



DPRG 2021 FEB 13

**OUTDOOR ROVERS
PANEL DISCUSSION**



ABOUT DPRG

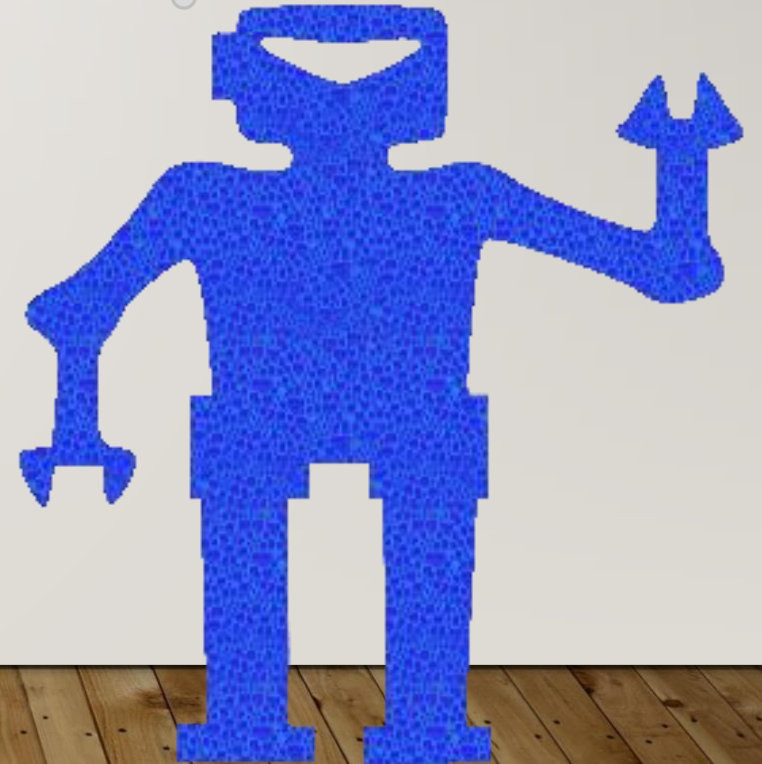
- Founded 1984
- IRS 501c
- Meet Every Tuesday Night & 2nd Saturday of each month
- Build / Putz Around / Compete / Learn / Community Outreach

Our Quest:

- STEM for all ages
- Programming, Problem Solving & "Putting it all together"
- Sensors, Motors & Microcontrollers
- Fabrication, Cool Technologies & Building Stuff



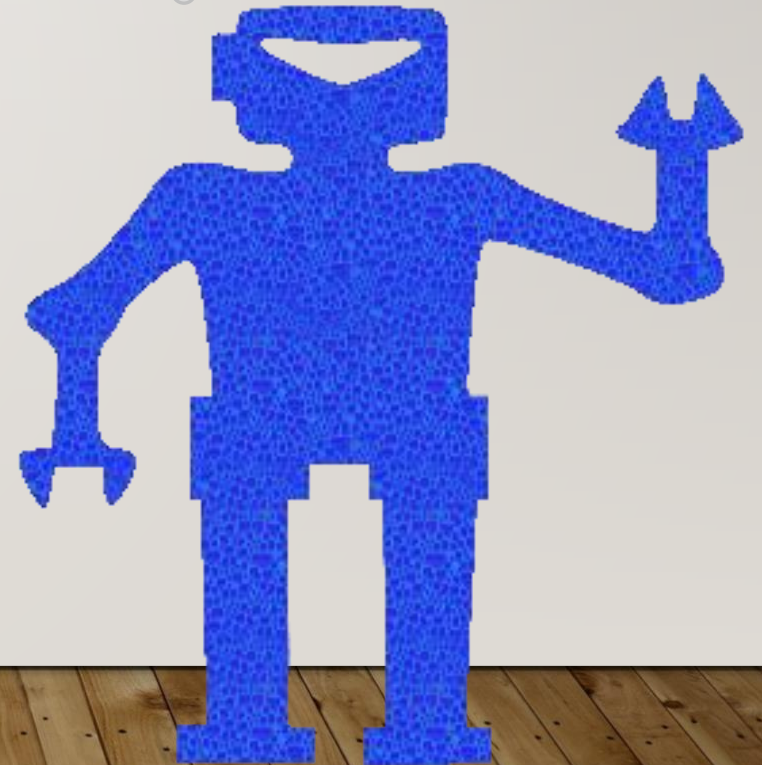
Build
More
Robots!





DPRG SUPPORTERS

Thanks!





TODAY'S MEETING

- Housekeeping
- Outdoor Rovers- Experienced Builder Panel
- Wrap Up

Housekeeping / Upcoming Meeting Plans

13 Feb- a Panel Discussion on Outdoor Rovers

13 March- Pencil in Iron Reign (Thanks Karim)
(depending on contest constraints)

April - July-

- Solo Outdoor Rover presentations in some of the monthly meetings **April - July**
 - ie. solo presentations on an individual robot
 - sort out later / match audience interest with presenter interest
 - let's talk after the 13 Feb panel, and see who could volunteer when
- How to do navigation w/o making a map
 - David Anderson Presentation
 - as compiled & published in the Seattle Robotics Society some years ago

August 14

- Outdoor Rover Competition
- Baseline “RoboColumbus-Plus”
 - See <https://www.dprg.org/contest-rules/>
 - <https://www.dprg.org/wp-content/uploads/2018/09/robocolumbusplus-20150726.pdf>
- Or some other? Any Ideas/Requests?

WHY OUTDOOR ROVERS? WHY TODAY?

- Open discussion & encourage focus on outdoor rover topics
- Identify topics & presenters to for coming meetings
- Spark outdoor rover builds
- Aim for in-person 14 Aug 2021 Outdoor Rover Competition

OUTDOOR ROVERS EXPERIENCED BUILDER PANEL

Agenda

- Panelist Intros
- 10ish Questions- Moderator Guided
- Open Q&A

Panelists

- David Anderson
- Scott Gibson
- Karim Virani
- Jesse Brockmann

MODERATOR GUIDED QUESTIONS

“GETTING STARTED“

I/10

For somebody who's never built an outdoor rover

- Maybe has only built indoor robots
 - No water
 - No elements
 - Or maybe has no robot experience
-
- How do you recommend to get started?

 - What are the top 5/10 Gotcha's?

MODERATOR GUIDED QUESTIONS

“MECHANICAL”

2/10

- What kinds of ‘wheels’ / suspension / steering do you like?
- What kinds of platform materials do you prefer?
- Bonus Challenge Question for Southerners:
 - “How would you make it drive through 3 feet of snow”
- For RC car based rovers, does the rover have differential(s)?
- Does your rover have any unpowered wheels?
- What size wheels (diameter, width) does your rover have?
- What size step could your rover navigate over?

MODERATOR GUIDED QUESTIONS “ENVIRONMENTAL”

3/10

- How do you keep out moisture & gunk?
 - electronics
 - motors / gearing / moving parts
- What kinds of connectors & seals do you like?

MODERATOR GUIDED QUESTIONS

“POWER REQUIREMENTS & SOURCES”

4/11

- How much power do you need?
- For rovers using a brushless motor, how are you controlling the ESC?
- What kinds of power sources do you recommend / and why?
- “Is Gasoline a good idea?”
 - e.g. Hybrid Petrol/Electric like Trains & Boats?
- “Is a thorium reactor a good idea” -> “Flux Capacitor”

MODERATOR GUIDED QUESTIONS “COMMUNICATION”

5/11

- Onboard Buses
 - What do you like & why?
- Remote telemetry
 - What do you like & why?
- Recommendations for Emergency Stop Button Implementation?

MODERATOR GUIDED QUESTIONS

“LOCATION ESTIMATION & NAVIGATION”

6A/11 (OR 12)

- What do you think about **Auto-Pilots**?
 - DIY vs. Off-The-Shelf vs. Some Other approach
 - e.g. the short path to navigate
- Recommendations for **data fusion w/ GPS**
 - DIY vs. Off-The-Shelf
 - Which method do you like
- Describe your rover's obstacle avoidance strategy.
- What is your main controller?

MODERATOR GUIDED QUESTIONS

“LOCATION ESTIMATION & NAVIGATION”

6B/11

- For rovers with encoders, how is the encoder data used (speed, location)?
- How does your rover's sensors handle readings made on a slope?
- What IMU does your rover use?
- What sensors in the IMU are being used?
- Does your robot use a magnetometer (compass)?
- How do you calibrate the magnetometer?
- What GPS does your rover use?
- Do you use NEMA messages or custom messages (like Ublox can)?
- How are the GPS messages being translated into robot coordinates?

MODERATOR GUIDED QUESTIONS “BILL OF MATERIALS”

7/11

- what are your favorite parts / brands?
- why do you like them?
- Describe your sensor suite, what sensors are included?

MODERATOR GUIDED QUESTIONS

“MOST DIFFICULT THING”

8/11

- What was the most difficult problem you had to overcome
 - what was it
 - what made it difficult
 - what did you try
 - how did it work

MODERATOR GUIDED QUESTIONS

9/11

“AT A GLANCE- EVALUATING A POTENTIAL BUILD”




<https://esa-prl.github.io/ExoMy/>





<https://github.com/esa-prl/ExoMy/wiki/System-Overview>

- What are your first impressions?
- What looks good about it?
- What would concern you about it?
- What questions would you ask to evaluate it?



Specifications

€			
Price	Size	Weight	Endurance
250-500€	300x390x420mm	2.5kg	3h

Network of ROS nodes
docker
Docker host running Ubuntu container
Raspberry Pi running Raspberry Pi OS

Open Source
ExoMy is 100% open source.

MODERATOR GUIDED QUESTIONS

“QUESTION FOR JESSE”

10/11

- Wrt. Robot based on an R/C car chassis
- Can you share a few pictures / thoughts
- What are details of encoders

MODERATOR GUIDED QUESTIONS

“NEXT STEPS?”

11/11

- What are your plans going forward?
- what are the next features you want to add or try?