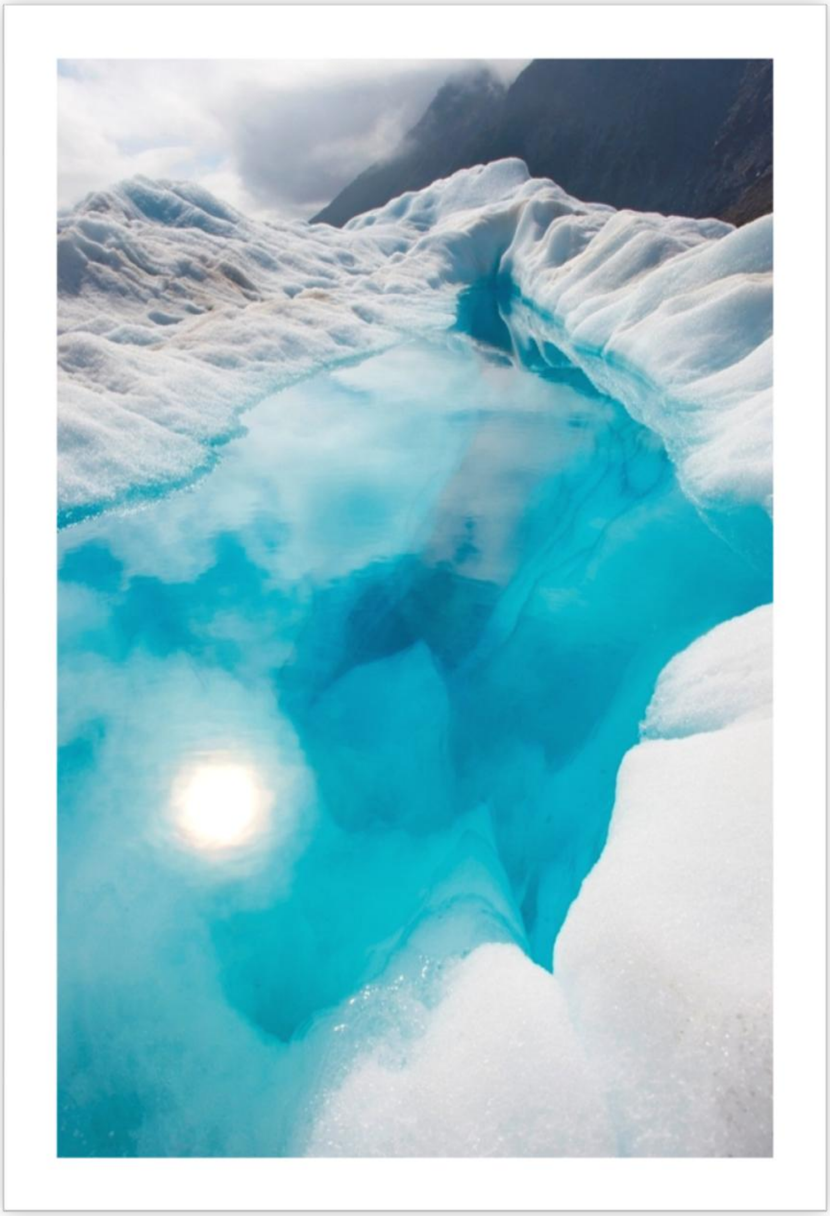

3D INSPECTION

SENSORS AND DIGITIZATION EXPERIMENT NO 6

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Objective

The goal of this practical lab is to study the applications of a 3D inspection system with Laser. In our case we will be working with the Keyence LJ-G080 system and the objective of conducting this experiment is to find the step measurement and angle measurement for industrial rail guide/ parts and shiny objects.

Introduction

3D inspection system is mainly used to find the step measurement, angles and to recognize the defects for the given object. It focused on CMM setup which can be dangerous as it is equipped with laser light. This kind of setup is used in most of the large scale industries to know the precise size and angle difference between the layers of objects or to correct the angle between them.

Equipment

For the proper realization of the experiments, it is being used:

- Keyence LJ-G080 system
- Keyence LJ-G Software embedded
- Keyence LJ-G Setup guide
- Keyence LJ-G User manual
- LJ-G Navigator

Setup

The first step is to connect all the required cables and monitor as in figure 1. The real time picture is pictured in figure 2. Once the cables are connected properly turn on the power supply to all the devices like Monitor Controller unit, 24V DC power supply and CMM. Check for the calibration of laser on monitor with different objects. Once the setup is properly arranged start grabbing the images.

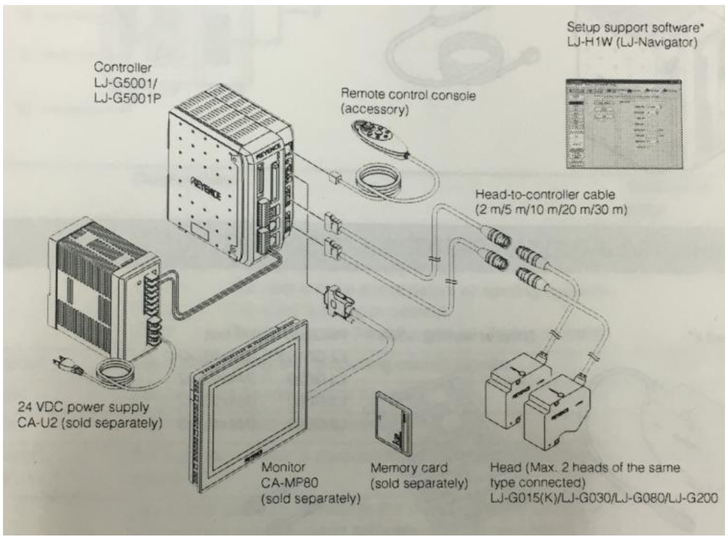

Figure 1. Installation setup

Figure 2. Real setup installation

Program Structure

The workflow for programming in Keyence system is clearly stated in the user's manual and the programming guide which are presented in the laboratory.

As a basic system to follow inside the settings, certain steps are designed so the programming becomes easier:

1. Inside the "Head Settings", the timing with which the target will be sampled is set. We also determine there the optimal sampling method.

2. Into "Master Registration", we can acquire a sample of the current state of the laser into the object and the pattern they are defining. This is optimal for tasks like the standard measurement, which is the one that appears from default.

3. If we go to "Position Adjustment", the angle and position of the target can be corrected in case it moves during the measurements.

4. "Out Settings", where we define the kind of measurement we want to perform and the concise way it is done.

Step Measurement

Our goal in this section is to program the device in order to characterize the difference in height of the industrial part that we are given. In these cases, is very important to follow the programming guide that the developer provides, as all the steps are noted there for an effective measurement.

As it has been tested before the initial setup seems to be working properly, so we start grabbing images of the upper shape of the object:

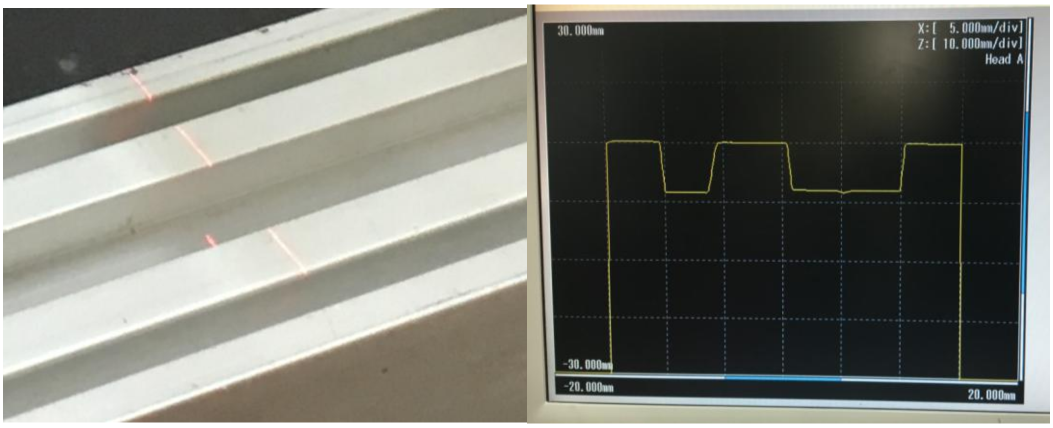

Figure 3. Step Measurement

We can appreciate that that upper shape is properly shown in the screen. By then, inside “Master Registration” trigger the image, we will be able to make the measurement.

To get a satisfactory image, we have supported ourselves on the official manual that Keyence provides (chapter 5-85).

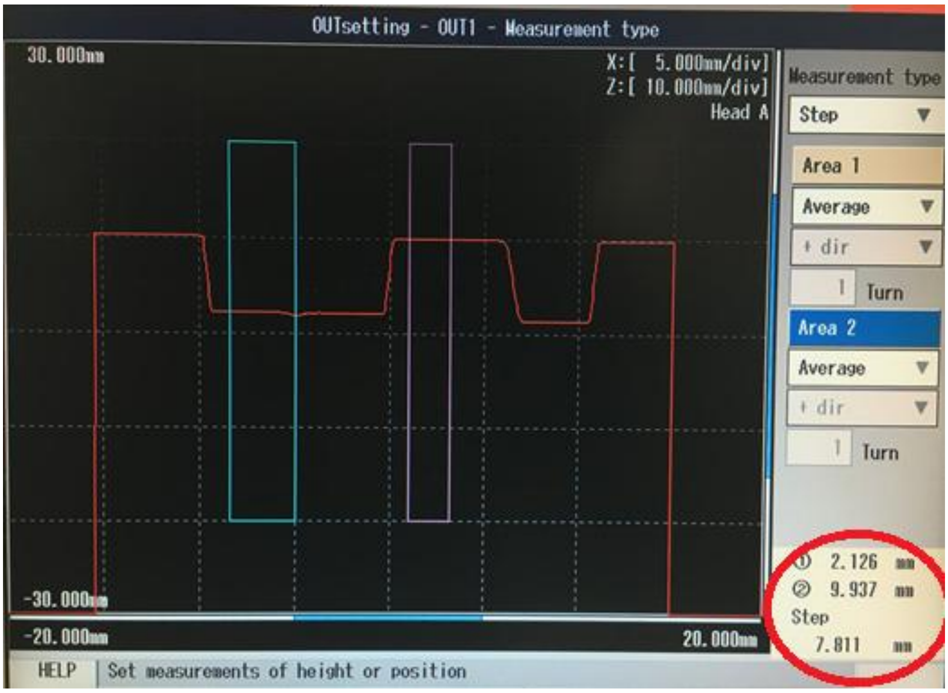

Figure 4. Step Values

As we can see in the above figure, the difference in height (i.e. the step) is of 7.811 mm.

Also, is possible to perform a shift and an angle correction for the software to be able to follow (to track) the object over small perturbances. This can be accomplished following again the manual, as the next figures show.

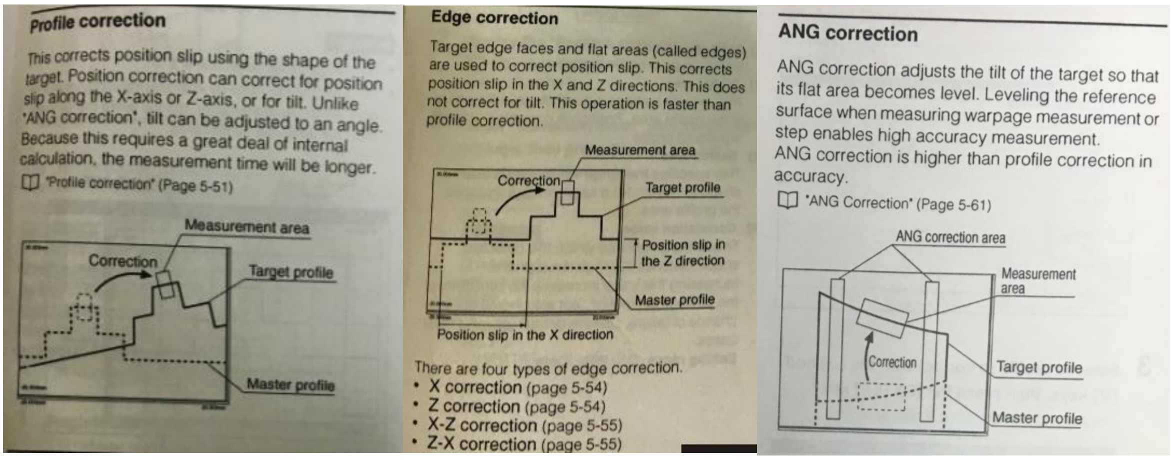

Figure 5. Corrections

It is worth to say that we have two ways of doing the shift correction: profile and edge correction, while there is only one way, a priori, to perform angle correction.

Angle Measurement on a Shiny Surface

The aim of this section is to program the machine in order to characterize the angle between two planes and to detect the holes on an industrial part that we have as the sample object.

This part characteristic about the shiny surface with "M" shaped contour and with some holes

First of all, we will take the angle by setting appropiately the measuring bars back in the Out Settings menu.

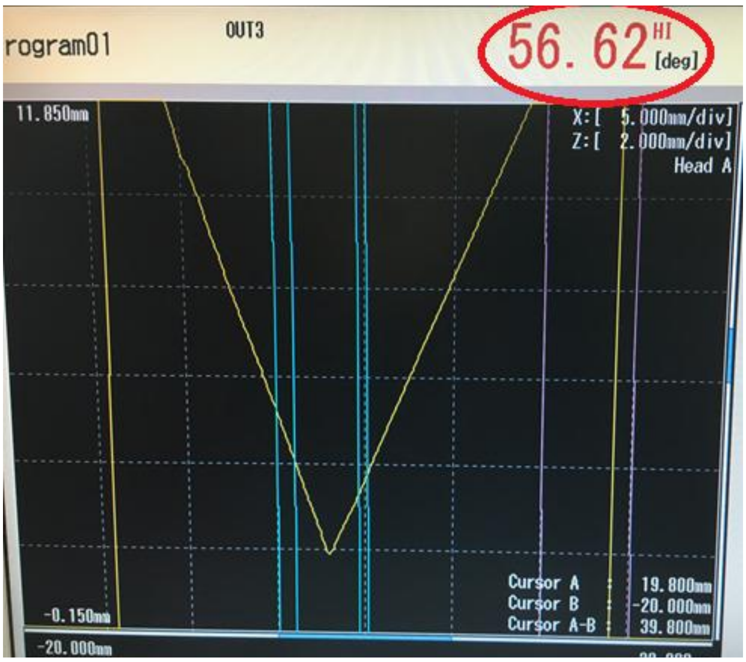

Figure 6. Shiny surface display

As it is seen in the above image, the angle is correctly computed, and so they are the hole's detected. By observing the object in real environment you can find the holes as shown in figure 7.

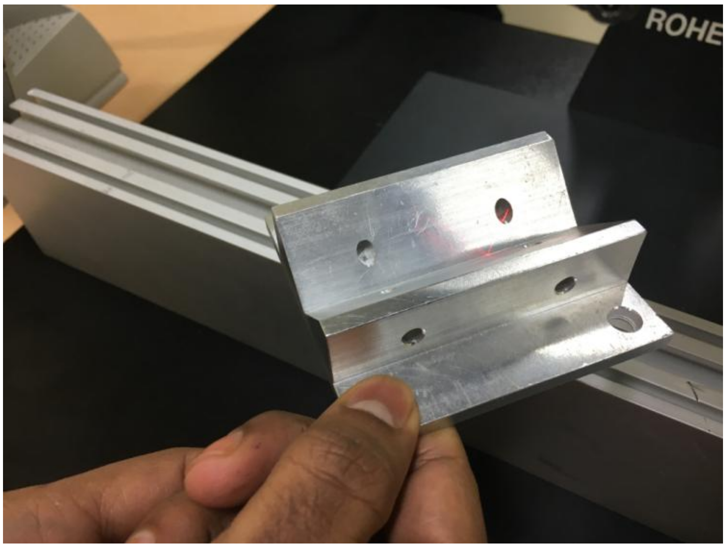

Figure 7. Shiny Object with holes

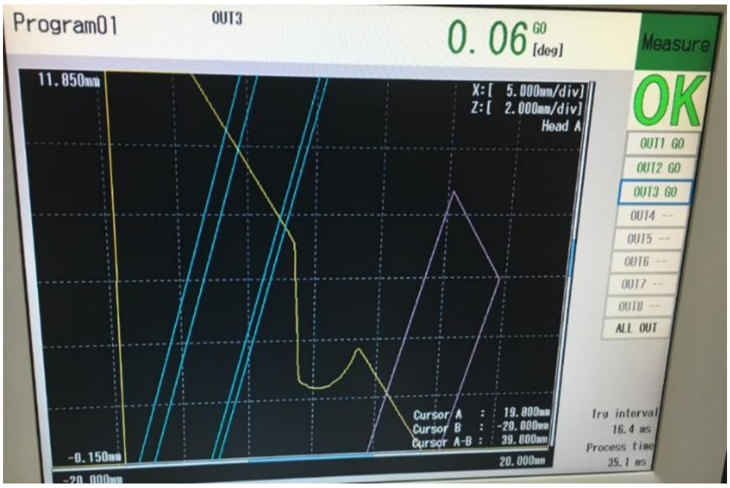

Figure 8. Shiny Object detecting holes on the screen

Conclusion

We have conducted step and angle measurement for the provided industrial object and the experiment is advanced to find the holes for the shiny object with respect to the setup carried out in the above images. The results are calculated on the display and tabulated with different pictures.