Problem statement:
The full description of the problem exists in separate document and here is a summary

“There are always 2 pictures belonging together. They differ only by the word "Leer" in the file name. Always the first picture is a 3-dimensional picture of a core in a selection station, the second 3-dimensional picture (“Leer”) shows the empty selection place.
All pictures were taken with an "Intel Realsense" camera. They are used in the CoremanNet software to determine the volume of the cores.
Your task is to create a program that can handle the pictures. The program must be able to calculate the relative ratio of the volume of the 3 cores among themselves based on the determined image data. Finally, the relative ratio should get displayed via a dialogue.
“

Terminologies

1. **3-D images**
   There are many formats for 3D images to be presented by 2D image. Because it comes from Intel Realsense , I assume it is a colorized Depth image but the image is not colorized so i assume it is in a different color domain like Gray domain.

2. **Intel Realsense**
   It is a family of cameras with different features to scan and represent 3D objects . It has many purposes like measurements and Face identifications and Tracking. After some investigation . i will assume the Camera model Stereo Depth Camera D400. Based on its documentation , This camera can output images similar to given images in this assignment.https://dev.intelrealsense.com/docs/stereo-depth-camera-d400

3. **CoremanNet software**

   This is a company that uses this type of camera for its applications to manage Cores and inventories and other business Cycle. https://www.coremannet.com/

Problem Analysis

Here we have 3 sets of images . Each set belongs to the same Core but it is calibrated twice . first time core with the selector and the second time selector without selector. We need to get the Volume of each Core then calculate the volume ratio between the three Cores.

Core Volume Calculation

We need to calculate the Volume of the Core and Selector all together. Then we need to calculate the Volume of the selector alone then we subtract both to get approximate volume of the core

$$V_{total} - V_{selector} = V_{core}$$

Volume relative Ratio Calculation

One simple way to do get this Ratio is to calculate the percentages between the three

$$V_{\text{Total core}} = V_{\text{core1}} + V_{\text{core2}} + V_{\text{core3}}$$

Then V_{core1} percentages = (V_{core1} / $V_{\text{Total core}}$) * 100

Implementation Plan

The first step to make the calculation is to read the bitmap image as a 3 D image. The second step is to get the cloud point vertices and also the Texture coordination after that we can calculate the total volume.

I will use here OpenCV to read the Image as Array and convert it to RGB scale

Then I will use the Camera SDK library librealsense to make the array as frame and convert it to Point cloud then I will get vertex and Texture coordination and use OpenCV to get the volume.

The code should be like that

```
import cv2
import pyrealsense2 as rs
//Read the image as Array by OpenCV
imageName =”Z25777766_Depth.bmp”
gray= cv.LoadImage(imageName )
//Convert to RGB
backtorgb = cv2.cvtColor(gray,cv2.COLOR_GRAY2RGB)
// converting points to vertex and texture
pc = rs.pointcloud()
points = pc.calculate(backtorgb)
vtx = points.get_vertices()
tex = points.get_texture_coordinates()
// getting volume here we should use algorithm like alpha shape to calculate the Volume
```

Notes:-

- This is my first time that i calculate volume passed on Image processing so i invest from the beginning to know the idea.
- I resterect myself to 5 hours as i got from you so i did not write a real code and there is some parts need more investigation