LECTURE-9

Other Important Components

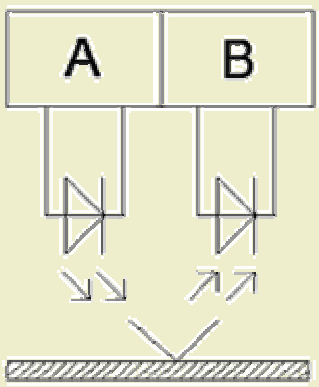
Sensors:-

Sensors detect and interpret things in the outside world (such as obstacles, sounds, and signs) or about the outside world (such as temperature, pressure, and viscosity).

Infra Red Sensors:-

IR distance sensors are one of the most used distance sensors. They fall in 3 categories:

Reflection (Short range. Not more than 2 - 3cm)



IR reflection sensor

This type uses an IR-LED and IR-diode (or phototransistor). When an object is close to the sensor it reflects the light emitted by the LED to the IR-diode. Using modulated IR-light (A) and filtering (B) the input signal of the IR-diode leads to better results as this blocks (much of) other IR-light. There are ICs that contain both modulator, IR-diode and filter-circuit.

Triangulation (Larger range. Around 10 - 30cm)

e.g. Sharp has a family of sensors that use this principle for measuring distance. They consist of an IR-LED and an IR-sensitive LDR strip. Combined with built-in

optical lenses, the reflected beam's position on the LDR depends on how far the object is.

Line detecting sensor

Similar setup as the reflection IR-sensor, but aimed downwards to detect lines on the ground. This sensor makes use of the difference in reflection between a white background and a black line.

More advanced robots use multiple line detection sensors to follow a line more cleanly.

Wall sensors:-

Wall sensors are used to detect the presence or absence of walls and to verify position on the maze. They are specially used at places where problem is related to detect walls and find path among then like a micro mouse. They will also be important in ensuring that the robot maintains an appropriate path without hitting any walls. For wall sensors, it may be more important to have good repeatability than absolute accuracy. The key is to avoid hitting anything. Thus it does not matter as much if you run with a small error as long it does not grow.

Chassis:-

In a robot chassis holds all the bits together. It must provide support for motors, batteries, sensors and the controller. Ideally, it will be light, strong, small and easy to construct.

Planning the chassis is probably something to do pretty early. For simple projects I recommend designing chassis in two halves, and placing one above the other. The lower half can contain sensors, motors, battery and the upper half to contain the microcontroller’s circuit and both halves attached to each other using mountings and long screws. This is pretty beneficial for beginners as it avoids complexity and also the robot built is compact.

The materials used will probably depend on what is available and our existing skills. Appearance is probably not going to be main concern so don't worry about wires

wandering about. Performance is the main aim, everything else is secondary. Naturally, if we can have adequate performance and look gorgeous then go for it.

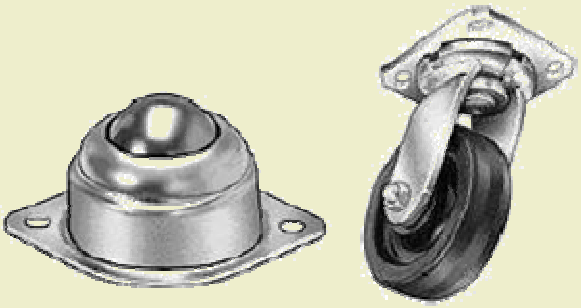
Decisions have to be made about sensor types and layout; motor types and their layout; how will vehicle steer; where the batteries will go; how the controller will be placed; how everything gets fixed together; how to rebuild if things turn out wrong and - by no means least - how big it should be.

Wheels:-

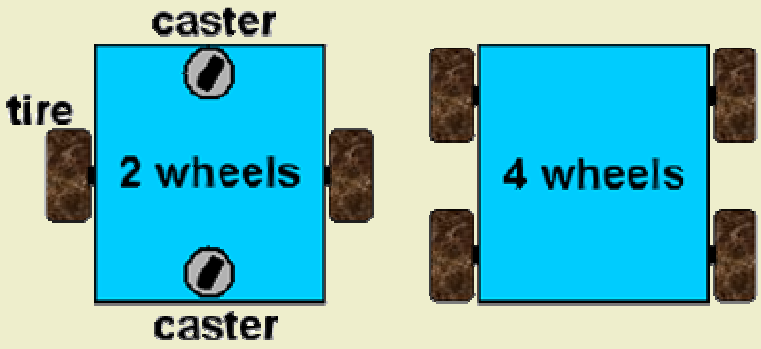
Wheels are always the first element in setting up a chassis. If you've got the right tires, you're 90% there. Wheels should be selected according to the grip needed keeping in mind friction between wheels and maze.

The tires are perhaps the most important part of the vehicle. We can gain the biggest improvements by installing tires with more grip. Tires are available in many different compounds: hard - soft. Soft tires have more grip than hard tires, but wear out faster. We can also able to mix types front and back and can reduce overseer by using hard tires in front and soft tires in back. This gives the rear tires more grip than the fronts, making them less likely to slide out. Likewise, you can reduce under steer by putting soft tires up front and hard tires in back.

Castar Wheels:-



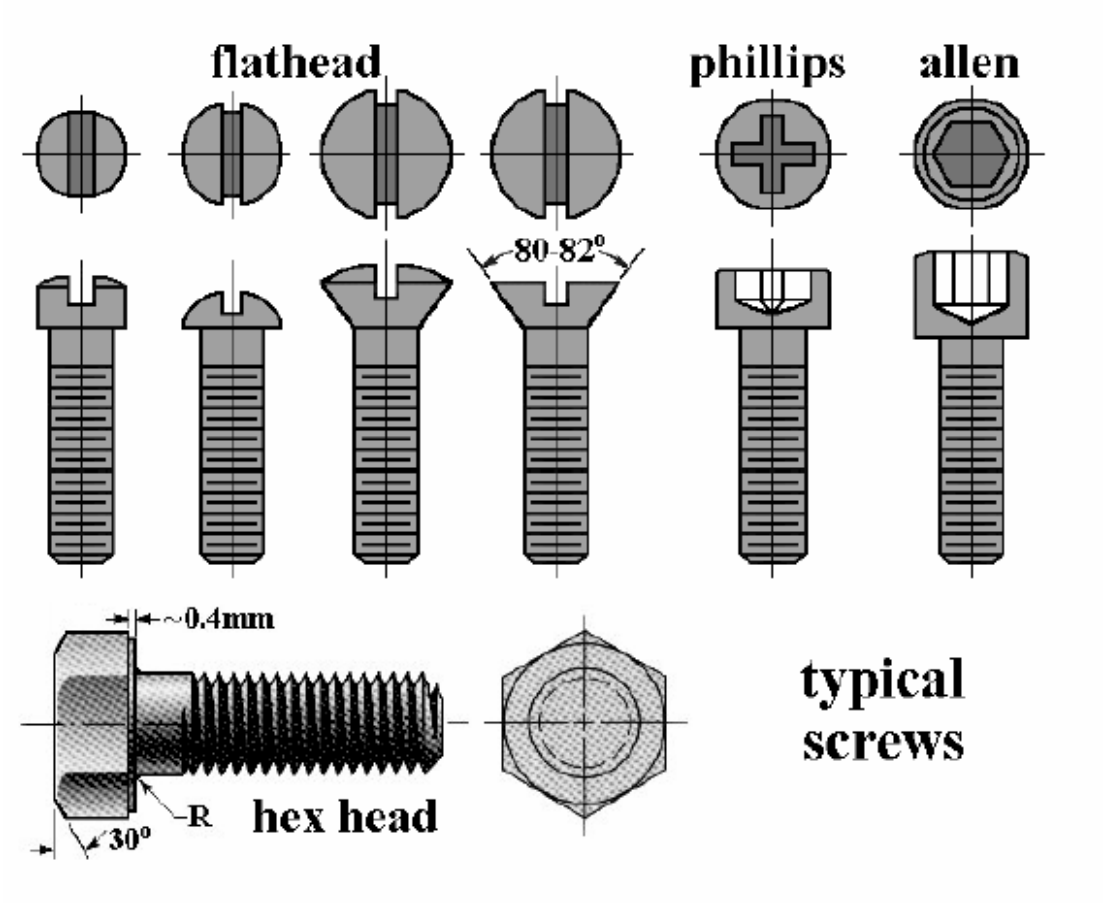
When the robot is made with two active wheels then it will probably need at least another ground support, ideally 2. This is usually accomplished with skids which are passive elements such as ball transfer or caster wheel.

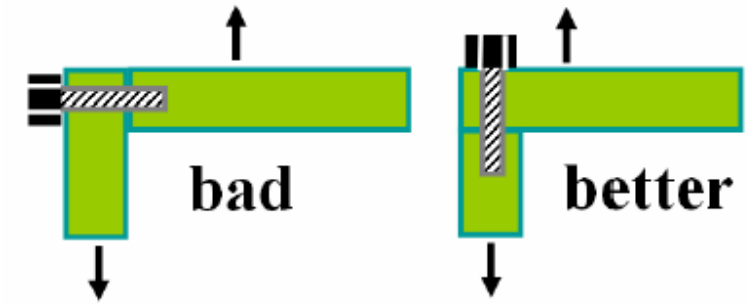


In this way the entire reaction from ground will go to the will go through the two active wheels. With two active wheels is possible to turn very fast and with less wastage of energy. In addition the robot saves the wait by not needing the extra set of active wheels, shafts and bearings.

Joining Elements:-

Joining elements are used to keep the robot parts held together in rigid and strong bond. The main joining element used in basic robotics is screws. These are almost always cylindrical with helical threads around their perimeter. The screws used in motor and chassis mounting should be of hex or allen head type as they allow highest tightening torques while screws used in electronics could be of flathead or Philips type.





Screws shear much more easily than they break due to traction forces. Therefore pay attention to the forces that would most likely to act on each part of your robot. For instance in the figure two parts are joined using a screw to transmit a vertical force. The configuration with a horizontally mounted screw is a bad idea, since it will be loaded in shear. Change the design so that the screw will be under traction as in next figure. In this way the screw will be able to take up twice the load.