

Chapter 2

Agile Eye

This chapter introduces the definition, geometric of Agile Eye robot, and uses of Agile Eye are mentioned here.

2.1 Definition

The Agile Eye is a 3-DOF 3-RRR spherical parallel manipulator developed for the rapid orientation of an end-effector. The work space of the Agile Eye is superior to that of the human eye. Moreover, due to its low inertia and its inherent stiffness, it has high velocity and accelerations, which are beyond the capabilities of the human eye, Figure 2.1 shows the mechanical component of Agile Eye.

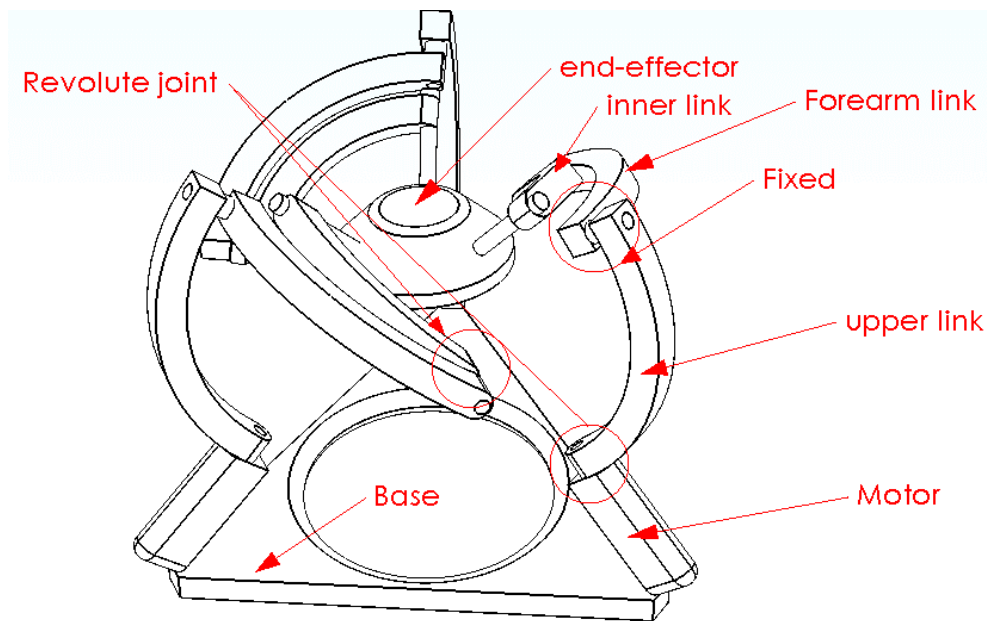


Figure 2.1: CAD model of Agile Eye robot

The input mechanism of the robot is structured into three active revolute joints while the output body is connected through a set of chains with identical geometry, the robot has many advantages that are high speed, high acceleration, high stiffness, low inertia, and high load capacity. The motion of the Agile Eye is a spherical motion, this motion is due to its structure, links, and revolute joints. Each link is a curved link and this property reduces the inertia of the robot.

The Agile Eye has many applications for example the end-effector holds a camera, laser, or other things that need high speed and high acceleration.

As shown Figure 2.2 in the Agile Eye consists of three identically links which is symmetrically ordered around the center of rotation in 120° .

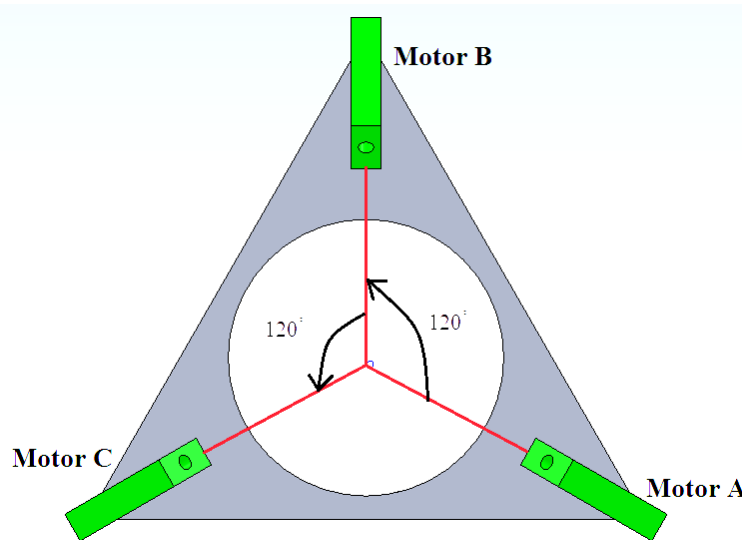


Figure 2.2: The angles between motors

Each link of Agile Eye robot consists of angular bipartite outer link and a passive inner link. The bipartite outer link which comprises an upper and forearm, is coupled at the upper link with actuator rigidly and at the forearm rotatably with the inner link. All inner links are connected with end-effector using revolute joints, all partial links are curved links. The two parts of the outer link are connected rigidly together, as shown in Figure 2.3.

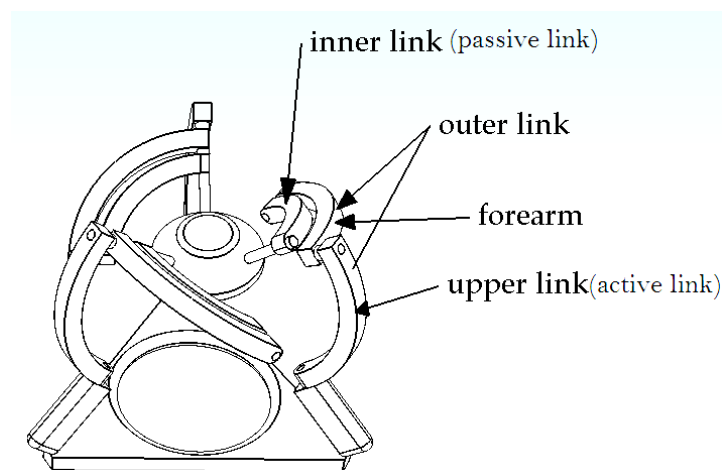


Figure 2.3: Links of Agile Eye

2.2 Geometry

The link angles of the manipulator are assumed to be the same for each of the chains connecting the end-effector to the base, these angles are β for upper link and forearm link. The angle γ is the angle of inner link, R_1 , R_2 and R_3 are the radius of upper, forearm and inner link respectively. These angles and radii are shown in Figure 2.4

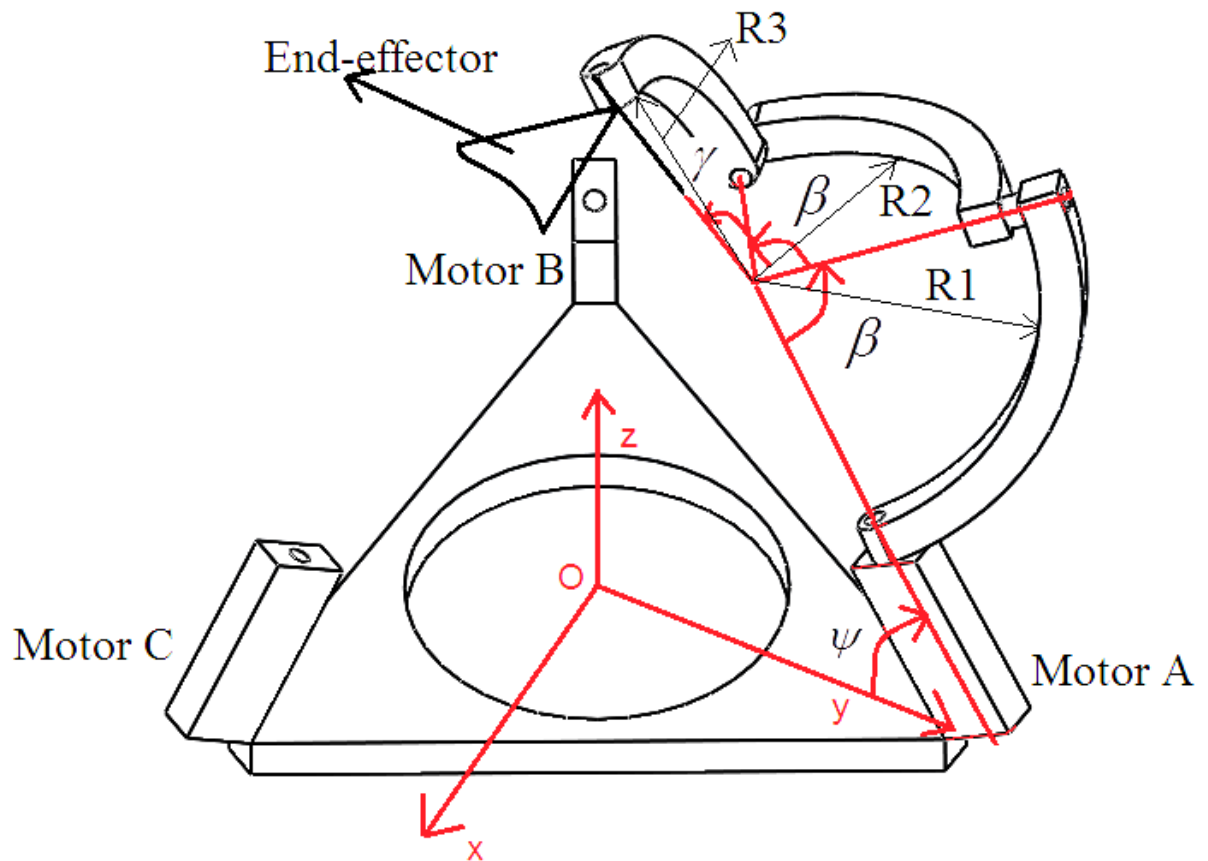


Figure 2.4 Geometric of Agile Eye

Each link of the Agile Eye has 3 chains. Each chain has 3 revolute joints connected serially. The serial chain is called orthogonal, i.e., its neighboring revolute axes layout at $\beta = \pi/2$, $\gamma = \pi/2$, $\psi = \pi/3$.