Choosing a Vehicle

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https://www.embeddedrelated.com/showarticle/964.php

There are a few things to take into consideration when choosing a vehicle or chassis for your autonomous vehicle. You can design and build your own, buy a stripped robot chassis, or use a radio controlled (RC) vehicle as a starting point. I usually use an RC vehicle as a starting point.

Two basic styles of RC vehicles exist. The first, is the toy-grade vehicle. It can be found in most retail stores, and usually costs below 50 dollars. Its main advantage is the low price, which can be as low as $2 if you find one in a Goodwill type store. The disadvantages are the lack of spare parts, sometimes low power, and having only one speed for throttle and all or nothing for steering. The more expensive hobby-grade vehicles usually have abundant spare parts, variable throttle, different motors, and servo steering. They are usually more suitable for adding sensors,

STEEERING

There are two main types of steering, Ackerman-type and skid-steering. Ackerman-type steering, like that used in automobiles, allows for easier use of wheel encoders and can have more precise steering. Skid-steering allows for turning in place, but doesn't allow wheel encoders to be effective because the wheels have to slip in order to turn. Each has a time and place where it will outperform the other.

ELECTRIC MOTORS

There are gasoline engines available, but they are loud and must be used outdoors. There are two basic types of electric motors available, brushed and brushless. Brushed motors have brushes and are simpler to connect, but are less efficient and have less torque. Some have replaceable brushes so they can be changed when they wear down or they stick to the commutator from lack of use. Brushless motors don’t have brushes. They are more efficient and have better torque ratings, but they require specialized hardware to function.

SUSPENSION

Many very low cost vehicles have a rigid chassis with not suspension except for what the tires provide. This makes for a very rough ride, especially outdoors and can cause problems with sensors and computer hardware. Some vehicles have springs to absorb some of the bumps, but this can cause oscillations on very bumpy surfaces. More expensive vehicles have oil-filled shock absorbers to make the ride smoother; this is the preferred setup.

POWER

There are a few ways to power your vehicle. Unless your vehicle is very small, alkaline batteries won't last very long. There are a few types of rechargeable batteries, like Nickel Cadmium (Ni-CD), Nickel Metal Hydride (Ni-MH), Lithium Polymer (Li-Po), and Lithium Ion (Li-on).Ni-CD degrade over time and develop a 'memory effect' if the battery is not fully discharge. Li-po batteries can ignite if they are damaged. If you are feeling adventurous, you can try a hydrogen fuel cell, like those available from http://www.horizonfuelcell.com/ .Solar panels could also be used to provide extra charge to the batteries.

SENSORS

Make sure your vehicle is large enough to accommodate the sensors you want to use. You can use a compass, GPS, or wheel encoders for navigation. Ultrasonic sensors and bumper switches can be used for object detection. Video cameras can also be used to detect obstacles if you have enough computing power.

CONTROL

For simple vehicles, you can use a microcontroller like the Arduino Uno or Basic Stamp. More sophisticated vehicles may need a Single Board Computer like the Raspberry Pi. Some large vehicles use notebook computers or rack-mounted systems. Note that regular hard-drives don't like being bounced or vibrated.

MOTOR CONTROL

Most vehicles use H-Bridges to allow for forward and reverse operation. Make sure that your motor driver can handle the maximum power your motor can draw.

These are a few things to think about when you choose the chassis for you autonomous vehicle.

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