A Neural Network Approach to Classifying Banana Ripeness

Kyle Demeule (kdd2@sfu.ca), Bernard S Chan (bernardc@sfu.ca), Saeed Soltani (saeeds@sfu.ca)

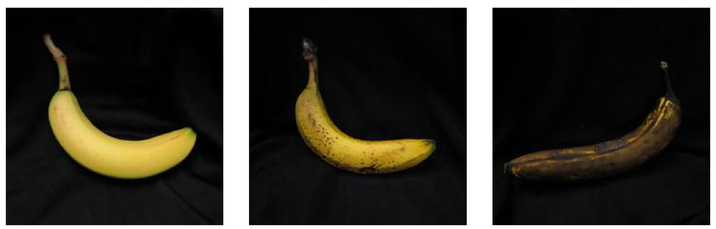
Department Computing Science, Faculty of Applied Sciences, Simon Fraser University

Introduction

- Interested in classifying fruit ripeness using machine learning methods.
- Previously studied by Saad et al. [2009] through neural network methods.
- More than just bananas: Aim to improve upon previous work by incorporating non-banana objects.
- Previous data set unavailable; will establish our own data set.

Data Collection

- Generated the data set by taking pictures of bananas and objects that are not bananas.
- Lighting, camera (Canon S90) and background were controlled.
- Used 12 unique bananas at various stages to represent the three stages ripeness:
  1. pre-ripe,
  2. ripe, and
  3. rotten.
- Used green pepper, apple, tomato, lemon and lime as non-banana objects.
- Pictures were resized and cropped to a square.
- Incorporated each picture at $0°$, $90°$, $180°$ and $270°$ of rotation to increase the number of pictures in the data set by four fold.



(a) (b) (c)

Figure 1: (a) Pre-ripe banana. (b) Ripe banana. (c) Overripe banana.

Tools and Methods

- Caffe.
- AlexNet.
- SciKit Learn: a Python library of machine learning algorithms.

Features Extraction via AlexNet

Experimental Results

Results

General Nonlinear Criteria

Based on all aforementioned criteria, the digraph in Figure **??** is a nontrivial example that would admit a general nonlinear Hamiltonian coupled cell system.

Conclusion and Potential Applications

- Able to enhance previous work by adding non-banana objects.
- Working towards generalizing ripeness detection for fruits, vegetable and other in general.
- Industrial application: automatic large scale sorting of fruits and vegetable based on ripeness and type.
- Mobile app for visually disabled: quickly find the ripeness of fruits and vegetables via machine learning model.

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