Choosing Suitable Motor

1-For Steering:

There are a lot of types you can use for that mission but the main two are:

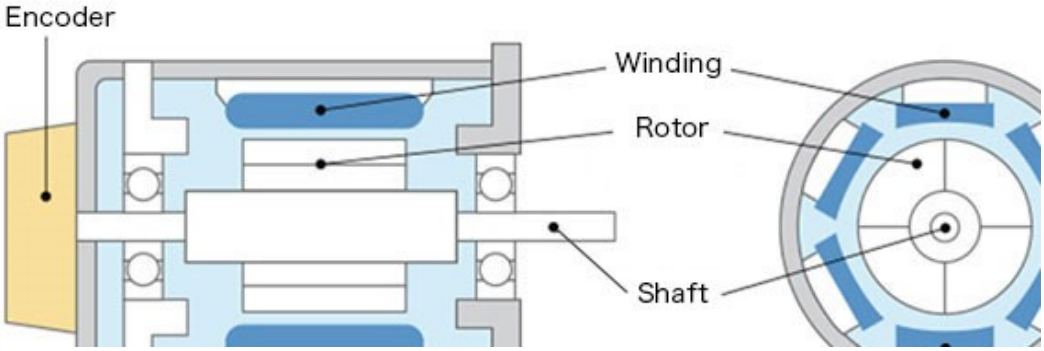
- Servo motor with encoder
- Stepper motor (heavier than servo)

Servo Motor

The Servo Motor is a commonly used motor for high technology devices in various industries like automation. This motor is a self-controlled electrical device, that switch part of a machine with high productivity and great accuracy. The o/p shaft of this motor can be stimulated to a specific angle. These motors are mainly used in different applications like home electronics, cars, toys, airplanes, etc. This article discusses what is a servo motor, working, types and its applications.

Servo Motors Parts and Functions:

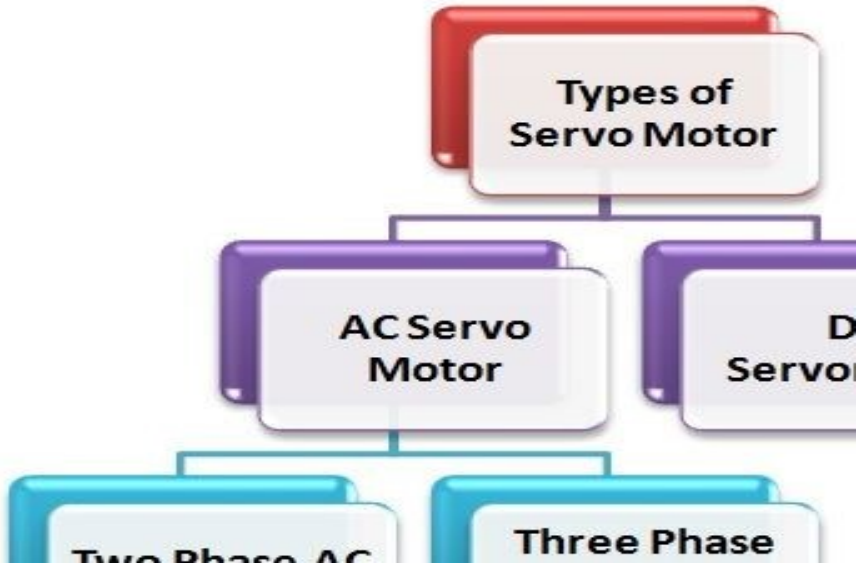
Each part of the servo motor serves a huge purpose in making the servos properly function or work.



- Stator - A stator creates a rotating magnetic field to efficiently generate torque.
- Winding - Current flows in the winding produces a rotating magnetic field.
- Shaft - The shaft transmits the motor output power. This load is driven through the transfer mechanism.
- Rotor - A rotor is a permanent magnet that is positioned externally to the shaft.
- Encoder - An optical encoder always observes and calculates the number of rotations being completed and watches the position of the shaft.

Types of Servo Motor

These motors are classified into different types based on their application like Brushless DC, AC, continuous rotation, linear and positional rotation, etc. Typical servo motors contain of three wires such as, power control and ground. The outline and dimension of these motors depend on their applications. The most common type of this motor is an RC servo motor used in interest applications like robotics due to their ease, reliability and affordability of control by microprocessors.



1. Dc Motor

Generally, this motor has a separate DC source in the winding and the armature winding field. The control can be archived either by controlling the armature current or field current. Field control comprises some benefits over armature control. Similarly, armature control comprises some benefits over field control. Based on the uses the control should be functional to the DC servo motor. This motor offers very precise and also quickly react to start or stop commands due to the low armature inductive reactance. These motors are used in related equipment's and computerized mathematically controlled machines.

2. Ac servo motor

This motor includes encoder which is used with controllers for giving closed loop control and also feedback. This motor can be employed to high accuracy and also controlled exactly as required for the applications. Often these motors have advanced designs of easiness or better bearings and some simple designs also use higher voltages in order to achieve greater torque. AC motor applications, mainly involve in robotics, automation, CNC machinery, etc.

3. Positional Rotation Servo Motor

This is a most common type of motor and the o/p of the shaft rotates in about 180o. It comprises physical stops situated in the gear device to stop revolving outside limits to protect the rotation sensor. These common servomotors include in radio controlled cars, radio controlled water, toys, aircraft, robots, and many other applications.

4. Continuous Rotation Servo Motor

This motor is quite correlated to the common positional rotation servo motor, but it can move in any direction indefinitely. As per the speed & direction of rotation, the control signal rather than set the static position of the servo is assumed. The range of potential commands causes the motor to rotate clockwise or anticlockwise as chosen, at varying speed, depending on the command signal. This kind of motor is used in a radar dish and it can be used as a drive motor on a mobile robot.

5. Linear Servo Motor

This motor is also similar the positional rotation servo motor, that is discussed above, but with an extra gears to alter the o/p from circular to back-and-forth. These motors are not simple to find, but sometimes you can find them at hobby stores where they are used as actuators in higher model airplanes.

Why to use servo motor:

We can use servo motor with encoder as feedback. The o/p shaft of this motor can be stimulated to a specific angle. This motor is used to activate movements in robotics for giving the arm (or wheel) to its exact angle. We can also use PID controller for precision. There are a lot of advantage of servo motor:

- High precision
- High speed
- Quick response
- Compact size

We can also use stepper motor but I preferred servo as it is cheaper and lighter. The servo can also do that task efficiently.

Link of the motor:

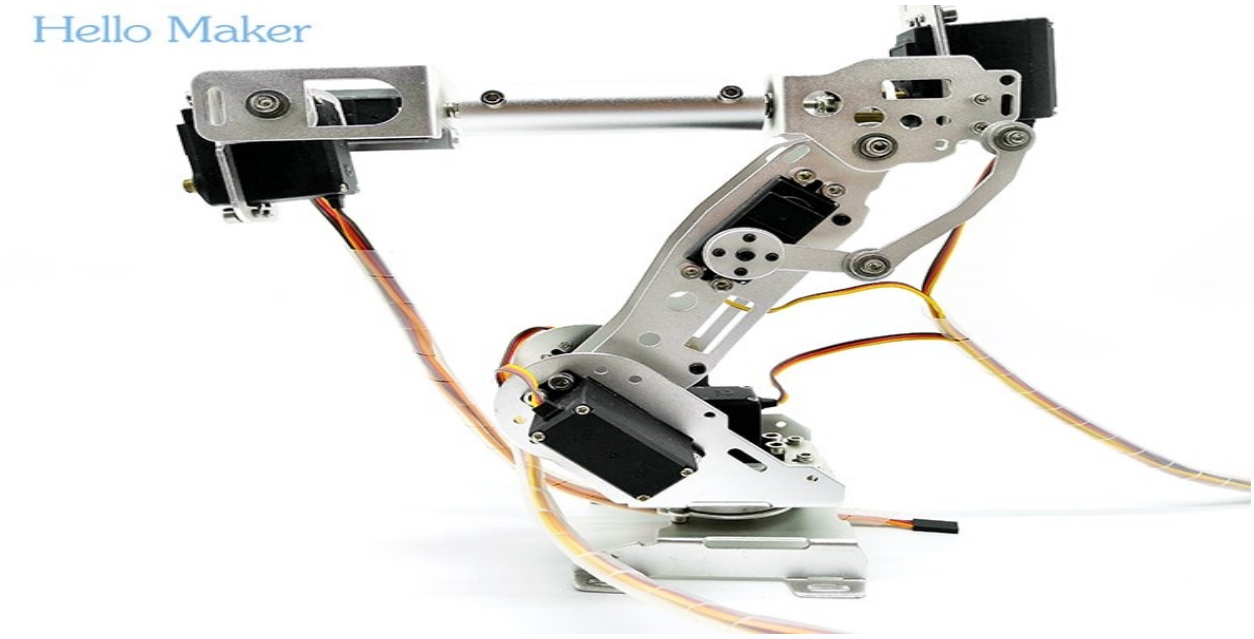
https://www.amazon.eg/-/en/TowerPro-Micro-Servo-Arduino-Raspberry/dp/B091D7YVS6/ref=asc_df_B091D7YVS6/?tag=egoshpadde-21&linkCode=df0&hvadid=545137319209&hvpos=&hvnetw=g&hvrand=5069466938673300124&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=1005386&hvtargid=pla-1484547627754&psc=1

https://www.amazon.com/Standard-3kg-cm-Torque-3-2kg-cm-Weight/dp/B00K57BD8G

2-For Shooting:

Strategy:

We will use robot arm (horizontal) and put the ball on it. When the motor run, the arm will leave horizontal plane and shoot the ball. That photo may mention what I want to do.



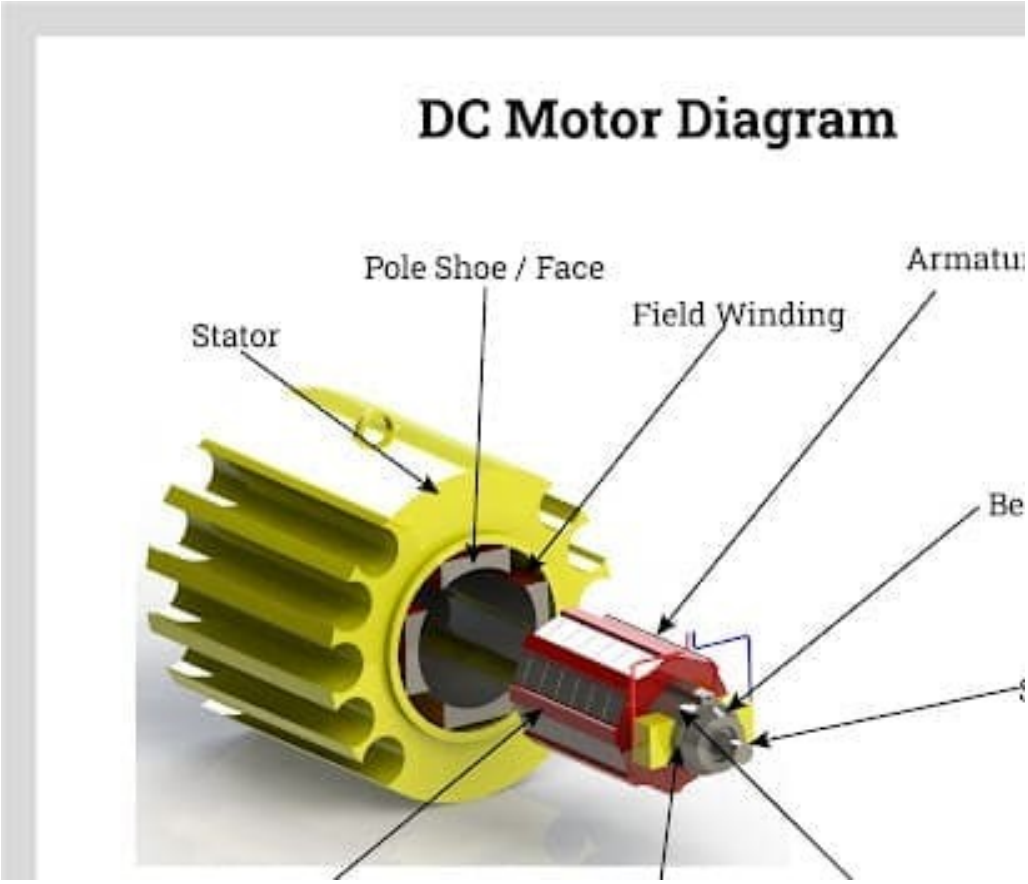
There are many types of motors you can use (you only need high torque at low time) like:

- Dc motors (higher starting torque) (Brushless motors or brushed)
- Servo motors

Dc motors

A direct current (DC) motor is a type of electric machine that converts electrical energy into mechanical energy. DC motors take electrical power through direct current, and convert this energy into mechanical rotation.

DC motors use magnetic fields that occur from the electrical currents generated, which powers the movement of a rotor fixed within the output shaft. The output torque and speed depend upon both the electrical input and the design of the motor.



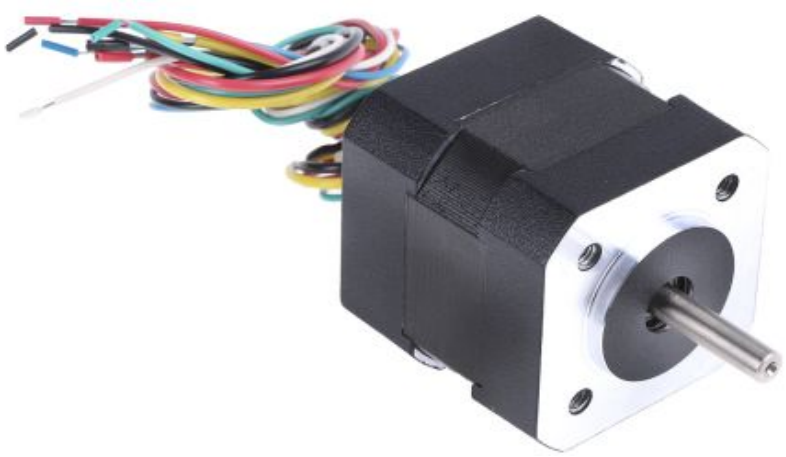
Types of DC Motors

- Brushless DC motors:

Brushless DC motors are also known as electronically commutated motors, or synchronous DC motors, and differ to the brushed motor, thanks to the development of solid state electronics.

The key differences between brushless DC motors and other varieties is that they do not have a commutator, which is replaced by an electronic servomechanism that is able to detect and adjust the angle of the rotor.

The brushless DC motor has several advantages. Commutators use soft contacts called ‘brushes’ which wear down over time. A brushless DC motor is therefore more durable, and also safer than the more classical design.



- Brushed DC motors:

  the classic brushed motor features a commutator, to reverse the current every half cycle and create single direction torque.

  While brushed DC motors remain popular for electrical propulsion, cranes, paper machines, and steel rolling mills, many have been phased out for the more efficient brushless model in recent years.

- Shunt DC motors:

A DC shunt motor is a variety of brushed motor that has the field windings connected in parallel with the armature. Shunt wound DC motors have a lower current because of the parallel windings.

A shunt motor is used for applications that require a constant torque, where the load is not significantly altered by speed, such as conveyor belts, mixers and hoists.

The specific field windings provide unique shunt motor characteristics that make it such an effective choice for constant torque applications. Many shunt DC motors feature constant speed characteristics, with the small difference between no-load and full-load speed the main benefit of this type of motor.

- Series DC motors:

Series wound DC motors are the final variety of brushed motors in this guide. The key difference between this variety and the shunt motors discussed previously is that field windings are connected in a series. This means that the entire armature current passes to the field winding, creating much faster speeds.

As the supply voltage can't be adjusted, series DC motors can't regulate their speed particularly well.

While this is a problem for some applications, it makes them particularly useful for tasks that require high starting torque, such as power tools and sewing machines.

The specific characteristics of DC series motors offers a clear and distinct purpose. The Aulhaber Brushed DC Geared motor is a good example of the benefits of series wound motors, having high starting torque that is ideal for appliances.

Why to use dc motors:

I think dc motor will be suitable with the strategy of shooting we use as it has a lot of advantages:

- Higher starting torque
- Fast response time
- Quick starting and stopping
- Reversing
- Variable speeds with voltage input and they are easier and cheaper to control than AC
- Good speed control

Links:

https://www.alibaba.com/pla/Large-torque-high-speed-RS775-dc_1600086620403.html?mark=google_shopping&biz=pla&searchText=dc+motors&product_id=1600086620403&language=en&src=sem_ggl&from=sem_ggl&cmpgn=16509557697&adgrp=139882388768&fditm=&tgt=pla-293946777986&locintrst=&locphyscl=1005386&mtchtyp=&ntwrk=u&device=c&dvcmdl=&creative=586657547254&plcmnt=&plcmntcat=&p1=&p2=&aceid=&position=&localKeyword=&pla_prdid=1600086620403&pla_country=EG&pla_lang=en&gclid=Cj0KCQjwpeaYBhDXARIsAEzItbEzQrtfU2bv81Oo2JCXFdhAjFWB0Yy3R6uZzMLBiveMOkcEMey9YNcaAiFYEALw_wcB

https://uk.rs-online.com/web/p/dc-motors/2389721