

Detection of Palm Tree Diseases

Using Image processing, Artificial Intelligence, and IOT

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Introduction 1/2

- ▶ Egypt has an estimated 15,582,000 date palm trees planted on an area of 86,000 feddans.
- ▶ Egypt is the largest date producer in the world.

▶ We Can Ain

Rank	Country
1st	Egypt
2nd	Saudi Arabia
3rd	Iran
4th	United Arab Emirates
5th	Algeria
7th	Iraq
8th	Pakistan



Our Team In Ain Shams University

557.28

268.01

Introduction 2/2

▶ According to our visits and research papers :

1) The most common pest that causes problems to the palm tree is **Red Palm Weevil** (RPW).

2) All palm

leaf

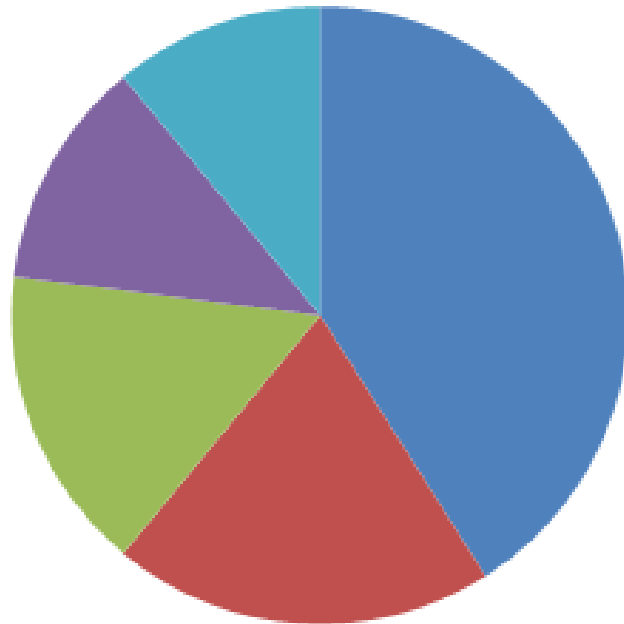
▶ Reasons:

- High

- Overw

spots

Palm Trees Pests Species



- Red weevils
- Hemiptera
- Acanthaceae
- Lepidoptera
- Others

: cause



Brown Leaf Spots



Blight Leaf Spots

Related works (1/4) :

- ▶ Detection of the **change of water stress** of palm trees by **thermal imaging** to detect RPW.
- ▶ The reduction of sunlight, sun reflections and glitters may alter the results.
- ▶ Proposed a method by comparing thermal imaging readings of a palm tree to its neighbors.
- ▶ Results shows accuracy of **77.73%** while detecting RPW
- ▶ Develop a protocol for the eradication of RPW, combining an early detection protocol of red palm weevil with control strategies.

Pugliese Massimo et al. "Devices to detect red palm weevil infestation on palm species". In: Precision agriculture 19.6 (2018), pp. 1049-1061.

Related Works (2/4):

- ▶ The early detection of **tomato leaf** diseases including **blight leaf disease** by using digital camera.
- ▶ Plant leaf images are complex with its background and the color information extracted from a single color component is limited.
- ▶ This paper presents a Convolutional Neural Network (CNN) model and Learning Vector Quantization (LVQ) algorithm based method for tomato leaf disease detection and classification.
- ▶ Results shows **85%** of detection of blight leaf disease.
- ▶ To improve recognition rate in classification process different filters or different size of convolutions can also be used.

M. Sardogan, A. Tuncer, and Y. Ozen. "Plant Leaf Disease Detection and Classification Based on CNN with LVQ Algorithm". In: 2018 3rd International Conference on Computer Science and Engineering (UBMK). Sept. 2018, pp. 382-385.

Related works (3/4):

- ▶ Detection of **Tomato** powdery mildew fungus Using **Thermal** and Stereo Visible Light Images.
- ▶ Environmental conditions which include leaf angles and depth of the canopy areas accessible to the thermal imaging camera.
- ▶ Combining thermal and visible light image data with depth information and develop a machine learning system to remotely detect plants infected with the tomato powdery mildew fungus.
- ▶ Results Shows that they reached a high accuracy of powdery mildew fungus detection that is more than 80% after 9 days of infection.
- ▶ This Technique can be used to classify different abiotic and biotic stresses such as water stress and disease in the future.

Gillian Prince, John P Clarkson, Nasir M Rajpoot, et al. "Automatic detection of diseased tomato plants using thermal and stereo visible light images". In: PloS one 10.4 (2015), e0123262.

Related works (4/4):

Project	Plant	Disease	Classifier	Accuracy
Thermal Camera	Palm trees	Red palm weevil	Not determined	77.73%
Our project: Thermal Camera, Hyperspectral Camera	Palm trees	Red palm weevil	CNN	Higher than 77.73%

Project	Plant	Disease	Classifier	Accuracy
Normal digital camera	Tomatoes	Leaf Blight	CNN	85%
Our project: Normal Camera and Hyperspectral	Palm trees	Leaf Blight	CNN	Higher than 85%

Project	Plant	Disease	Classifier	Accuracy
Normal Digital Camera	Apple tree	Brown Leaf Spot	CNN	80.45%
Our project: Normal Camera and Hyperspectral	Palm trees	Brown Leaf Spot	CNN	Higher than 80.45%

Problem Statement :

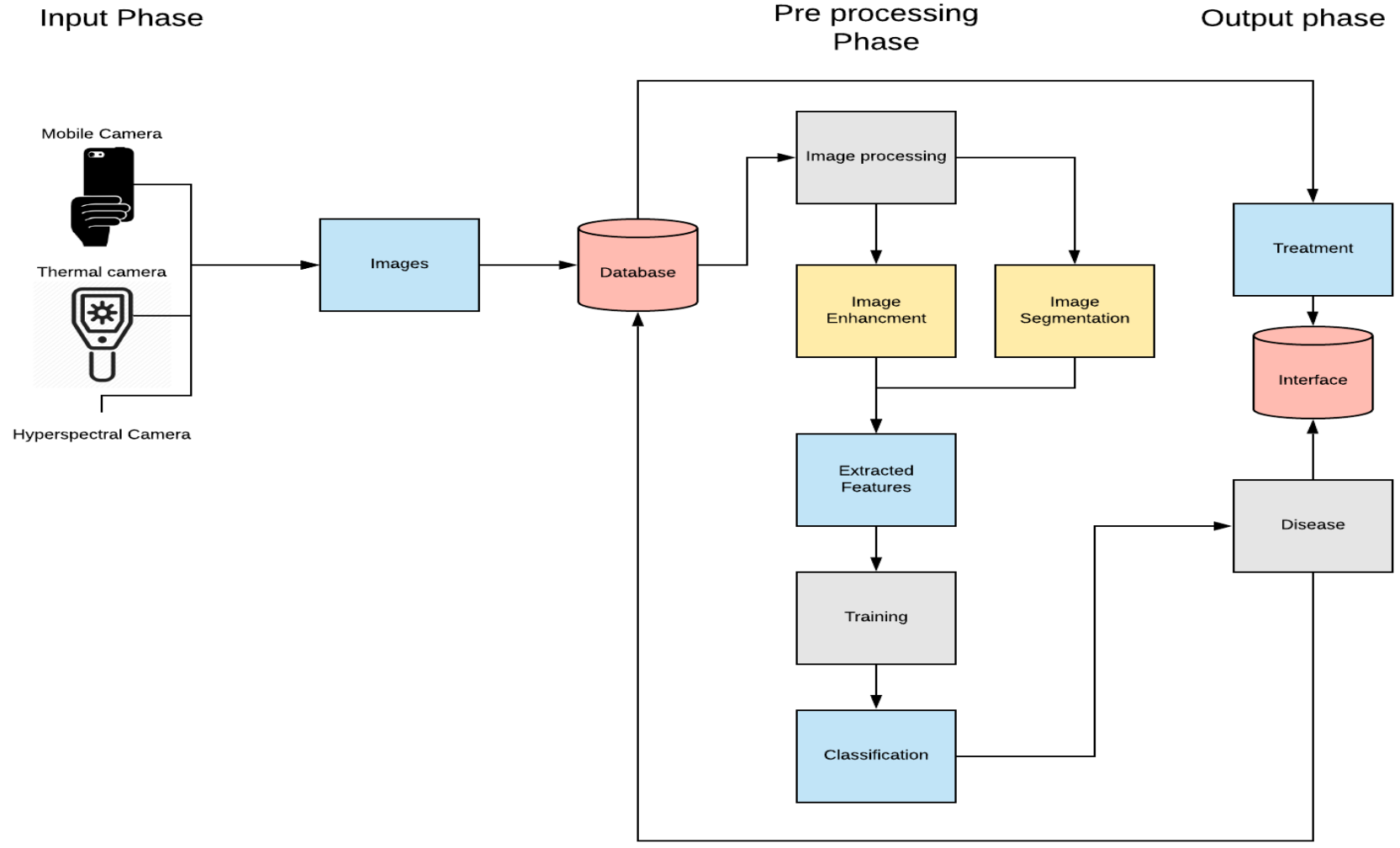
Reducing the time, effort and costs needed for **detection** of Red Palm Weevil pest, blight leaf spots and brown leaf spots in its early stages by developing a system that consists of three different types of cameras (Thermal camera, Hyperspectral Camera, Mobile Camera) and process the acquired images and then classify them with CNN algorithm in order to **increase the accuracy** of detection and **suggest the suitable treatment** for these diseases.

Treatment of Red palm weevil in Egypt:

- ▶ Experts
- ▶ Vibration Sensors



System Overview :



Input Phase

- ▶ In case of detection of RPW :
 - We use **thermal camera** because the RPW l change the water stress inside the palm tree and **increase its temperature** which can reach 30C and 40C even in winter.
 - We use **hyperspectral camera** because the RPW **change the chlorophyll indices** of the palm trees.
 - We don't use Mobile camera to detect the RPW because it cannot detect the disease unless the palm tree is severely damage and it is not very beneficial to use at commercial scale.
- ▶ In case of brown leaf spots or blight leaf spots:
 - We use only 8 megapixel mobile camera or higher to detect these diseases with high accuracy by using image processing techniques

Pre-Processing Phase

- ▶ Image Enhancement :
 - We will Constrain transformation algorithm with thermal images.
- ▶ Segmentation :
 - We will Canny edge detection algorithm.
- ▶ Classifier :
 - We will Convolutional Neural Network (CNN) algorithm.

Expected Results

- ▶ The application will give the user the choice to **build the app** according to his needs(Diseases and cameras).
- ▶ The application will **detect** leaf spots and leaf blights diseases, and the red palm weevil.
- ▶ The application will take images by **three different cameras**(mobile camera, Hyperspectral camera and Thermal camera).
- ▶ The application will **combine the results** of the two image types through Hyperspectral camera and inform the user if palm tree is infected by a disease or not.
- ▶ The application will provide the **best treatment** in case of any disease(leaf spots and leaf blights diseases, and the red palm weevil)found.

Demo:

The screenshot displays a Jupyter Notebook environment in a web browser. The browser's address bar shows the URL `localhost:8888/notebooks/PycharmProjects/cats%20and%20dog/mywindow.ipynb`. The Jupyter interface includes a menu bar (File, Edit, View, Insert, Cell, Kernel, Widgets, Help) and a toolbar with icons for file operations and execution. The main area shows a code editor with Python code for a Tkinter widget. A "Select A File" dialog box is open, showing the contents of the Local Disk (C:). The dialog lists several folders, including "Python36" and "Python37". The "File name" field is empty, and the file type is set to "jpeg files (*.jpg)". The "Open" button is highlighted.

```
self.button()

def butt
self
self

def file
self
self
self
self
self
if s
else
#
#
#
#

root = Root()
root.mainloop()

In [ ]:
```

Name	Date modified	Type	Size
5f88cd582c163cebeaa1b7566b02159a	٢٠١٧/٠٢/١٨ م -٦:١٢	File folder	
48c3a37d0cfb6fbdef	٢٠١٧/٠٤/٢٢ م -٩:٥٥	File folder	
52937ca9f9b6a034e6d22e	٢٠١٧/٠٢/١٩ ص -١:١٧	File folder	
fb75db87b047bea1f974d78b	٢٠١٧/٠٢/٠٤ م -٤:٤٧	File folder	
gfx files	٢٠١٧/٠٩/٢٤ م -١:٢٣	File folder	
HashiCorp	٢٠١٩/٠٨/١٢ ص ١٢:٢٢	File folder	
Intel	٢٠١٦/١٠/٠٢ م -٢:٤٦	File folder	
PerfLogs	٢٠٠٩/٠٧/١٤ ص -٦:٢٠	File folder	
Program Files	٢٠١٩/٠٩/١٦ م ١٢:٥٩	File folder	
Program Files (x86)	٢٠١٩/١٠/٠٢ م -١:٢٣	File folder	
Python36	٢٠١٩/٠٩/٢٠ ص -٢:١٧	File folder	
Python37	٢٠١٩/١٠/٠١ ص -٢:٥٩	File folder	

Any Questions ?

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Thank you



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