[D magery] Educational Services

A

Workshop on

Digital Image Processing via Smartphone

Organised by

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Dmagery educational services is a sole proprietorship startup which aims at providing pragmatic and visually aided educational services by conducting workshops in educational institutions. The mission of our company is "**To inculcate digital teaching aids so as to enhance a student's learning experience**" and our vision is to **empower student's imagination**.

Dmagery is a portmanteau of two words- **D**igital and I**magery**. Imagery means to use figurative language to make objects, actions, ideas or concepts easily comprehensible and appealing to our physical senses. We at Dmagery put our efforts to accomplish this on the digital platform for developing educational products and hence the name - Dmagery.

About the Workshop

The workshop on **Digital Image Processing via Smartphone** comprises of many fun and interactive activities wherein students will perform various image processing operations hands-on using their smartphone on our web platform dmagery.com which is equipped with all the necessary image processing tools.

The objective of the workshop is to fulfil the objectives of digital image processing:

1. Improve the quality of an image, and
2. Extrapolating features of an input image.

Every problem domain of digital image processing boils down in accomplishing either of the aforementioned objectives. In this workshop, the students will learn how to incorporate various image processing algorithms on a web platform on a computer.

Expected Audience

III year and IV year students pursuing B.Tech in CSE, ECE or IT.

Prerequisites

1. Linear Algebra - Matrices
2. Basics of Probability and Statistics
3. Fourier Analysis - Basic understanding of the series and transforms
4. Set Theory
5. Familiarity with at least one programming language - C/C++, JavaScript (preferred) , python, java, etc

The Workshop Curriculum

Phase I: Hands-on learning using a smartphone

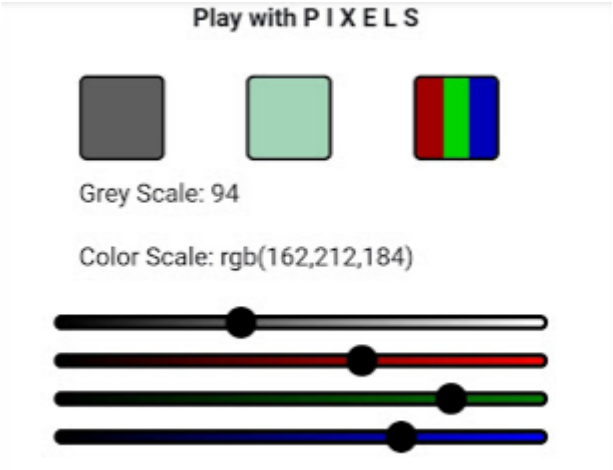
Expected duration: 3 hrs

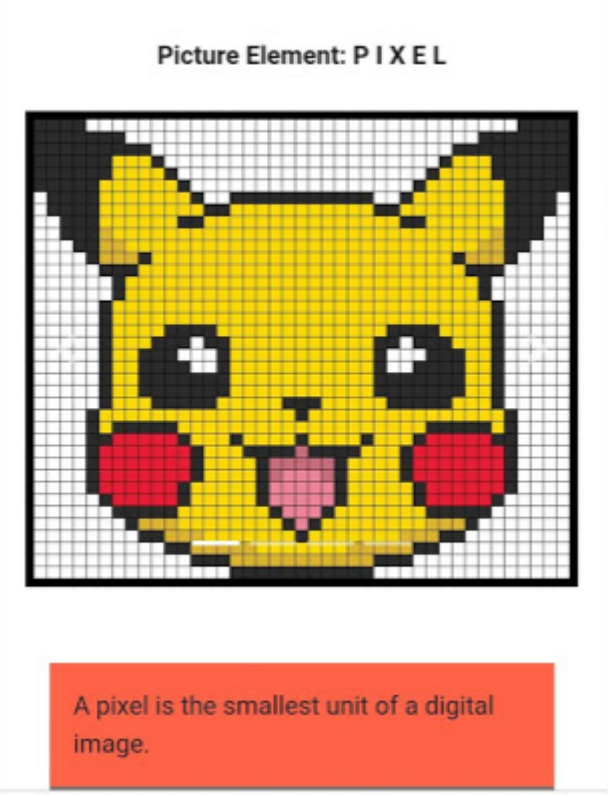
I. Motivation

1. First time ever: Capturing the image of a black hole (10 April 2019)
2. Story of how DIP helped in solving a criminal case (Reginald Denny, 1992)

II. Digital Image Fundamentals

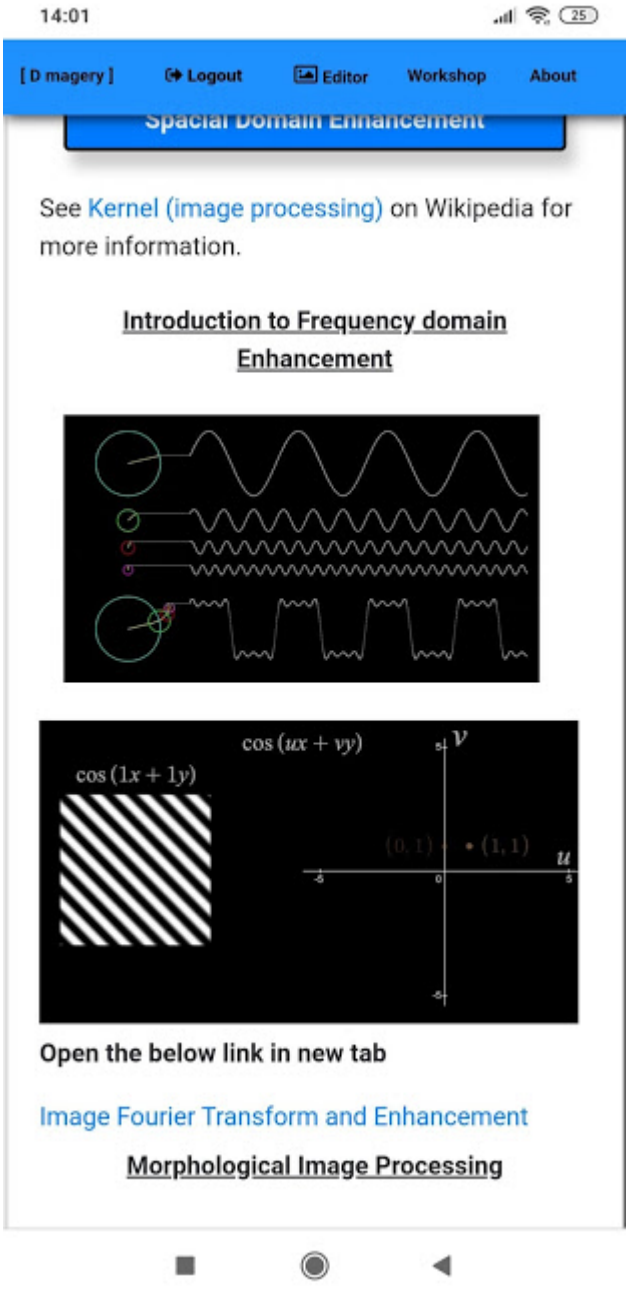
1. Picture Element- Pixel
2. Colour scale and intensity function
3. Image Representation - pixelated and matrix format

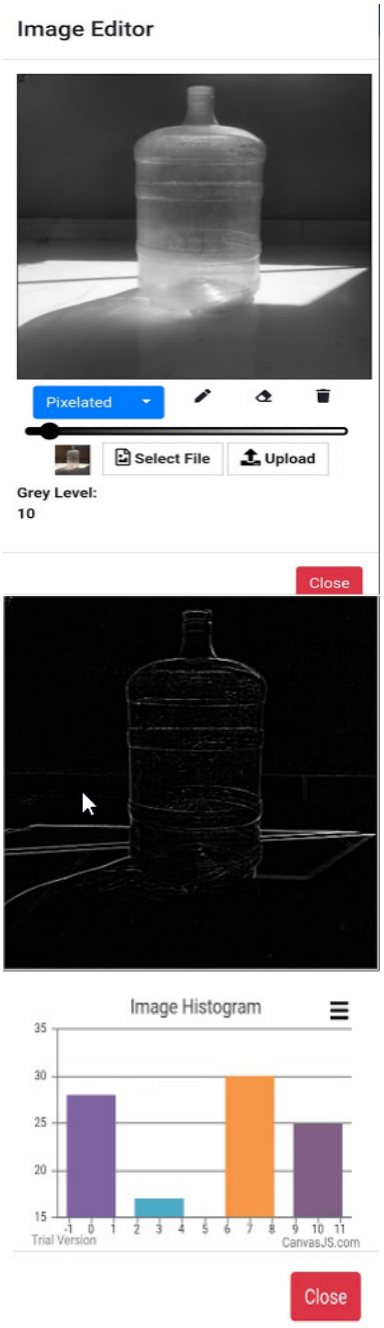




III. Image Enhancement Techniques

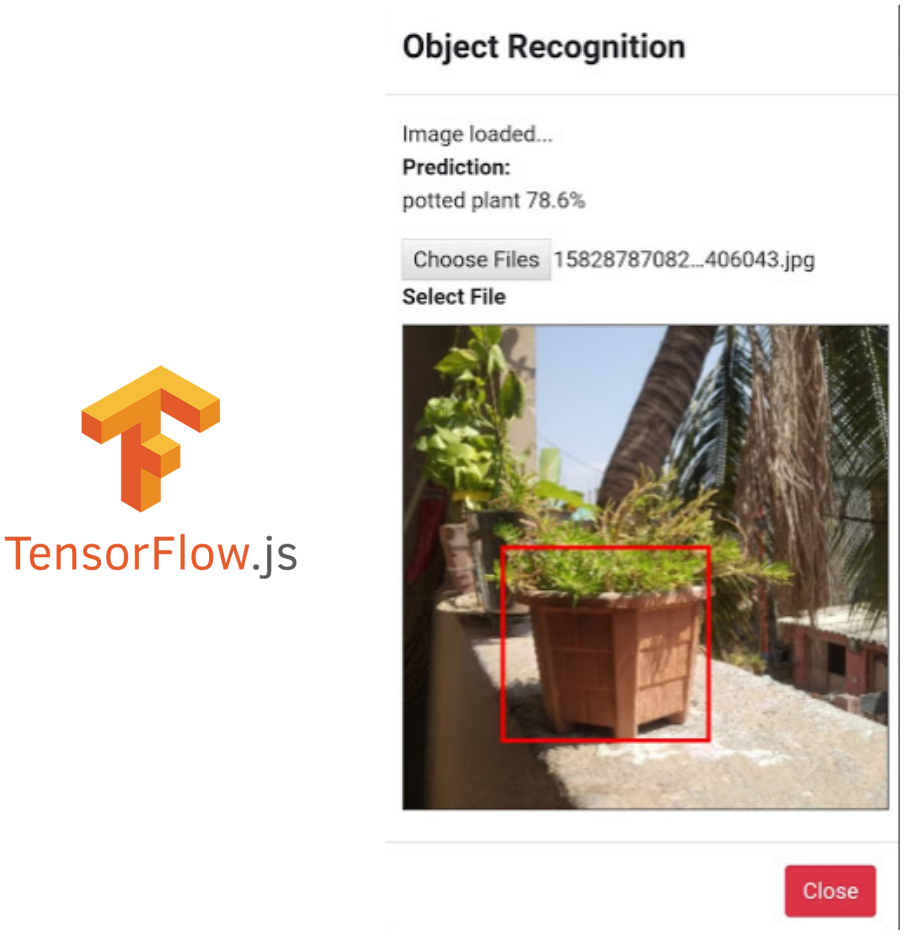
1. Contrast adjustment through histogram equalization
2. Edge detection through spacial enhancement techniques
3. Spacial filtering - smoothing and sharpening
4. Introduction to frequency domain enhancement techniques
5. Morphological image processing - dilation, erosion, opening and closing





IV. Applications of Digital Image Processing

1. Application demonstration - Object Recognition using TensorFlow.js



Phase II: Introduction to Web development

Expected duration: 3 hrs

This phase is an introduction to front-end web development technologies - HTML, CSS and JavaScript. The students will develop their own dynamic website using **visual studio code**, a source-code editor software developed by Microsoft for Windows, Linux and macOS. Also, the students will learn how to host their website locally on a LAN using **XAMPP** software to access their website on a smartphone/PC connected to the same network.

After successful completion of phase II, the students will be completely prepared to learn how to implement image processing techniques on the web platform.

Visual Studio Code **XAMPP Server**

Phase III: Implementation of Image Processing Algorithms

Expected duration: Day 2

This is the final phase of the workshop wherein the students will learn and implement various image processing algorithms using front-end web technologies. Under the supervision of the workshop instructor/facilitator, the students will learn digital image processing in five methodical steps (the programming method) as follows:

1. Define the problem and objective(s)
2. Propose a solution
3. Develop an algorithm
4. Implement the algorithm on a computer using a preferred programming language - Javascript
5. Execute the program and verify results