

CHAPTER 1

INTRODUCTION

1.1. Background

Mass measurement is one of the major necessities in daily life and has many real-world applications. A lot of benefits can be acquired by knowing the object's mass but further developments are needed for our current mass measurement. The mass measurement itself has a linear relationship on its own scale where the bigger mass to measure requires a bigger scale too. Estimating an object's mass through naked eye is not possible and it's very inconvenient especially when a person needs to bring a measurement scale everywhere just to calculate the mass of an object.

Practicality and efficiency have become our primary necessities on this very era. A new mass estimation approach is needed and with the help of modern technologies, it can be realized. Computer vision and machine learning have been incredibly advanced during these past few years. By featuring them there's no need for human intervention to place the object one by one into the mass scales, it can be done just by taking pictures of them.

Most of the research that has been conducted still needs further improvement and a lot of high resources. High-tech cameras and 3D images have become essential. Nowadays people tend to bring their own personal devices such as mobile phones everywhere. By using a mobile phone's built-in camera users can utilize it to take the object's photo and use them for mass measurement. Moreover, it can lead us to bigger things such as the calculation of food calories from their mass, mass count for delivered orders, cargo purposes, determining what tools we should use to carry those objects and many more.

We all need a simple device with great performance but low resources. From this research just by phone camera, users can estimate the object volume and mass. This research's main purpose is with new methodology just by using 2D images and phone camera, we can know the object's volume and mass, there is no need for special devices nor high-tech cameras.

In this research the author has focused on fruits and vegetables as our object's mass measurement. Reasons behind are because fruits and vegetables have important roles in human lifestyle, besides for weighing fruits and vegetables manually can be very laborious, there has to be an easy way for humans to calculate the mass estimation. New mass

measurement can be done just by taking the top view image and side view image using the mobile device's built-in camera of the object in order to find the volume. With the help of machine learning and mathematical formulas, an object's mass can be found.

Clustering and classification take part in this research. In order to have an accurate object detection, clustering is done in order to become training data for classification. New algorithm approach that features clustering by DBSCAN and classification by k-NN algorithm is expected to be more cost effective. As for the evaluation method the author uses accuracy measures which consist of comparison between real object's mass and obtained mass. Accuracy measures value become the benchmark of this research success.

1.2. Problem Formulation

The following questions is accordance with the focus of this research.

1. How to use and how qualified is the DBSCAN algorithm for clustering?
2. Does various image distances to object affect the result?
3. How accurate is the result compared to real object's mass?

1.3. Scope

Dataset in this research is obtained through Kaggle which consists of fruits and vegetables catalog images. This dataset consists of 131 kinds of fruits and vegetables, each with approximately 400-900 training images. Kaggle dataset becomes training data for clustering by DBSCAN while the results become training data for classification by k-NN in order to accelerate object detection.

For evaluation methods, accuracy measures will be applied. Through the accuracy measures the author can find out how good the model can perform, how well it is compared to other algorithms, and measure how accurate the results are.

1.4. Objective

This research purpose is to find a new mass measurement method which is more effective and efficient than the previous one by using DBSCAN and k-NN approach. With the new measurement method, no laborious human intervention is needed to measure the fruit one by one. Mass measurement can be done just by taking pictures of the object using a built-in mobile phone camera where in this research fruits and vegetables as the target object.