Raspberry Pi based ANPR for smart access

ABSTRACT

Automated Number Plate Recognition (ANPR) is a term that refers to a system that acquire image of a vehicle and recognises the characters on the number plate. The purpose of this paper is to investigate how a Raspberry Pibased ANPR system for smart access can be used to replace the traditional access system for high-rise residents. Number plate recognition was chosen over other systems due to its high level of security. The process of recognising number plates is divided into four stages: image acquisition and preprocessing, extraction, segmentation, and character recognition. Preprocessing involves converting RGB to Grayscale, filtering out noise with a Gaussian Filter, and enhancing the image with Adaptive Thresholding. The number plate extraction step includes morphological operations, image binarization, and contour extraction. The techniques used in segmentation are Connected Component Analysis (CCA) and Boundary Box Analysis (BBA). Character recognition using the KNN method is the final stage. The primary hardware consists of a Raspberry Pi model 4, a Raspberry Pi camera, and servo motors. A total of 120 number plates from 24 different cars were used in the experiments. The number plates are divided into two categories: training and testing, with approximately 83 percent being used for training, which includes approximately 100 plates from four different cars. 17 percent, or approximately 20 number plates from four different cars, are used for testing purposes. The experiment establishes the optimal distance, angle, and height from which to capture the licence plate. At two metres, the system recognises the number plate. The system's design is 85 percent accurate.