

# Automated Machine for Sorting Sarawak Pepper Berries

A.H. Fauzi, D.N.F. Awang Iskandar\* and M. Alif A. Suhaimi

Faculty of Computer Science and Information Technology,

Universiti Malaysia Sarawak,

94300 Kota Samarahan, Sarawak, Malaysia.

hadinata@fit.unimas.my, dnfaiz@fit.unimas.my, alifammar@outlook.com

**Abstract**— White pepper berries is one of the Malaysia's key export as it is categorised as high valued commodity product. At present, processed white pepper berries are graded semi-automatically. This process is time consuming as it dependent on the experience of the pepper grader. In this paper we present a solution for Sarawak White Pepper grading using a combination of image processing technique and robotic solutions to sort pepper berries into their respective grades. In particular, we present the result of using different colour sensors. With the automated sorting machine, more high grades pepper berries are able to be sorted; this means more income to the smallholders, which are the local pepper farmers.

**Keywords**—grading; pepper; colour sensor; agro-informatics

## I. INTRODUCTION

In other plantation such as apples or oranges, machine is used to sort them into different grades. The grades are sorted based on their characteristic such as the sizes and colours. During sorting process, the fruits will come from a conveyor through a grading and sorting machine which automatically sort the fruits based on their colour and size.

Unlike these fruits, pepper berries have its own colour scheme. We focus our research work in grading the Sarawak White Pepper. The lighter the colour of the pepper berries, the higher grade it will be classified in. Using a conventional conveyor is not suitable since the pepper berries are small and it will roll faster due to the roundness of the pepper berries.

Even though pepper plantation is a smallholder crop, it provide employment for 67,000 people in Malaysia (includes owners, operators, part-time farmers, and seasonal labourers)[1]. Most of the farmers are from rural area and has a low income background. This research project is to help in providing a system that could help them to improve the local farmers socio-economy and country incomes by using a smart, automated and low cost solution.

Nowadays, demand from consumer for high quality of white pepper has become the motivation for developing the automated pepper berries grading and sorting machine. The manual grading and sorting techniques is time consuming and error prone due to human judgments. Moreover, in a huge amount, the grades were determined using sampling approach.

In this paper, we describe our framework an initial findings of the accuracy of colour sensors to grade the pepper berries using a customised portable sorting machine. The white pepper berries will be sorted to their respective grades using colour sensor and Arduino Mega [2] as the controller for sorting. Several colour sensors were tested to determine the most accurate grades based on colour values extracted from the samples provided and according to the specification of the Malaysian Pepper Board (MPB). The pepper berries sorter will be able to grade the pepper berries easily on site.

The remainder of this paper is organised as follows. In Section II, we present the background on existing related work. In Section III, we describe the framework. In Section IV, we present and explain the experiment settings and results. A discussion on the experiments outcome is presented in Section V. We conclude in Section VI along with our suggestions for future work.

## II. LITERATURE REVIEW

For several years, many researchers have attempted to design and create a sorting machines for sweets, fruits and pepper using different approaches. Some of the works have been commercialise into big machines. In this section, we focus the discussion on several existing related approaches and techniques.

A fully automated sorting machine using a microprocessor to sort the skittles into its respective colour was proposed by King [3]. The author has compared DRAGON12-Plus, an expensive microcontroller against Arduino Mega and found that Arduino Mega provides adequate speed.

Chherawala, Y. *et al.* [4] inspect, grade and sort fresh cranberries using image processing and machine vision. They used the colour features, Principal Component Analysis, and a robust data fitting method.

An attempt to grade a well known Malaysia's mango known as Harum Manis was proposed by Mohd Mokhtar [5]. The author used a mechatronic system to grade the mangoes by weight. In this work, the Arduino Uno Board was used as part of the grading system and load cell as the main weight sensor.

---

\*Corresponding author.