

# Implementation of Embedded Face Detection System on Raspberry Pi Platform

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**Abstract**—Face detection is one of the biometric identification methods, which identifies or verifies a person from a digital image or a video frame containing a person face. Face recognition is recently popular in security system as a tool for identifying a suspected person or access control. A traditional facial recognition algorithm, which identifies facial features by extracting features (i.e., shape of eyes, nose, and jaw) of the subject, is implemented in computing platform capable of processing an image or a video frame at decent speed. The extracted feature is then compared with the existing features stored in the database for finding matched features. The position of the subject image is crucial to the accuracy of facial recognition algorithm. A stationary platform may have high computing power, but the position of the subject as images cannot be controlled. In contrast, a mobile platform can position itself in order to obtain better subject images. This paper presents the implementation of face recognition algorithm on the embedded system, which can be installed on a mobile platform in order to overcome the limitation of the position of subject as image. In this system, Raspberry Pi based on Linux operation system is used as an embedded system. The facial recognition algorithm is developed using python programming language in order to extract the positions and shapes of eyes, nose, and jaw of the subject as face. The system connects to the database via WiFi and searches for matching features.

**Keywords:**internet of thing, iot,raspberry pi,opencv,face detection system

## I. INTRODUCTION

A Face detection system is computer technology to identifies human faces in digital images. It is a subfield of machine learning method that uses machine learning technique to recognize the specific pattern on the human face. The method uses the position of eyes, noses, or mouth as the facial features to identify the presence of human in the image. For example, an algorithm may analyze the relative position, size, and shape of the eyes, nose, cheekbones, and jaw.[14] These features are then used to search for other images with matching features. A probe image is then compared with the face data. The face detection can be done as off-line or on-line processing. In an off-line processing, images are captured and stored in the system for further processing of face detection on captured image. In an on-line processing, images are processed simultaneously while being captured. Both methods require intensive amount of computing power depended on the size, resolution, and the captured rate of images. Face detection system are widely used in surveillance system for detecting human intruders in the prohibited area. In addition to being

used for surveillance systems, it has been used in many other applications. For example, it can be used in TV broadcasting especially in sport program to identify the player on the TV screen.

Many face detection systems are implemented in the stationary and centralized computing system, where the detection process is done in the central system. As the internet technology becomes popular nowadays, many small devices are capable of communicating with each other through internet and processing more complex algorithm.[1] Hence, the idea of distributed processing becomes very attractive. Instead of perform face detecting algorithm at the centralized system, the algorithm can be done distributively. In the distributed face detection system, each device processes the image in small scale and distributes the result to the others in order to get better and more completed result of overall situation in the scene. However, the limitation of small device is that it has limitation on energy and computing power.

This research proposed the implementation of face detection system by using small and low powerful system i.e., Raspberry Pi [13], which is small size computer. This research aims to test result of time to process face recognition by use Raspberry Pi. The raspberry pi system is configured with Linux Operation System. The face detecting algorithm is implemented using OpenCV Library via python language .

## II. BACKGROUND

### A. Face Detection System

Face detection can be specific case of object-class detection. In object-class detection, the task is to find the locations and sizes of all objects in an image that belong to a given class. Face-detection algorithms focus on the detection of human faces. It is analogous to image detection in which the image of a person is matched bit by bit. Image matches with the image stores in database. Any facial feature changes in the database will invalidate the matching process. A reliable face-detection approach based on the genetic algorithm and the eigen-face technique Firstly, the possible human eye regions are detected by testing all the valley regions in the gray-level image. Then the genetic algorithm is used to generate all the possible face regions which include the eyebrows, the iris, the nostril and the mouth corners. Each possible face candidates is normalized to reduce lightning effect caused due to uneven illumination and the shirring effect due to head movement. The fitness