Mansoura University

VEHICLE COLLISION AVOIDANCE SYSTEM

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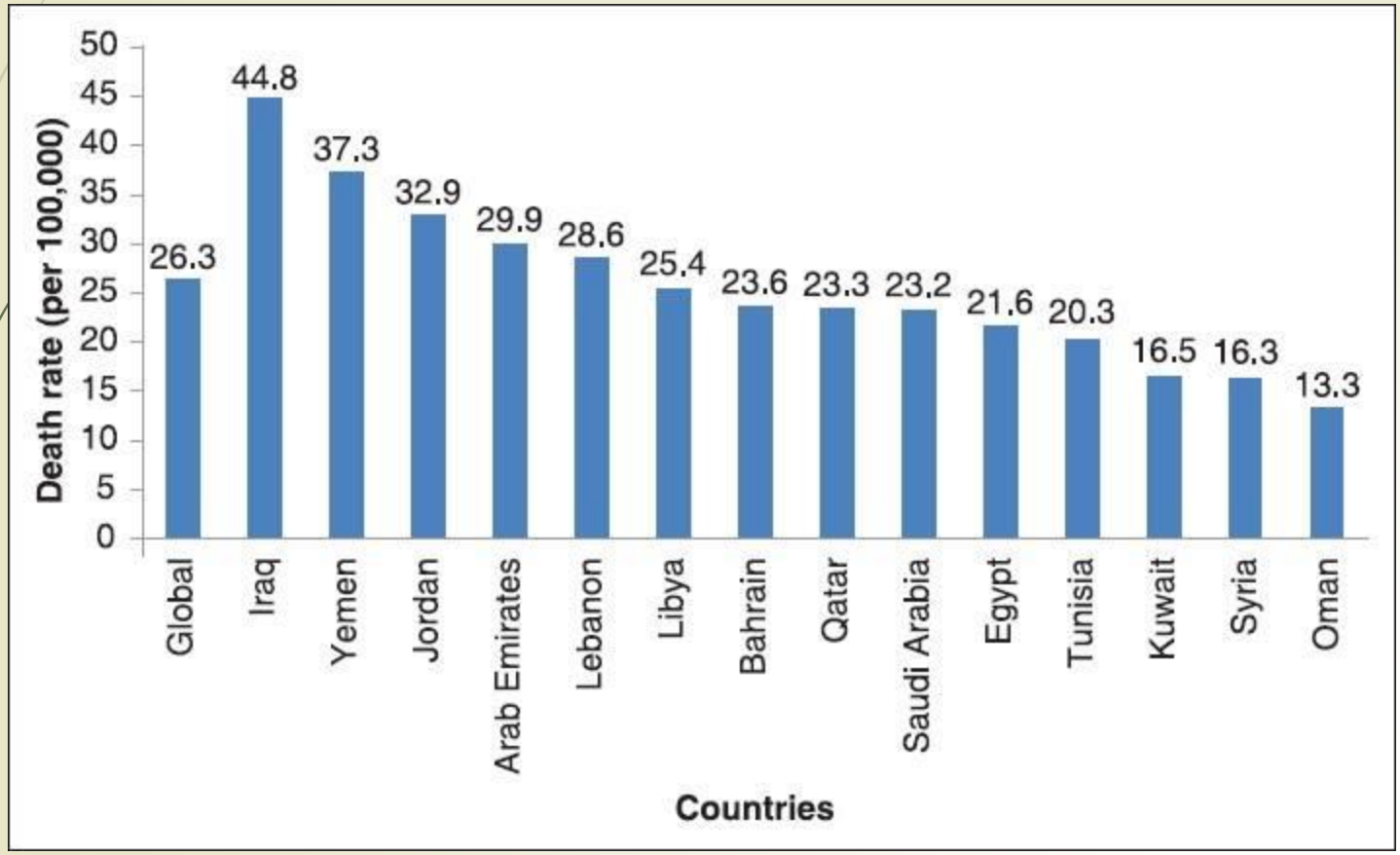
Motivation

- Egypt occupies the tenth position globally in road accidents.
- Highway obstacle detection is one of the most difficult and challenging task in real time systems in vehicles.
- California first introduced the obstacle detection techniques which uses impanation of ultrasound, infrared lasers and radars.
- Our target is to detect objects in the front side to avoid collisions.

Motivation


Death rate (per 100,000)
50
45
40
35
30
25
20
15
10
5
0
26.3
44.8
37.3
32.9
29.9
28.6
25.4
23.6
23.3
23.2
21.6
20.3
16.5
16.3
13.3
Global
Iraq
Yemen
Jordan
Arab Emirates
Lebanon
Libya
Bahrain
Qatar
Saudi Arabia
Egypt
Tunisia
Kuwait
Syria
Oman
Countries

Related works..

	Project	Uses	Year
Audi	Braking guard	Radar	2013
BMW	Driving Assistant Plus	Camera,radar,sensors	2013
Mercedes-Benz	radar based forward collision warning	combination of stereo camera and radar sensors to detect pedestrians in front of the vehicle	2013
Volvo	Volvo introduced the first cyclist detection system.	Lidar laser sensor that monitors the front of the roadway	2013

Objectives

1. Detecting the cars blocks

2. Calculate the distance between two cars

3. Give an alarm and decrease the speed when exceed the minimum distance

Proposed System

This project aims to create a low cost, retrospective solution that can be implemented in large scale to help reduce a significant number of accidents.

This project focuses on development of a crash warning and avoidance system that monitors the environment of the vehicle constantly and assisting the driver in avoiding a collision.

The Proposed Analysis Framework:

Input:
Video,(car.xml) file.

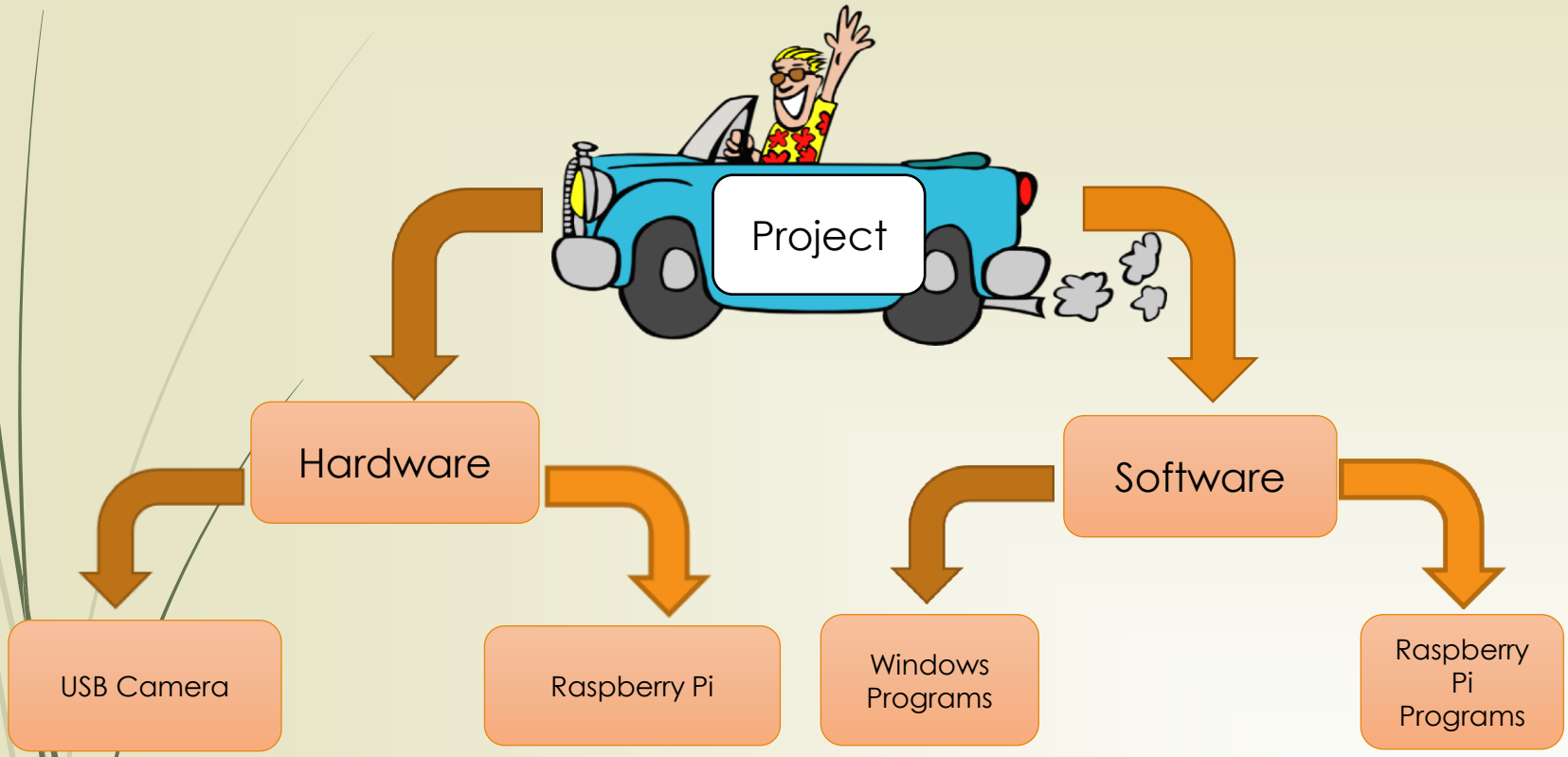
Raspberry pi:
video Processing.

code

detection.

Calculate distance .

Output:
Decrease speed and give alarm


Project
Hardware
Software
USB Camera
Raspberry Pi
Windows Programs
Raspberry Pi Programs

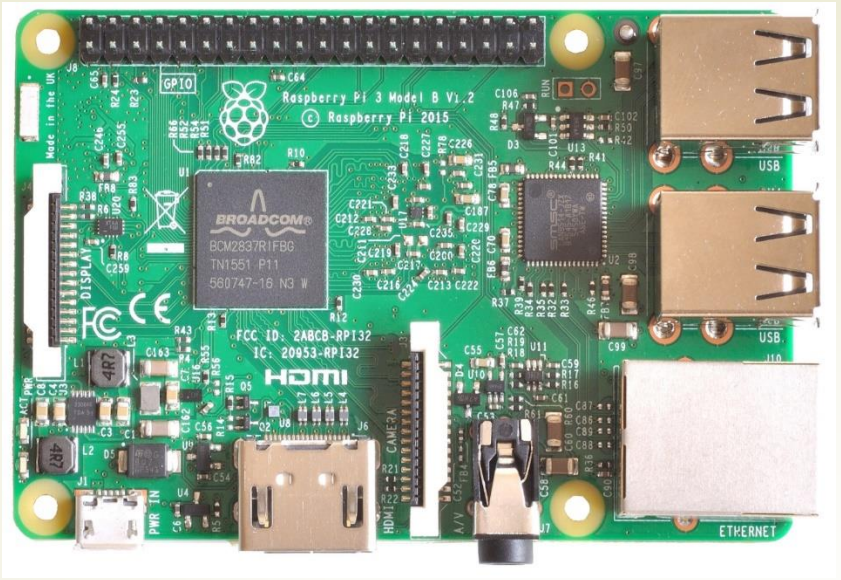
Logitech USB webcam

- The webcam has a frame rate is 30 fps with video capture resolution of 1024 x 768.

Hardware (Raspberry Pi 3Model B+):

- Raspberry Pi is a small sized single board computer like credit card.
- 50% faster than Raspberry pi 2 .
- It costs 35 $
- It consist of :

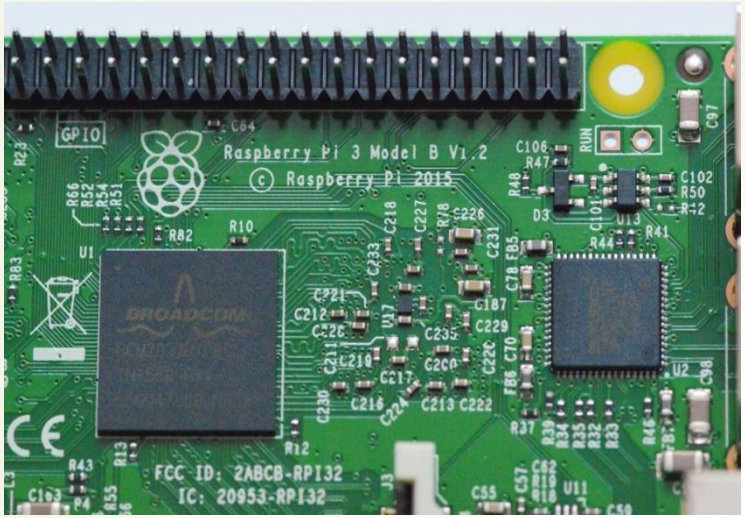
1. **Processor**
2. **RAM**
3. **Networking**
4. **Peripherals**
5. **Video**



Hardware

- **1-Processor**

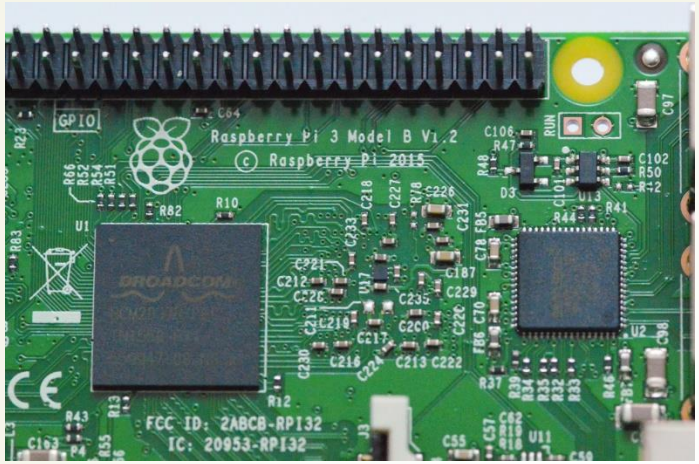
The Raspberry Pi 3 uses a Broadcom BCM2837 SoC with a 1.2 GHz 64-bit quad-core ARM Cortex-A53 processor, with 512 KB shared L2 cache



Hardware

- **2- RAM**

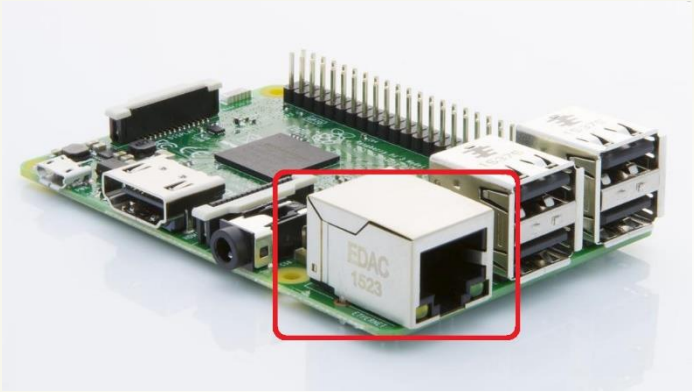
The Raspberry Pi 3 have 1 GB of RAM



Hardware

- **3- Networking**

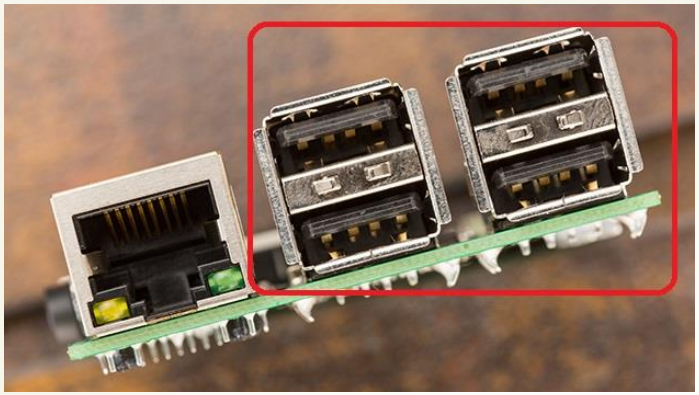
The Raspberry Pi 3 is equipped with 2.4 GHz WiFi 802.11n (600 Mbit/s) and Bluetooth 4.1 (24 Mbit/s) in addition to the 10/100 Ethernet port.



Hardware

- **4- Peripherals**

The Raspberry Pi may be operated with any generic USB computer keyboard and mouse.



Raspberry Pi 3Model B+:

- **5- Video**

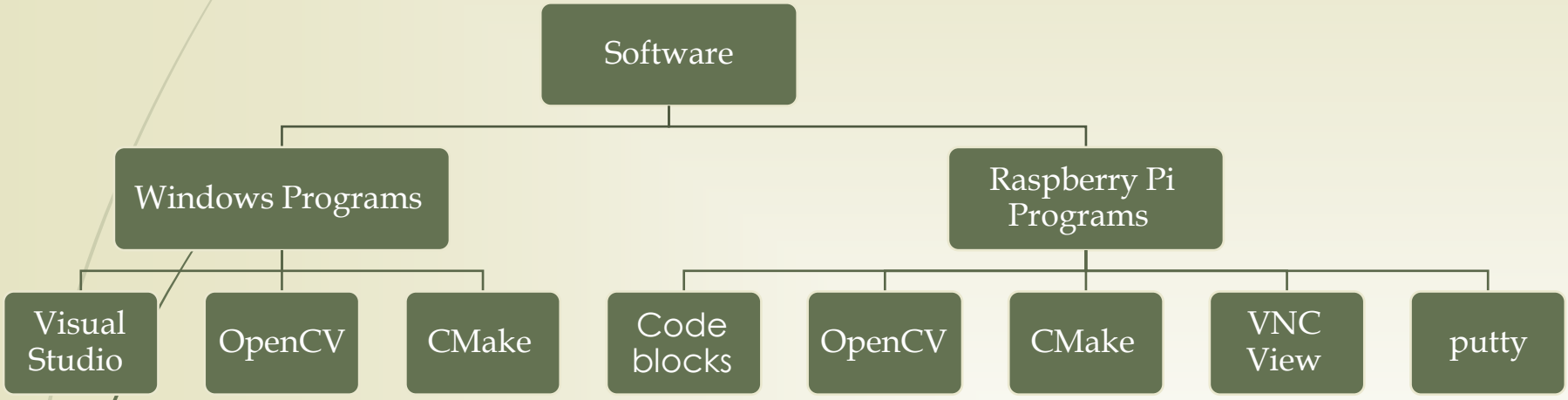
The Raspberry Pi 3 able to decode H.265-encoded videos in software.

It contains :

HDMI ouput to lcd display

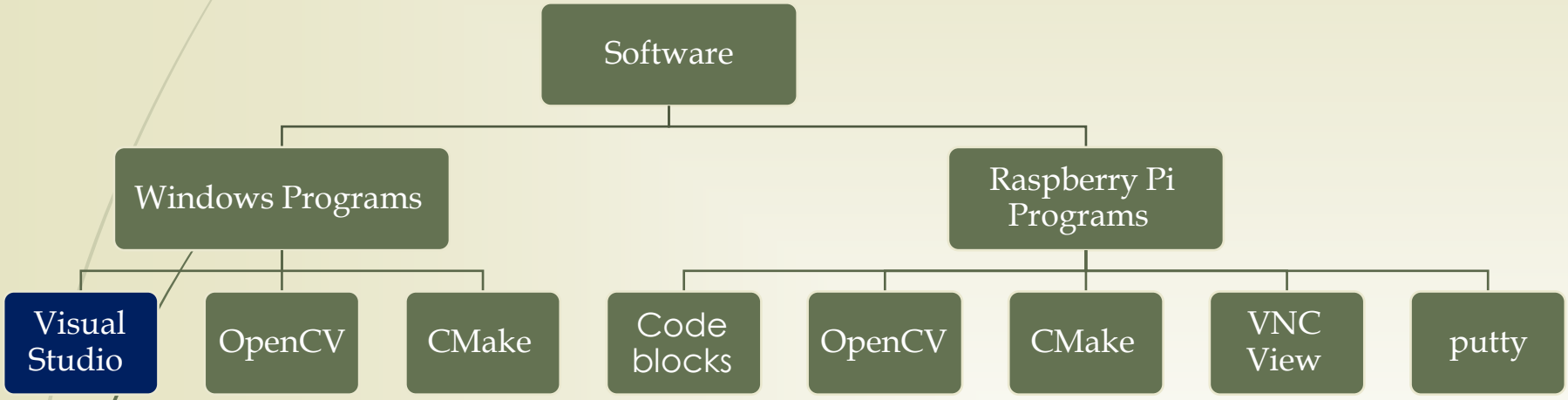
and oput to touche screen display

Software


Software
Windows Programs
Raspberry Pi Programs
Visual Studio
OpenCV
CMake
Code blocks
OpenCV
CMake
VNC View
putty

Software algorithm

Software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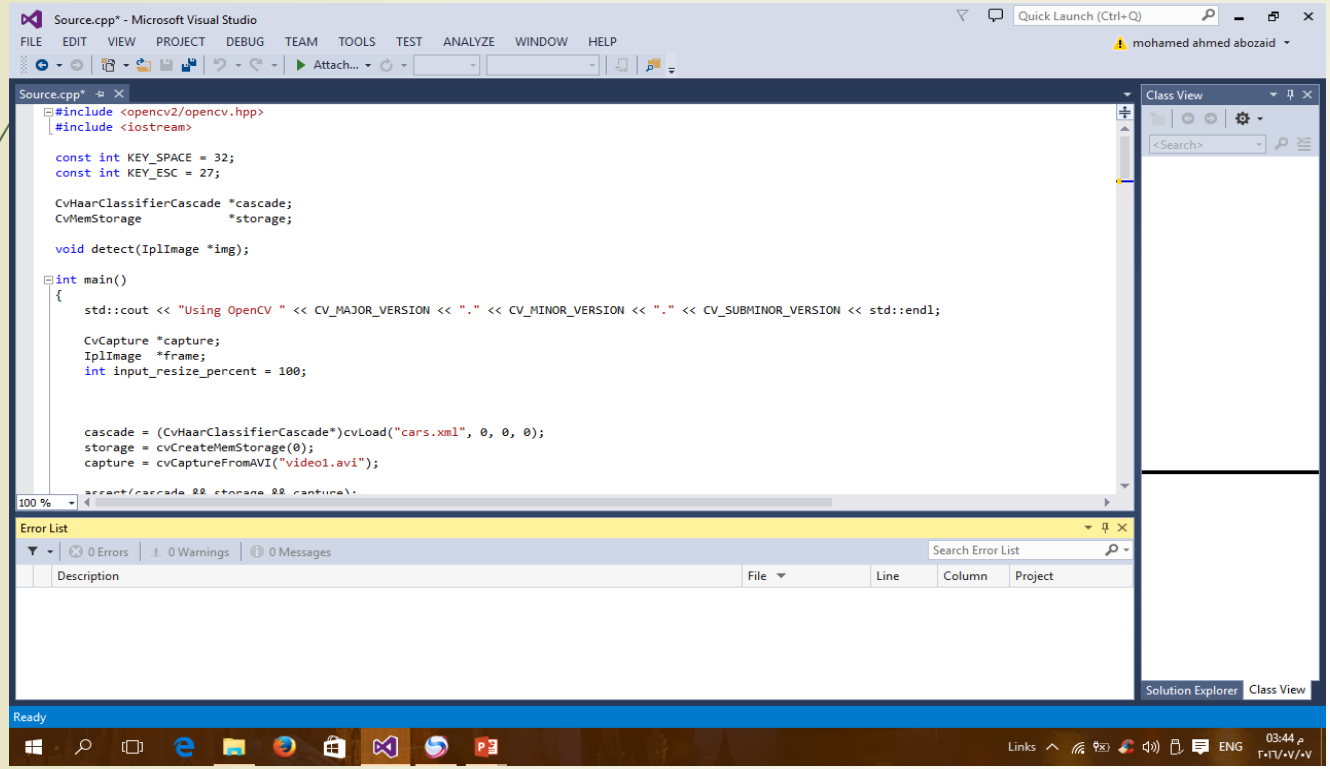
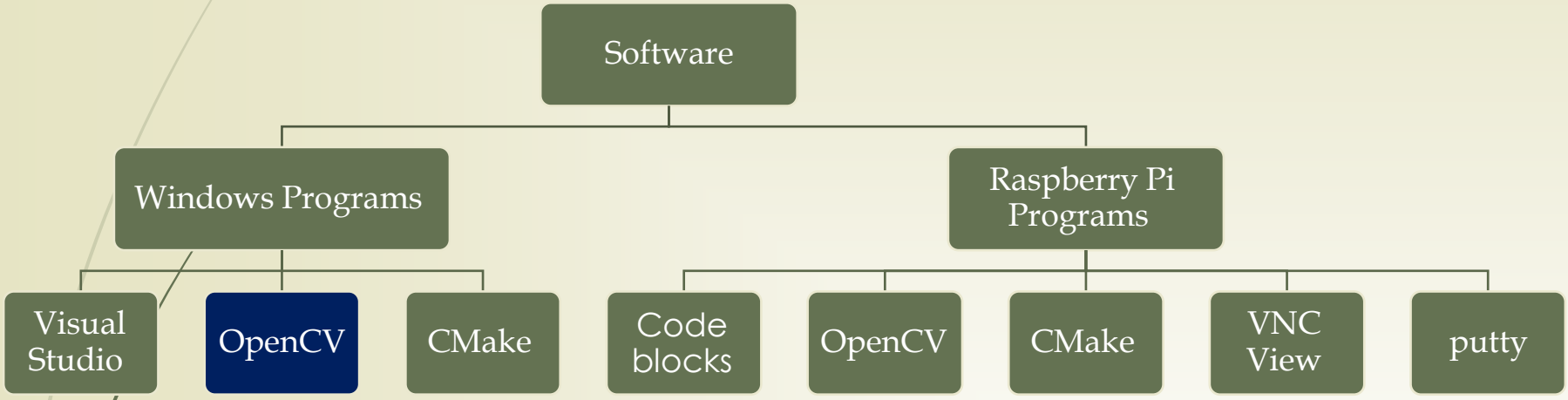
Software

Microsoft Visual Studio

Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft .Visual Studio supports different programming languages and allows the code editor provided a language-specific service exists. Built-in languages include C,C++ and C++/CLI (via Visual C++).



Software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Software

OpenCv

OpenCV (Open Source Computer Vision) is a library of programming functions mainly aimed at real-time computer vision .

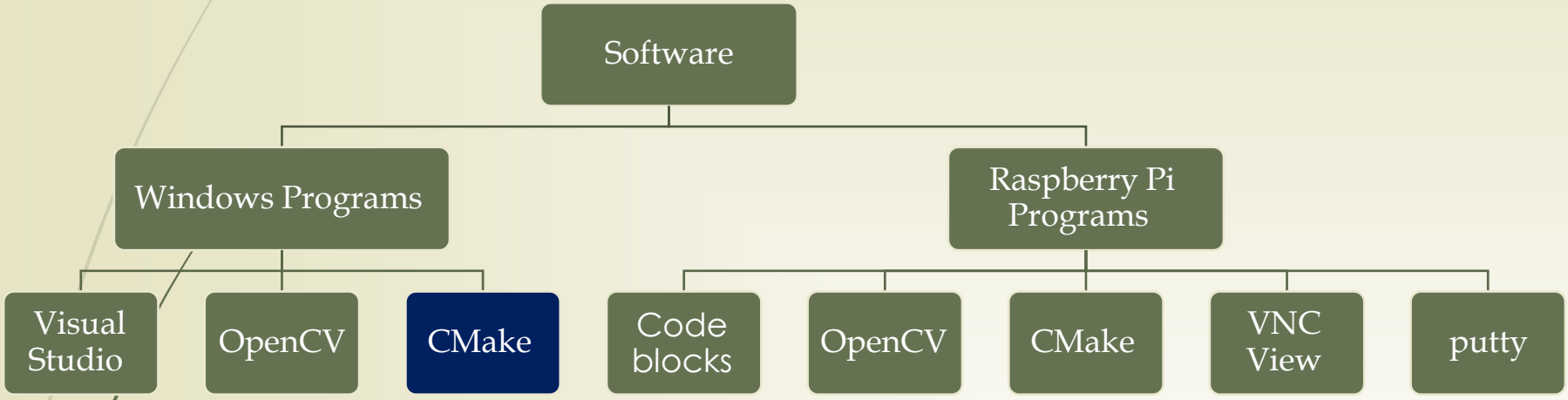
Applications :

in our project we used Opencv For Some Applications such as Motion understanding and Object identification.

Programming language:

OpenCV is written in C++ and its primary interface is in C++, There are bindings in Python, Java and MATLAB.

Software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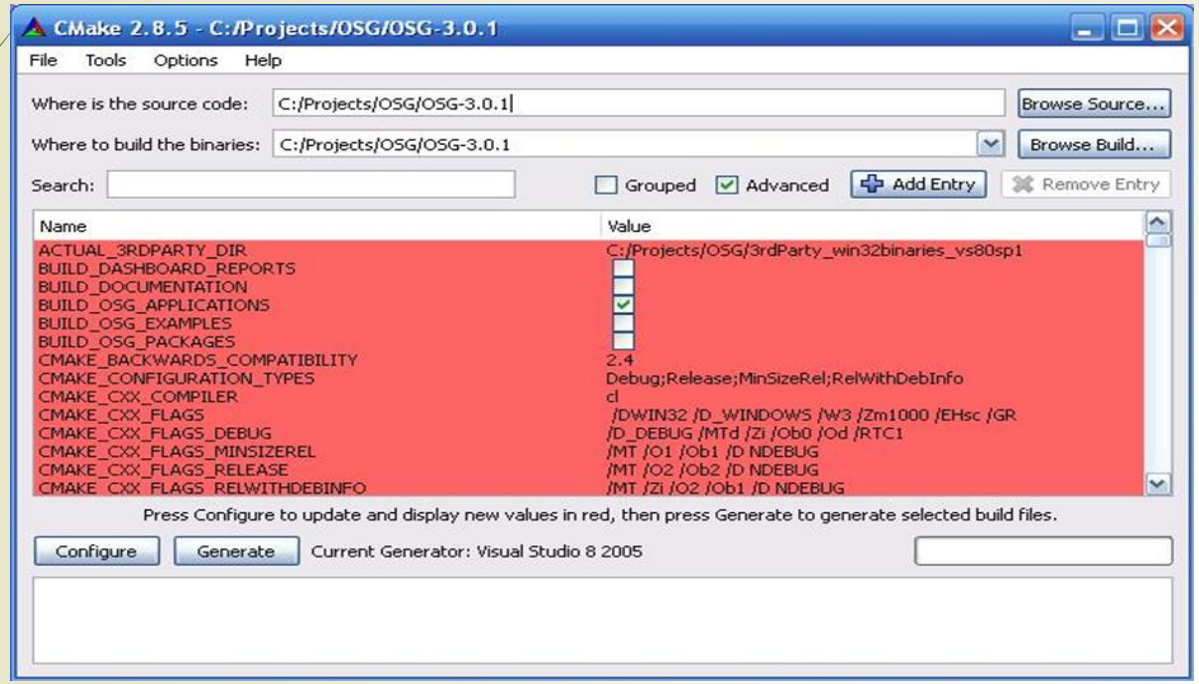
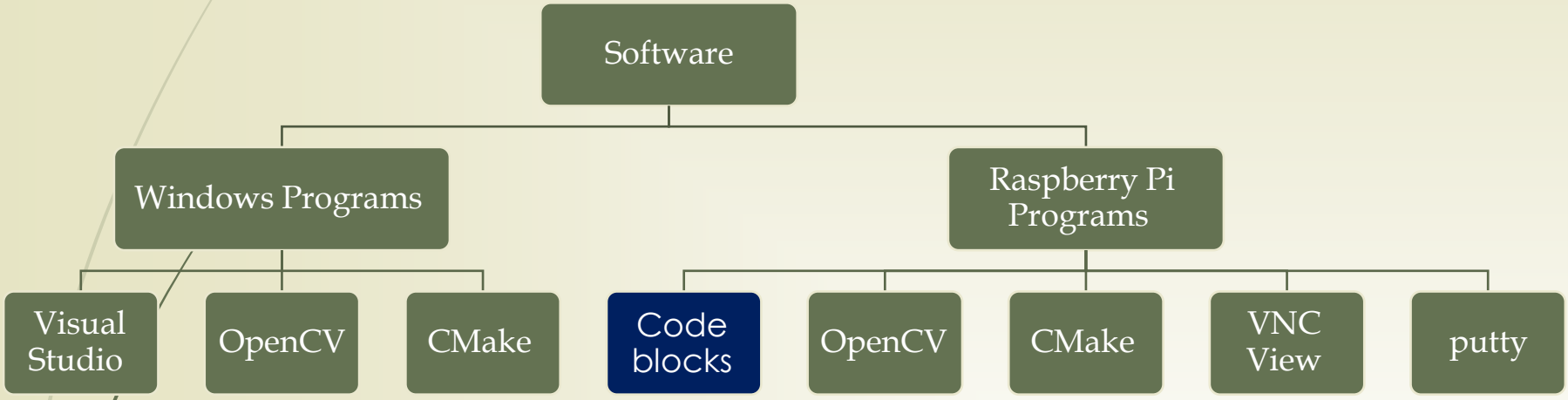
Software

- **Cmake :**

CMake scripts can produce Microsoft Visual Studio project and solution files.



Software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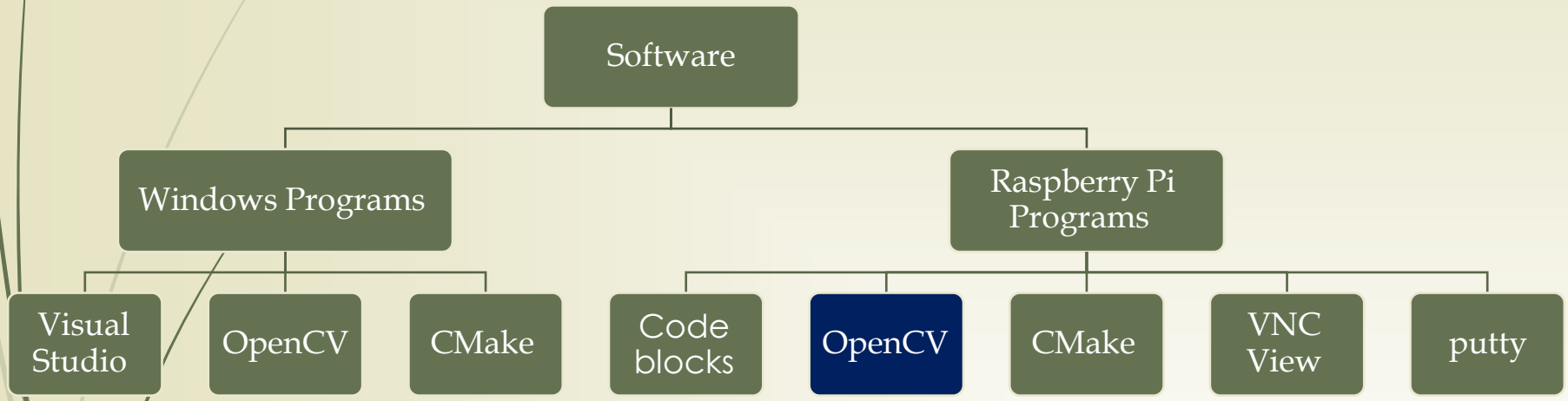
Software

Code blocks :

Code Blocks is a free , open-source cross platform IDE. Code blocks supports different programming languages as C,C++and paython.This also installs codeblocks-common and codeblocks-contrib, which gives several libraries and some plugins and compilers such as :

- GNU GCC Compiler (we use this compiler)
- Intel C/C++ Compiler
- SDCC Compiler
- Tiny C Compiler
- GDC D Compiler
-

Software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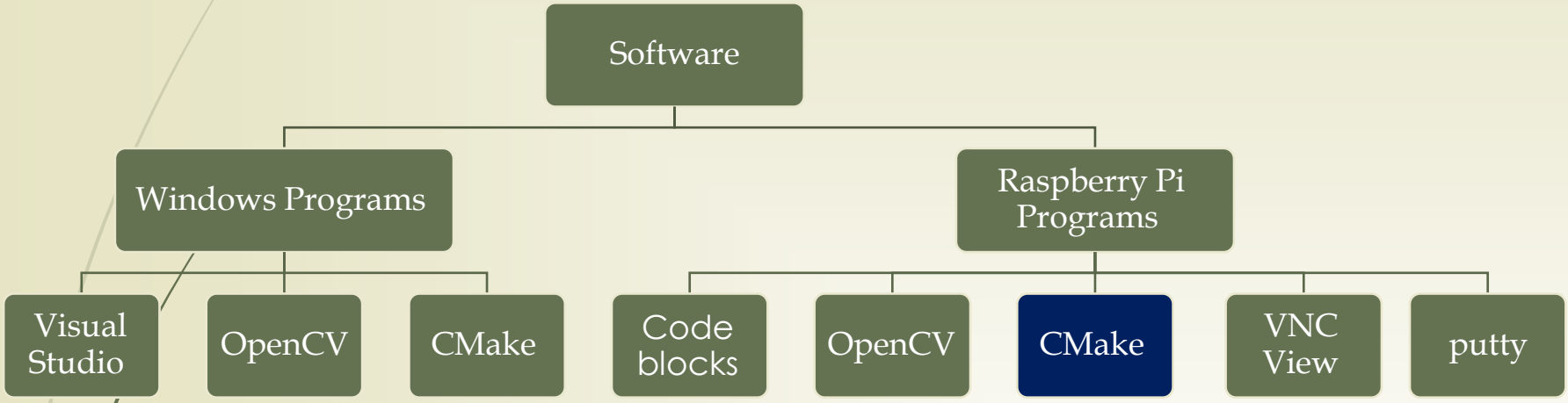
Software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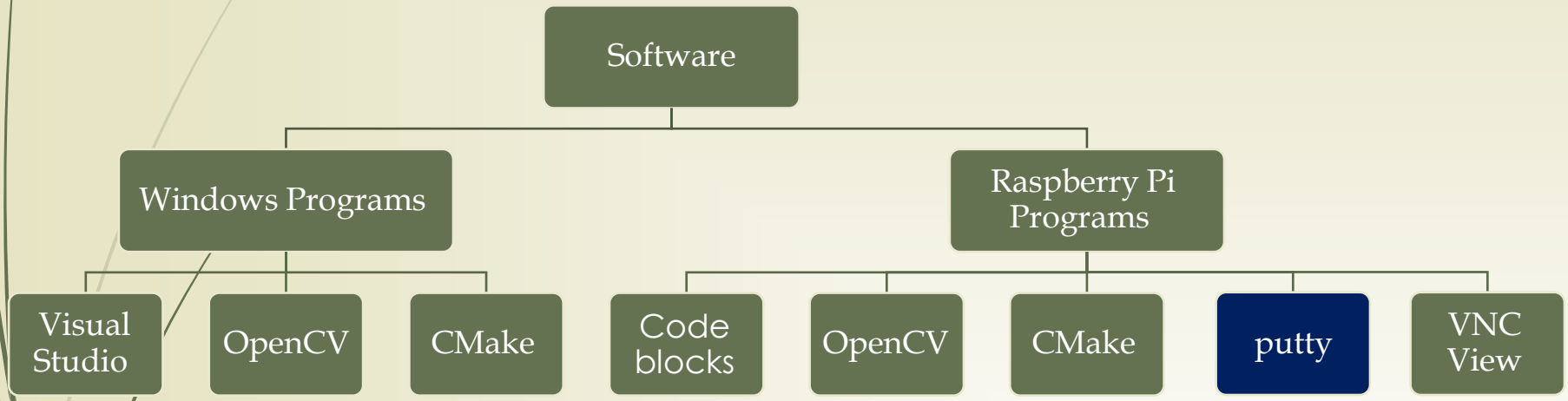
Software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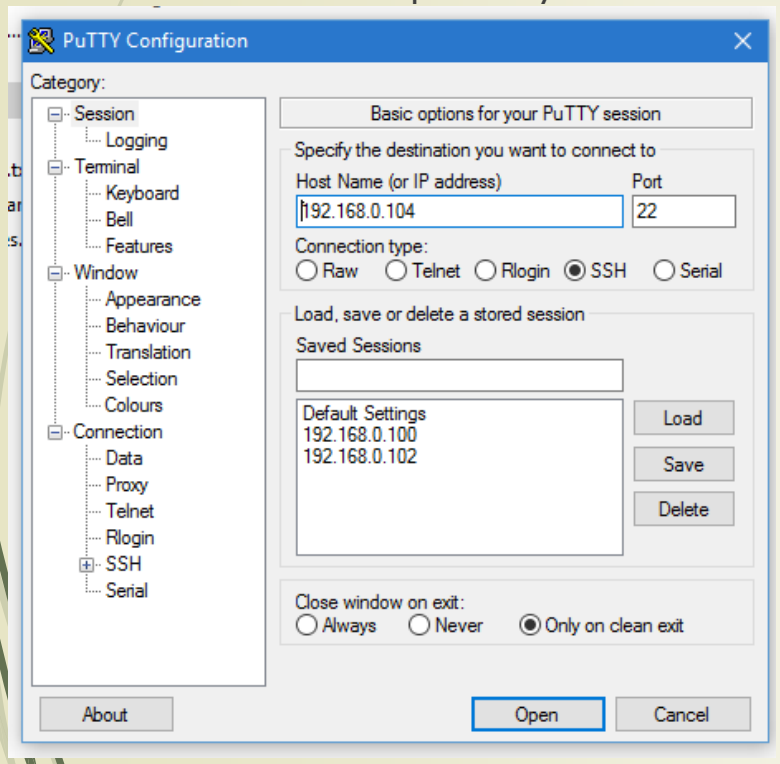
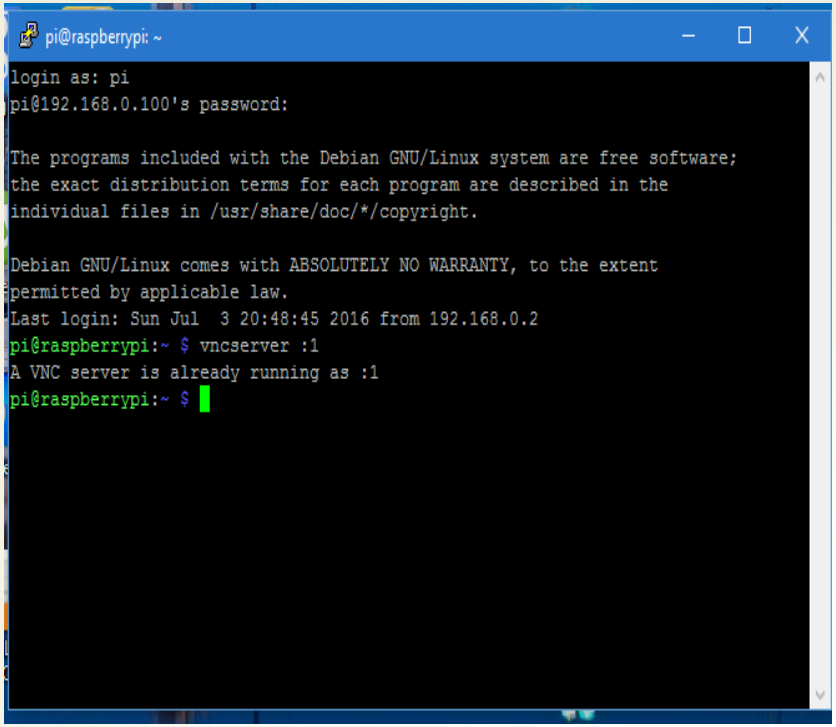
Software

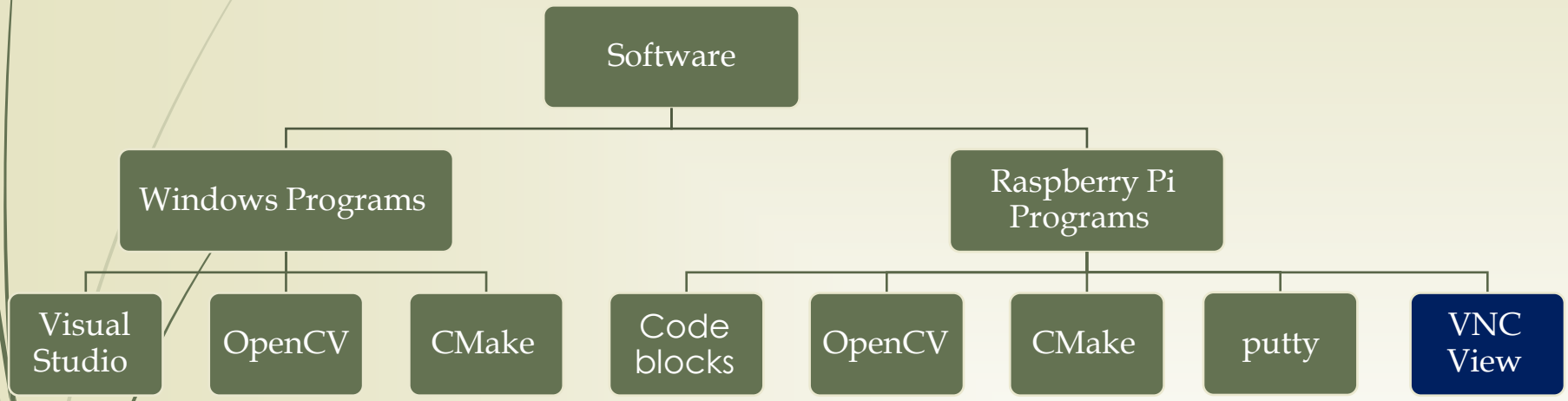
Putty :

- Putty is a very useful application that can be used to connect to serial ports and Secure Shell(SSH) to Raspberry Pi's.
- Putty is mostly used on Windows to connect to remote devices but it can also run on a Raspberry Pi.





Software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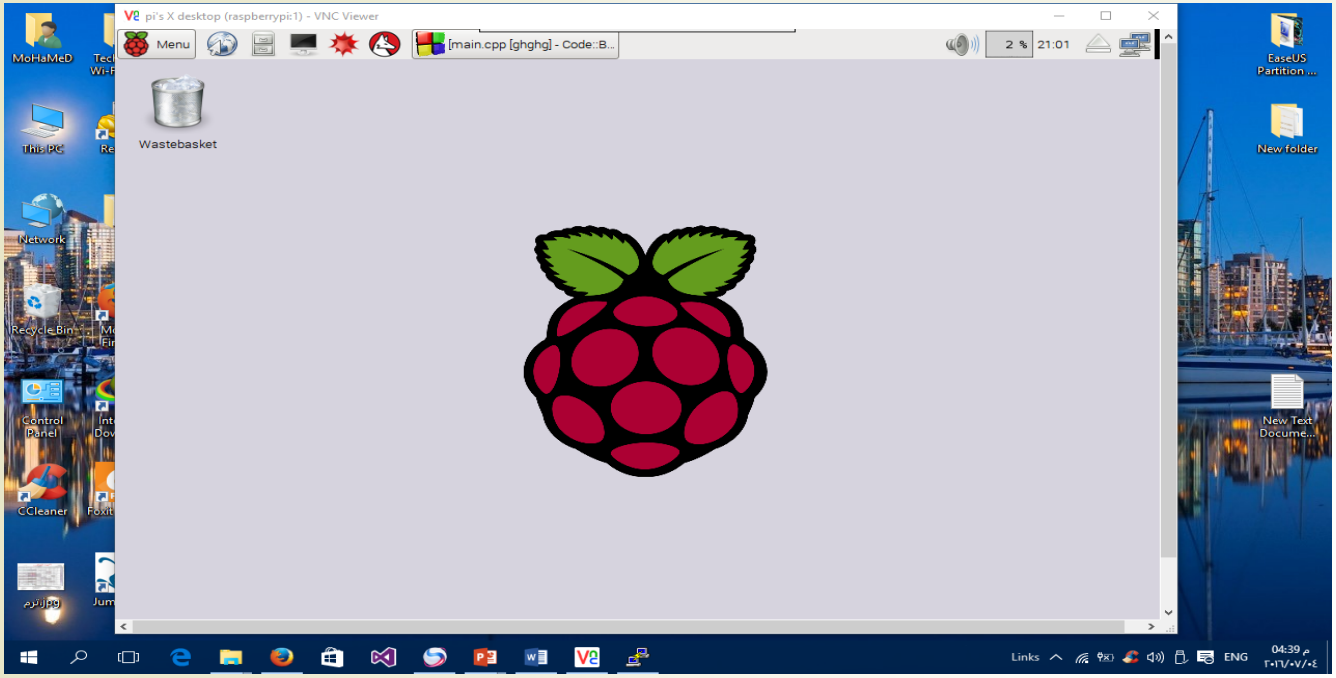
Software

VNC Viewer :

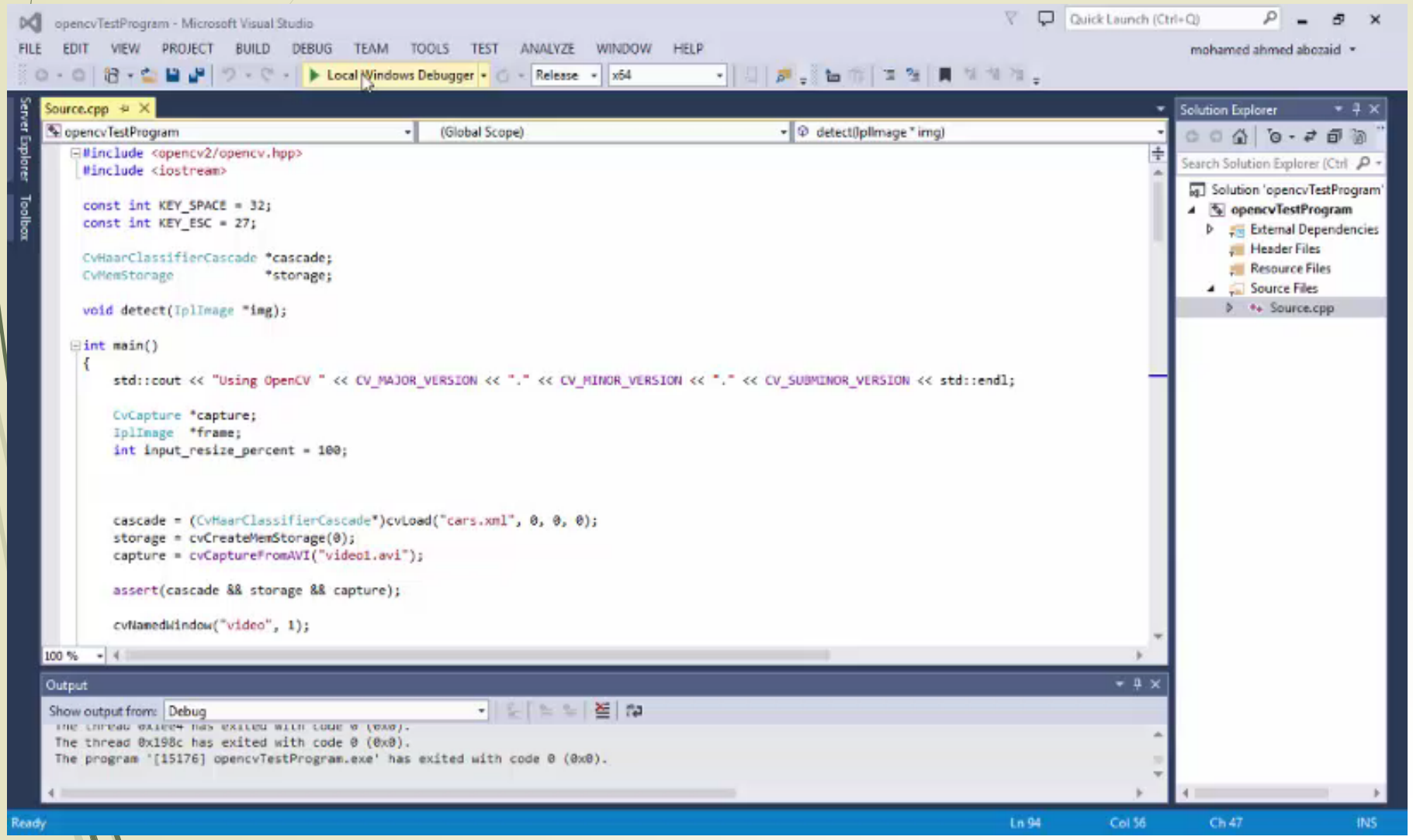
- VNC is a graphical desktop sharing system that allows you to remotely control the desktop interface of one computer from another. It transmits the keyboard and mouse events from the controller, and receives updates to the screen over the network from the remote host
- On our Pi (using a monitor or via SSH), install the TightVNC package.



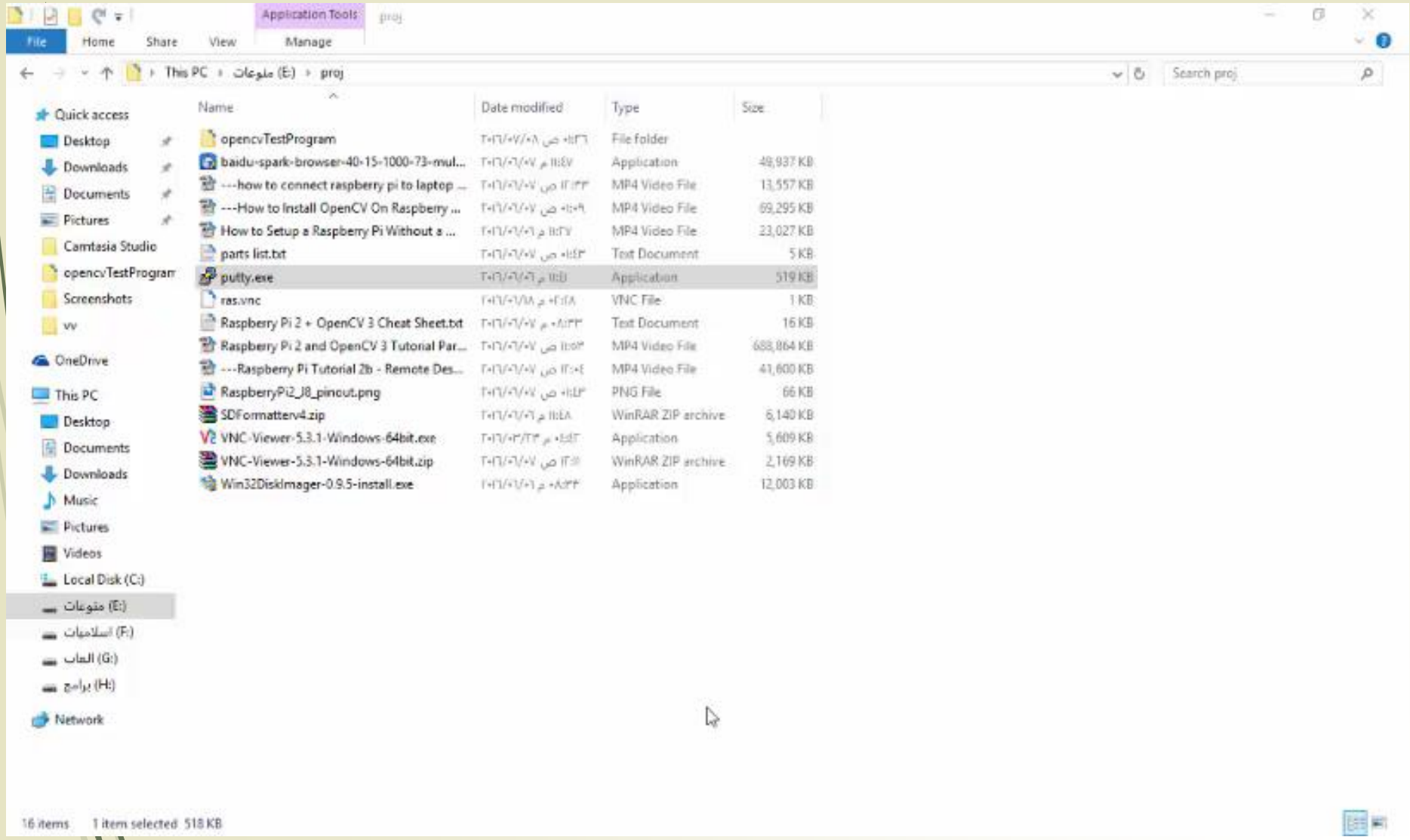
EXPERIMENTAL SETUP

- We Test our project on both (windows and raspbian systems).
- We use a high definition video input.
- This video is saved in system memory and basic detection operations are performed by the code.
- algorithms are allowed to run and perform basic image processing functions.

EXPERIMENTAL SETUP



Results :


Application Tools
proj
File
Home
Share
View
Manage
This PC
ملوعات (E:)
proj
Search proj
Quick access
Desktop
Downloads
Documents
Pictures
Camtasia Studio
opencvTestProgram
Screenshots
vv
OneDrive
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Desktop
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Downloads
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Application
49,937 KB
---how to connect raspberry pi to laptop ...
MP4 Video File
13,557 KB
---How to Install OpenCV On Raspberry ...
MP4 Video File
69,295 KB
How to Setup a Raspberry Pi Without a ...
MP4 Video File
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parts list.txt
Text Document
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Application
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ras.vnc
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SDFormatterv4.zip
WinRAR ZIP archive
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Application
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WinRAR ZIP archive
2,169 KB
Win32DiskImager-0.9.5-install.exe
Application
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1 item selected 518 KB

Conclusions and Future Work

- We introduce a system with low cost and real time image processing .
- An illustrative comparative analysis is performed on the test video captured by USB webcam and the Haar cascade classifier operations are performed in OpenCV on Raspberry Pi board.
- The future scope of this above work is to a generate a novel distance measuring algorithm based on canny edge detection principle to measure the distance between the objects and vehicles and efficiently minimize the risk of accidents especially in areas densely infested with people .
- can use RADAR and LIDAR to overcome weather changes to make a better performance for getting a detailed images.

References :

- ARPN Journal of Engineering and Applied Sciences ©2006-2015 Asian Research Publishing Network (ARPN). (RASPBERRY – PI BASED COST EFFECTIVE VEHICLE COLLISION AVOIDANCE SYSTEM USING IMAGE PROCESSING).
- INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH VOLUME 2, ISSUE 10, OCTOBER 2013 www.ijstr.org (Collision Avoidance Device For Visually Impaired (C.A.D.V.I)).
- International Journal of Modern Engineering Research (IJMER) (Automotive Collision Avoidance System)
- Automotive Collision Avoidance Methodologies Sensor-Based and ITS-Based) - Rawa Adla, Nizar Al-Holou, Mohannad Murad -Department of Electrical and Computer Engineering University of Detroit Mercy Detroit, Michigan, USA .

Thank You