Engineering Students Win Robotic Competition." Florida State University News, 28 Sept. 2016, news.fsu.edu/news/science-technology/2012/05/09/engineering-students-win-robotic-competition/.

Chase Sapp



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Problem

Design a robot that can move around a plane, respond to a changing environment, avoid obstacles and sort colored objects.



terminology

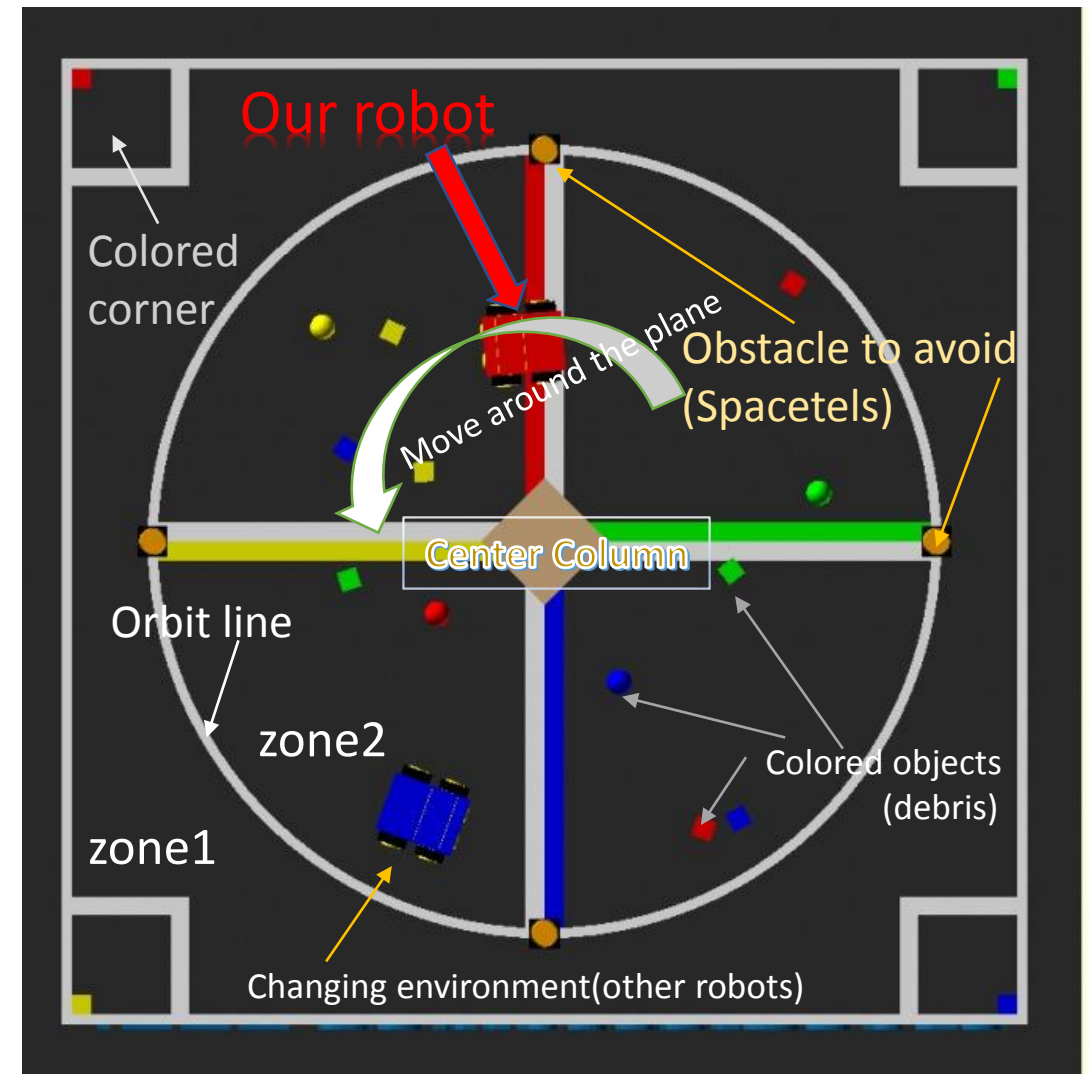
Colored corner: where the robot begin and end and put color matched debris in.

Orbit – any Counter-Clockwise (CCW) complete traversal around the central column.

Spacetel – Space Hotel, LED obstacles.

Zone 1 – Outer space outside of orbital line.

Zone 2 – Space inside of orbital line.

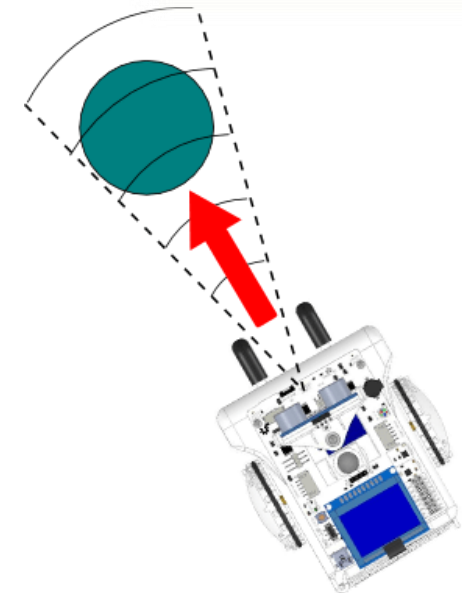
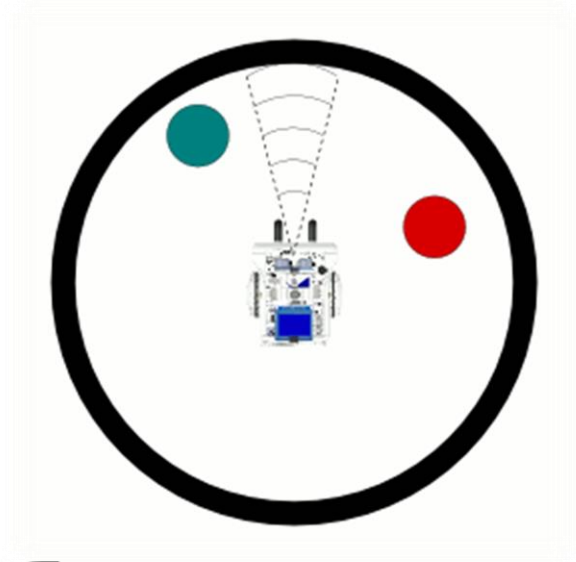


Needs

- Move around the playing field in counter-clockwise orbit
- Find the fastest route to clear debris from the region
- While clearing the field, sort the debris
- Avoid collision with spacetels and other robots
- Have the robot return to home base

Requirements

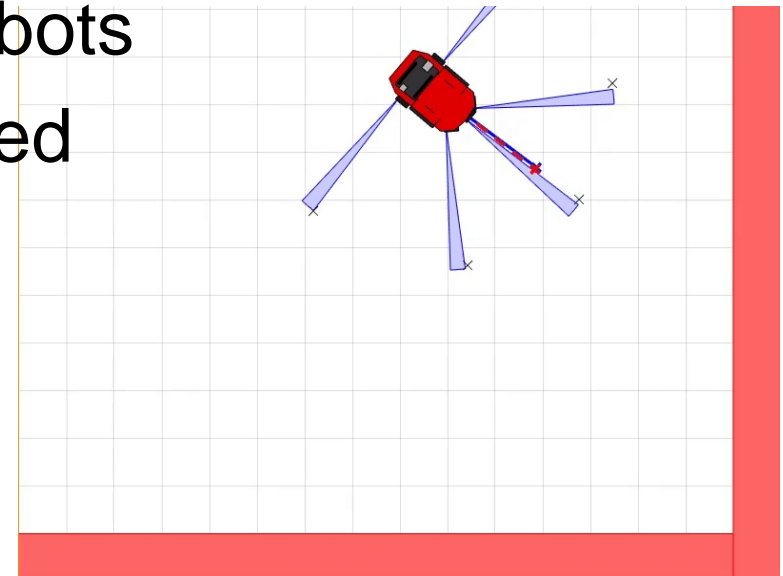
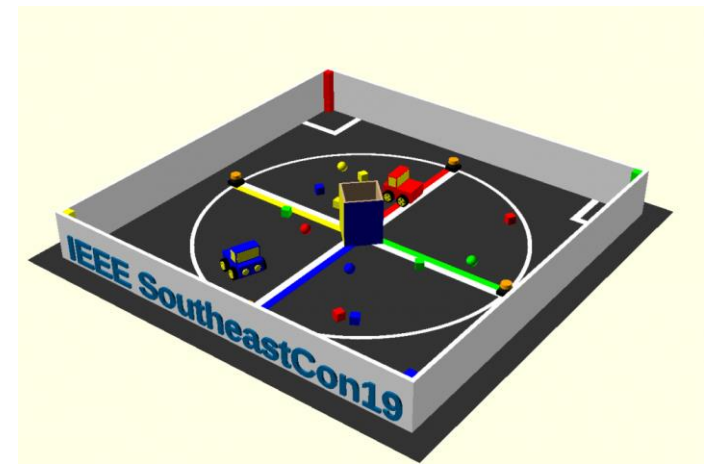
- The robot must be able to move on a carpet plane
- Be able to recognize the shape of the object
- Be able to recognize the color of the objects
- Be able to collect the objects it recognized
- Be able to organize the objects collected



<http://arcbotics.com/lessons/cleaning-robot/>

Requirements Cont.

- Find a route to clear majority of objects
- The robots must be able to recognize the route to home base
- Identify the location of spacetels and other robots
- Be able to avoid robots and spacetels identified



<http://www.cellar--door.com/control-of-mobile-robots/>

Project Scope

- Break the needs into modules
- Modules:
 - Motion
 - Route clearing algorithm
 - Sorting software and hardware
 - Acknowledge location and home base
 - Recognize and avoid other UFOs



<http://saryan.info/project-scope-management-cartoons.html>

Assumption

- Robot advances to second round of the competition
- Playing field will remain the same throughout the competition
- Competition rules will remain constant throughout the robot's design
- Flash photography usage will be limited during each round



Tradeoffs

- Our choice is Arduino Mega over other prototyping microprocessors
 - More pin ports versus then Arduino Uno
 - Relatively inexpensive compared to other platforms
 - Cross platform
 - Open source software
- 7v DC brushless motor preference
 - Stepper motors are slow loud and inefficient
 - DC motors are faster, have better speed selection, and have more power output per power input (efficient)

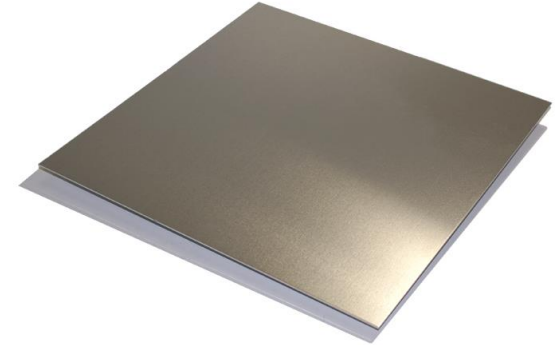


[4]Arduino Mega 2560 Rev3,
store.arduino.cc/usa/arduino-mega-2560-rev3.



Trade Offs (Cont.)

- 6060 Aluminum frame
 - Lightweight
 - Durable
 - Easy to disassemble for switching parts
- 2.68 in. rubber tires
 - Lightweight
 - Carpet specific tire https://images-na.ssl-images-amazon.com/images/I/61ftvUxyJqL._SL1301_.jpgs



[5] "48' x 96' .125 Aluminum Sheet 3003." Tampa Steel & Supply, tampasteel.com/product/aluminum-sheet-125-x-48-x-96-3003/.



[6] "AutoEC 68mm Smart Car Robot Tire Wheel (Pack of 4)." Amazon, www.amazon.com/AutoEC-68mm-Smart-Robot-Wheel/dp/B00U4HP2X4.

Market

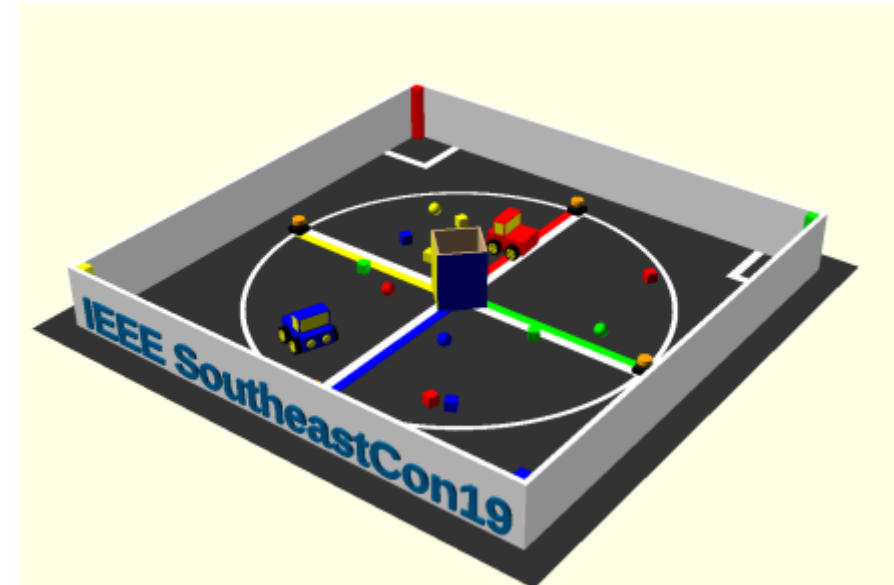
- Our primary target is the competition
 - Meet regulation
 - Gather as much points as possible
- Our secondary target Recycling
 - Clean up parks, oceans, and other locations
 - Sort consumer waste
 - Small and inexpensive option



[7] Knowles, David. "Surfing Trash Island: Photographer Captures Startling Images of Garbage-Strewn Waves in Indonesia - NY Daily News." Nydailynews.com, 19 Aug. 2013. www.nydailynews.com/news/world/photos-surfers-ride-trash-filled-waves-indonesia-article-1.1431227.

Getting to the Competition

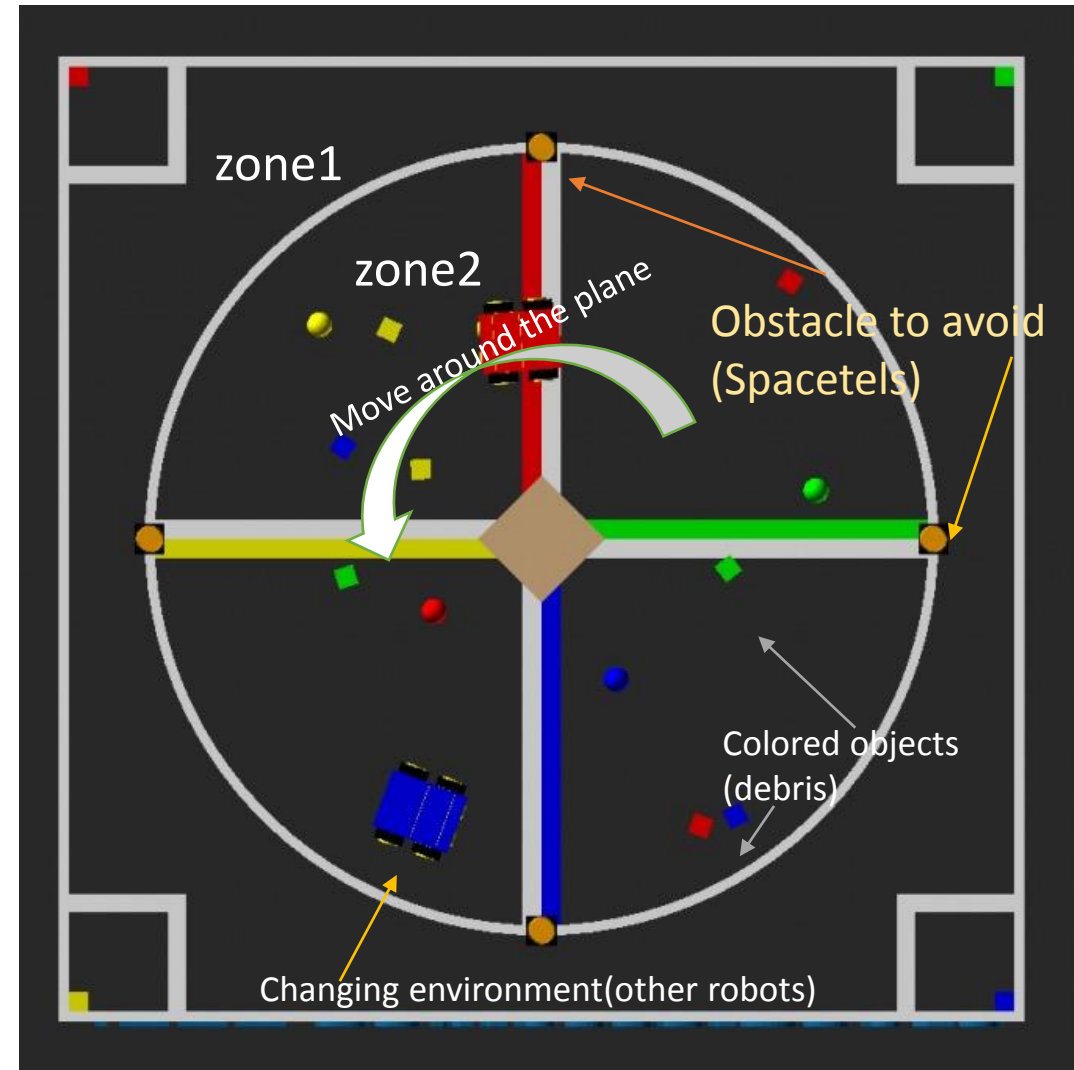
- The robot must be able to:
 - Move on a carpet plane
 - Clear majority of objects
 - Return to home base
 - Avoid collisions
- Key assumptions:
 - Our robot will progress to the second round
 - The playing field will remain unchanged
 - Outside interference will be limited



[3] IEEE SoutheastCon 2019, sites.ieee.org/southeastcon2019/program/student-program/.

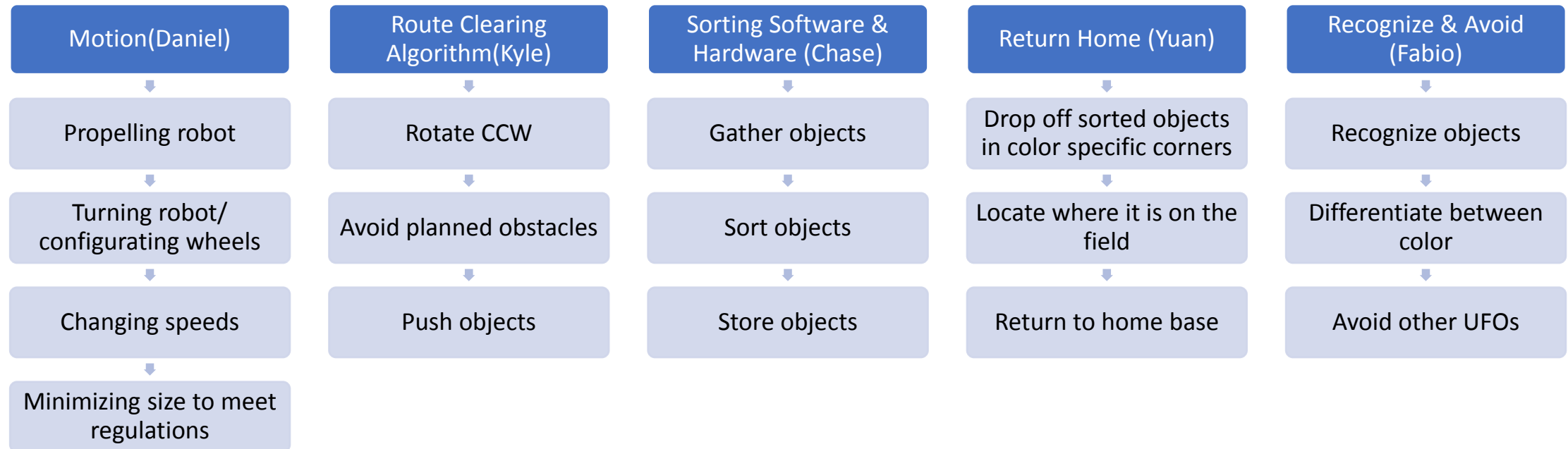
Modules

- Move the robot
- Route clearing
- Sort debris
- Return home
- Avoid collisions



[3] IEEE SoutheastCon 2019, sites.ieee.org/southeastcon2019/program/student-program/.

Functional Decomposition



Initial Approach to the Competition

- Arduino Mega
 - Variety of pins, and open source software
- Brushless DC motor
 - Efficient, and supports a variety of gearboxes
- AI 6060
 - Lightweight, and readily machinable
- Rubber wheels
 - Excellent traction on carpeted surfaces

Interest Outside of Competition

- Create interest in using autonomous robots to clean up parks and oceans
- Spark interest in robots that can adapt to a changing environment
- Inspire an inexpensive alternative to accomplish simple tasks



[8] Zanolli, Lauren. "Monitoring Deep-Sea Coral to Measure BP Oil Spill Fallout." Pacific Standard, 26 Dec. 2017, psmag.com/environment/monitoring-coral-habitat-to-measure-oil-spill-impact.

Question?

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References

- [1] Philip. "Biggest Piece of Space Junk Ever." *ECO Globe*, 3 June 2017, eco-globe.com/biggest-piece-of-space-junk-ever/.
- [2] "Engineering Students Win Robotic Competition." Florida State University News, 28 Sept. 2016, news.fsu.edu/news/science-technology/2012/05/09/engineering-students-win-robotic-competition/.
- [3] IEEE SoutheastCon 2019, sites.ieee.org/southeastcon2019/program/student-program/.
- [4] Arduino Mega 2560 Rev3, store.arduino.cc/usa/arduino-mega-2560-rev3.
- [5] "48' x 96' .125 Aluminum Sheet 3003." Tampa Steel & Supply, tampasteel.com/product/aluminum-sheet-125-x-48-x-96-3003/.
- [6] "AutoEC 68mm Smart Car Robot Tire Wheel (Pack of 4)." Amazon, Amazon, www.amazon.com/AutoEC-68mm-Smart-Robot-Wheel/dp/B00U4HP2X4.
- [7] Knowles, David. "Surfing Trash Island: Photographer Captures Startling Images of Garbage-Strewn Waves in Indonesia - NY Daily News." *Nydailynews.com*, 19 Aug. 2013, www.nydailynews.com/news/world/photos-surfers-ride-trash-filled-waves-indonesia-article-1.1431227.
- [8] Zanolli, Lauren. "Monitoring Deep-Sea Coral to Measure BP Oil Spill Fallout." *Pacific Standard*, 26 Dec. 2017, psmag.com/environment/monitoring-coral-habitat-to-measure-oil-spill-impact.
- [9] Project Scope Management Cartoons, saryan.info/project-scope-management-cartoons.html
- [10] "Control of Mobile Robots." Cellar Door, www.cellar--door.com/control-of-mobile-robots/.
- [11] "Cleaning Robot." ArcBotics - Cleaning Robot, arcbotics.com/lessons/cleaning-robot/.

