The 4-step guide

To choosing the right robot platform for your academic & corporate research

Avular
Building Imagination

The 4-step guide to choosing the right robot platform

For your academic & corporate research

Working with robots opens up a world of endless possibilities. The ability to create intelligent machines that can perform complex tasks is exciting and holds tremendous potential. However, developing robots is not without challenges. It requires knowing your robot mission, defining your use case, assessing your team's technical ability and understanding your long-term goals.

This guide helps you choosing the right robot platform for your academic and corporate research, in only four steps.

By providing valuable insights into platform selection, this guide ensures that research endeavors are positioned for success and impactful outcomes. Accelerate your mobile robotic research and get started!

Step 1.

Decide your robot mission

Clearly defining the mission of the robot is essential in selecting the right platform for the job. Consider the specific goals, such as the tasks the robot needs to perform and the duration of its operations. Whether you are planning a short-term trial or a long-term project, you need to make sure you align these mission requirements with the robot platform.

Goals

Describing the objective that you want to achieve allows you to weigh which aspects of your future platform are important. We find that robots can play different roles in academic and corporate research:

- **Robot as a tool carrier.** In this research area, the focus lies in the application of robots. The robot is a means to an end. For example, object monitoring, inspection, or analysis of fields of crops for agriculture. Important aspects to consider are easy mechanical and electrical integration of additional payloads, being able to adjust the robot's behavior based on the payload and the required level of autonomy, such that the user can focus on the application rather than on the vehicle itself.
- **Robot as a part of a swarm.** In this area, the robot is used as a part of a team of more robots, e.g., accomplishing a goal with a swarm of robots, or fleet management. Important aspects to consider are communication and coordination, scalability, swarm behavior, planning and task allocation, sensor integration and data fusion.
- **Robot for AI and Machine Learning applications.** In this area, the robot is often used as the hardware required to run the software. For example, running your algorithms to analyze gathered data. Important aspects to consider are computational power and real-time performance, sensor integration, cloud connectivity (e.g., via 4G/5G or WiFi), software development tools, software optimization capabilities and software deployment and updates. For example, running your algorithms to analyze gathered data.
- **Robot as a DIY platform.** In this area, the focus lies in being able to change certain parts of the robot, hardware, or software wise. Integrate a robot arm on a driving platform or implement a new sensor technology. Important aspects to consider are modularity, documentation, hardware expansion and interfaces, and safety measures.

Duration

The duration of the robot mission is a critical aspect to choose the right robot platform for your application. The ability of the robot to operate for the required duration directly impacts its success and effectiveness. Factors such as power source, energy efficiency and payload capacity contribute to the selection process. To choose a platform that aligns with the mission's duration requirements, you need to keep the following things in mind:

- **Power source:** how will the robot be charged? Can the robot charge itself through a docking station or does it (solely) depend on manual charging?
- **Energy efficiency:** look for a platform that is designed to optimize its performance by minimizing the energy consumption, while delivering the performance you need; a walking robot is less power-efficient than a driving robot.
- **Battery capacity:** for same-level operations, a driving robot is a preferred option for longer distances, due to longer battery life.
- **Maintenance:** do you mind if the robot requires regular maintenance, or do you prefer a platform that is robust, reliable and requires minimal maintenance?
- **Payload capacity:** a robot that carries heavy loads, will consume more power. This affects the operational time of the robot. If this is something your application requires, make sure to choose a platform that can perform effectively with heavy payloads.

Step 2.

Define your use case

When choosing the right robot platform, you need to define your use case and consider factors such as the environment the robot will operate in. Other important factors include vehicle type and user interactivity. Understanding these factors will decide which platform can function optimally in your desired setting.

Environment

Which platform is suitable for your application or not, is defined by the environment the robot platform will operate in. A platform that is optimized for an indoor setting with level floors will not be appropriate for a rough outdoor terrain. Therefore, it is important to thoroughly consider where you want your robot to deploy and where not. While research can be executed in a controlled area, without unforeseen events, robots are being more and more implemented in (semi) public environments. Following aspects are important to keep in mind:

- Indoor, outdoor or hybrid situations
- Surface type/terrain adaptability
- Public or fully controlled environments
- Possible weather conditions
- Desired IP-rating
- Sensors

Vehicle type

This might seem straight-forward but a reoccurring statement in the industry can be ‘we want a drone’. But driving would also be able to fulfill their mission. Ask yourself and your team with your mission in mind, what would be able to fulfill your requirements.

- Flying
- Driving
- Walking
- Sailing
- Hybrid

Be critical about what vehicle will work for your case. Interestingly, as a drone and robot company, we see that many inquiries start with ‘a drone for XYZ’, whilst ‘a driving robot for ABC’ makes a better fit.

User-interaction

When you know the environment, it is crucial to consider the interaction with the user, as well as the interaction with the environment. Check if you require certain features for successful implementation.

- Environmental awareness
- Obstacle recognition, tracking, and avoidance
- Navigation and localization
- Human-robot safety
- Adaptability to environmental conditions
- Interaction with moving elements
- No-go areas

Step 3.

Assess your team's technical ability

When considering technical capabilities that are required for using robotic platforms for research purposes, we defined four types of users.

Types of users

1. The first type of users are robot fanatics that want to explore the world of robotics and unleash their creativity. They make use of DIY kits for purposes such as personal projects, hobby and entertainment, educational activities, prototyping, and innovation.
2. The second type of users are those who prefer complete control over the robot's development process. They are comfortable handling all aspects, including integrating payloads and coding software. These users value the ability to customize and finetune the robot according to their specific research requirements.
3. The third type of users are those who are comfortable configuring only specific parts of the robot. They leverage existing components and frameworks to streamline the development process and seek a balance between customization and utilizing pre-existing tools and resources.
4. The fourth type of users prioritize ease-of-use and simplicity. They prefer to focus on their research objectives, rather than dealing with the technical complexities a robot can entail. A platform that offers pre-integrated solutions and a user-friendly interface is ideal, which allows them to quickly start their research without the need for extensive technical expertise.

Understanding which segment aligns with your preferences and capabilities will guide you towards the most suitable robot platform. Check if the functionalities such as a fully integrated mission planner, full autonomy and integrated payload are aspects you want taken out of your hands. If you want to implement your own autonomy, there should be a possibility for this. Secondly, if you want to integrate all aspects on your own, check if the platform allows this mechanically, such as mounting holes. Thirdly, consider the electronic side, such as the right voltage. Finally, consider the software side: is there an API, or do you have full access through e.g. Linux?

These are fundamental aspects if you want to start your own integration. But for all four types of users, also consider if you require service to some degree (for example some help with integration). Does the supplier offer this? Is there an SDK?

Step 4.
Understand your long-term goals

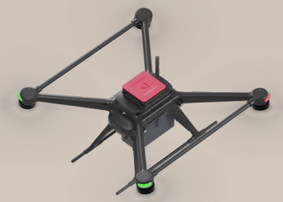
Start whilst keeping the end in mind. Choosing the right robot platform requires consideration for the final application; first of firsts, or first of many?

If the intention is to have a single trial robot, the focus may be on immediate functionality. However, if the plan involves scaling up and deploying multiple robots, more factors should be considered. Factors like robustness, scalability, and compatibility with future iterations become crucial. When deploying multiple robots, you need a mission planner that can run multiple robots. For OEM versions, a platform needs to be able to be made in large volume, stripped from all unnecessary parts. If you wish to use and receive (software) updates for a longer period of time, consider if the vendor will be supporting this version on the long run. Also consider if your supplier supports potential upscaling and the challenges that come with it.

It is important to articulate a clear long-term vision to ensure the selected platform aligns with the desired trajectory.

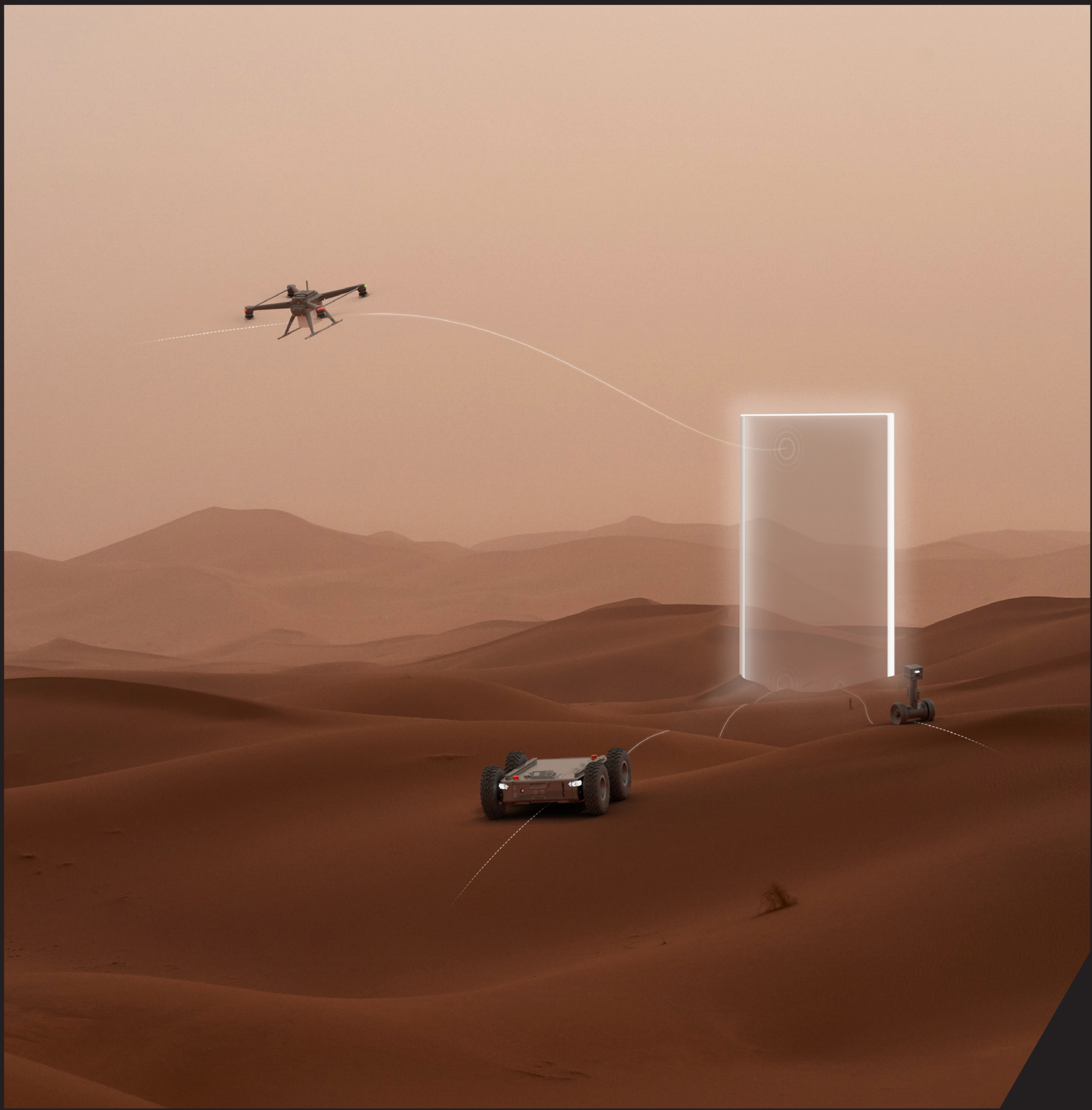
That's it – we hope you now have the knowledge you need to find your ideal robot platform!
If you need help selecting the right platform, our Academic & Corporate Research representatives are ready to help you. Contact us for more information.

The Origin is a driving robot that is the ideal robotic platform to elevate your academic and corporate research. It is equipped with an Nvidia Jetson Orin NX, a real-time computer and default (perception) sensors. This allows you to work with our Autopilots (autonomy right out of the box), or use its modularity and change the hardware and software (or even add your own) and conduct your own research on autonomous driving.



The Vertex is a flying robot (drone) that is built in an open-access way, making it the perfect drone platform for corporate and academic research projects. It is equipped with an Nvidia Jetson Orin high-performance compute platform with enough computing power for your research. Easily attach our sensors and use our autonomy or add your own hardware and software in a plug-and-play matter.

For more information about the Avular robotic platforms, please visit **avular.com**



An agile and innovative robotics company, accelerating the creation of mobile robots that shape a brighter future.