Visual servoing Lab Work

Kevin SECRET-MORLAND

***Abstract*—Visual servo control refers to the use of computer vision data to control the motion of a robot. The vision data may be acquired from a camera that is mounted directly on a robot manipulator or on a mobile robot, in which case motion of the robot induces camera motion, or the camera can be fixed in the workspace so that it can observe the robot motion from a stationary configuration. Other configurations can be considered such as, for instance, several cameras mounted on pan-tilt heads observing the robot motion. The camera may be carried by the robot or fixed in the world, known respectively as end-point closed-loop (eye-in-hand) or endpoint open-loop.**

***Index Terms*—Visual servoing, motion, robot manipulation, eye-in-hand, endpoint open-loop.**

I. Introduction

There are two fundamental configurations of the robot end-effector (hand) and the camera:

- Eye-in-hand, or end-point closed-loop control, where the camera is attached to the moving hand and observing the relative position of the target.
- Eye-to-hand, or end-point open-loop control, where the camera is fixed in the world and observing the target and the motion of the hand.

Visual Servoing control techniques are broadly classified into the following types:

- Image-based (IBVS)
- Position/pose-based (PBVS)
- Hybrid approach

IBVS was proposed by Weiss and Sanderson. The control law is based on the error between current and desired features on the image plane, and does not involve any estimate of the pose of the target. The features may be the coordinates of visual features, lines or moments of regions. IBVS has difficulties with motions very large rotations, which has come to be called camera retreat.

PBVS is a model-based technique (with a single camera). This is because the pose of the object of interest is estimated with respect to the camera and then a command is issued to the robot controller, which in turn controls the robot. In this case the image features are extracted as well, but are additionally used to estimate 3D information (pose of the object in Cartesian space), hence it is servoing in 3D.

II. Lab Work

The lab is to provide few techniques on visual servoing in order to understand the algorithm given to control a virtual robot. We have to modify some variables (Theta (rotation) and Lx) and see their influence to the moving of the robot thanks to simulation. By the changing of theta we will see it's influence to the error and control law curves and Lx to the eigen-values of interaction matrix curve.

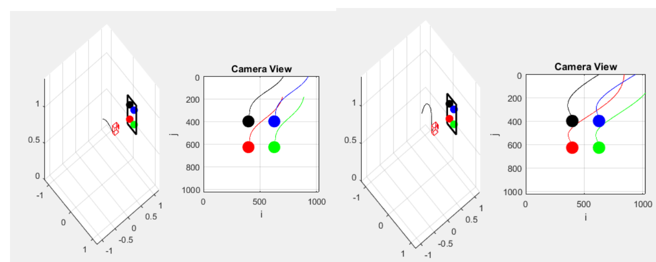

Fig. 1. Representation of different rotation of the robot, 90 and 150 degree.

A. Interaction with Theta

The value of Theta will change the orientation of the robot from the surface plane. The robot will create a path-finding to localise itself on the area and find the best way to match the surface plane. So if the orientation is changing a lot, the interaction movement will be more important and the error curve will be less smoother. The velocity is very dependent to the start rotation. The more the start rotation is important, the more the velocity in the beginning is huge. The influence of Theta is improve by the comparison with an angle of 90 and 150.

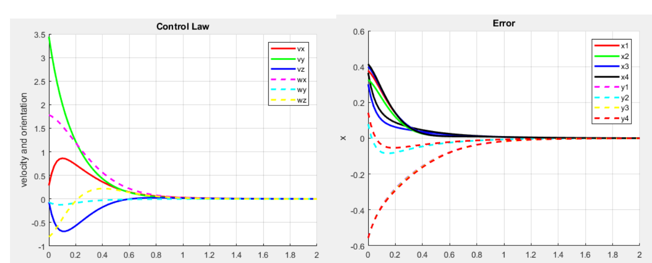

Fig. 2. Control law and error curve in 90 degree.

B. Interaction with Interaction matrix Lx

Now in this part we will see what happen when we start playing with the value of lx. We know that Lx correspond to the interaction matrix and it's derivation give the control law. So what will happen if we change these parameter. For

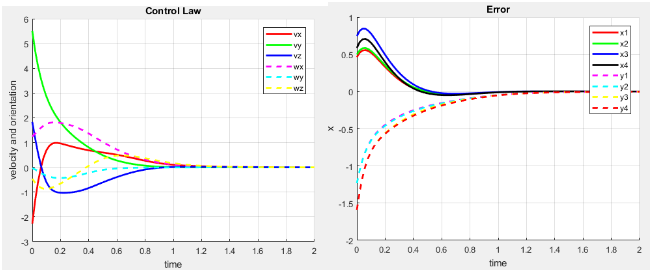

Fig. 3. Control law and error curve in 150 degree.

the experimentation, the rotation is initialized to it's default value, 90 degree.

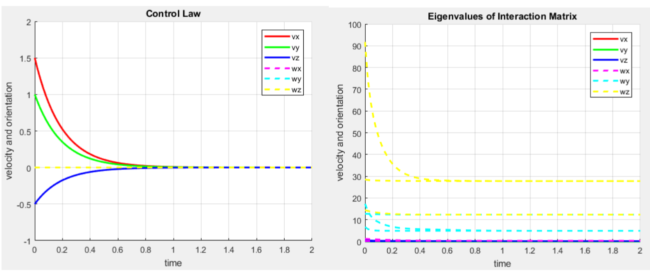

Fig. 4. Control law and Eigen matrix curve in 90 degree with Eigen matrix to 0.

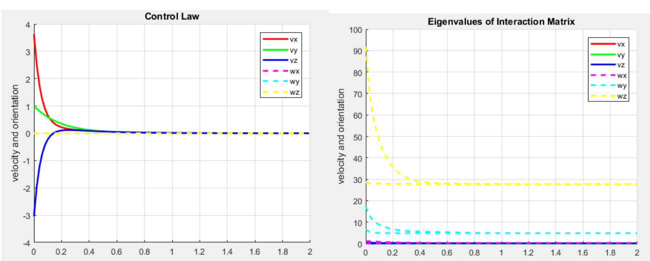

Fig. 5. Control law and Eigen matrix curve in 90 degree with Eigen matrix to 1.

We see the eigen matrix is controlling the velocity and the rotation of the robot. When the Eigen matrix is equal to 1, the speed of the velocity increase and the rotation is more direct where as it's equal to 0, the velocity is smoother, lower and the rotation is higher. So the eigen matrix change the speed and the angle of the robot interactions.

III. Conclusion

This work shows the importance of an accurate modeling of trapping effects in GaN HEMTs when they are used in large signal dynamic operation. An existing version of non-linear model including trapping effects has been improved in order to give better consistency between the dispersion effects around the nominal bias point and in the high I_{ds}-low V_{ds} area, the first determining the model accuracy when the RF is switched off during pulsed RF operation, the latter the model accuracy under CW operation, or when RF is on during RF pulsed operation.

Further work will investigate the behavior of the model under other types of dynamic RF operation like two-tone characteristics, and also on the improvement of the dispersion amplitude and detrapping time constants accuracies over the whole IV characteristics by fitting low frequency S-parameters measured at several bias points.

References

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