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Raspberry Pi Vehicle Anti-theft Face Recognition System

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ABSTRACT:*This is an advanced system that can be utilized in many cars. Today, it is not difficult to make duplicates of vehicle keys and using such keys increases the risk of robbery. For such problems, we here by propose an efficient and reliable solution. Our system uses a face recognition system to identify the authorized users of the vehicles and only authorized users are allowed to use the vehicle. This allows for a fast easy to use the authentication system. The system uses a Raspberry Pi4 circuit, it also consists of a camera. When we turn on the system authority provided by 3 options that are registration, authentication, and face recognition.while registering, it first scans the owner's face. It gives 100 samples of face .After successful registration, the owner can start the vehicle. If an unauthorized user tries to use the car, the system scans the person's face and checks whether face matches with the authorized face, if it does not match the system denies. In this way, the system helps to secure such intelligent vehicles.*

Keywords: Raspberry Pi 4B, Pi Camera, Mobile application, Motor driver, Dc motor

Introduction

With the new modern era development of new technologies is a must be it in the management sector or in the technical sector. improvements are necessary for every field. regarding the project chosen in the field of vehicle security. various techniques have been improved such as biometrics, retinal scanning, image processing. Apart from all the improvised techniques the theft of vehicles till remains high in order to maintain the car security the system needs to be efficient, robust and highly reliable so in this paper, the security system involving face detection using Raspberry Pi4, FRS algorithm along with database which consist of images uploaded by the owner of vehicle. If the newly scanned image does not match with the image uploaded earlier to the database the system will gives message to the owner of the vehicle. The All the process here is controlled by programmed Raspberry Pi 4.

BLOCK DIAGRAM:

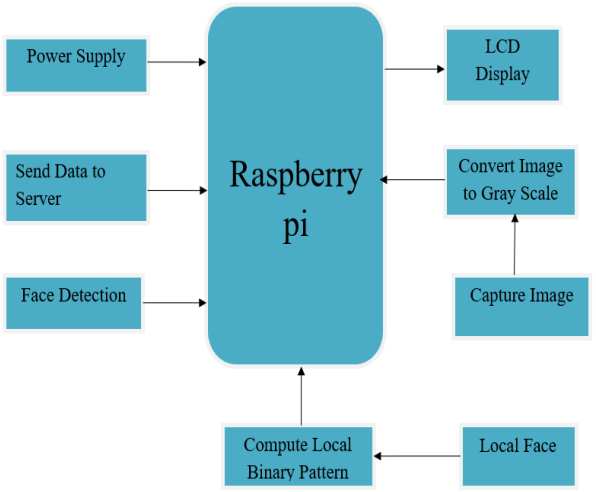

Fig1: System Block Diagram

BLOCK DIAGRAM DESCRIPTION

1. Raspberry Pi 4B

Raspberry pi is a small board computer. By connecting peripherals like keyboard, mouse, display to the Raspberry Pi, it will act as a mini personal computer. The Raspberry Pi is Operates in the open-source ecosystem, Pi OS, is open-source software. Raspbian OS is an official Operating System available for free to use. Raspbian has GUI which includes Browsing,Pythonprogramming,Office, games, etc. We should use the SD card to store the Operating System.

The CPU speed of Raspberry Pi varies from 700 MHz to 1.2 GHz. Also, it has on-board SDRAM that ranges from 256 MB to 1 GB. A powerful feature of the Raspberry Pi is the row of GPIO pins along the top edge of the board. A 40-pin GPIO header is found on all current Raspberry Pi boards.

2. Pi Camera

The Pi camera module is a portable light weight camera that supports Raspberry Pi. It communicates with Pi using the MIPI camera serial interface

protocol. It is normally used in image processing, machine learning or in surveillance projects. It is commonly used in surveillance drones since the payload of camera is very less. Apart from these modules Pi can also use normal USB webcams that are used along with computer.

3.Motor Driver

This L298N Motor Driver Module is a high-power motor driver module for driving DC and Stepper Motors. This module consists of an L298 motor driver IC and a 78M05 5V regulator. L298N Module can control up to 4 DC motors, or 2 DC motors with directionand speed control.

4. LCD Display

16×2 Character LCD is a very basic LCD module which is commonly used in electronics projects and products. It contains 2 rows that can display 16 characters. Each character is displayed using 5×8 or 5×10 dot matrix. It can be easily interfaced with a microcontroller. In this tutorial we will see how to write data to an LCD with PIC Microcontroller using Hi-Tech C Compiler. Hi-Tech C has no built in LCD libraries so we require the hardware knowledge of LCD to control it. Commonly used LCD Displays uses HD44780 compliant controllers.

5.DC Motor

A DC motor is any of a class of rotary electrical motors that converts direct current electrical energy into mechanical energy. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings.

FLOW CHART:

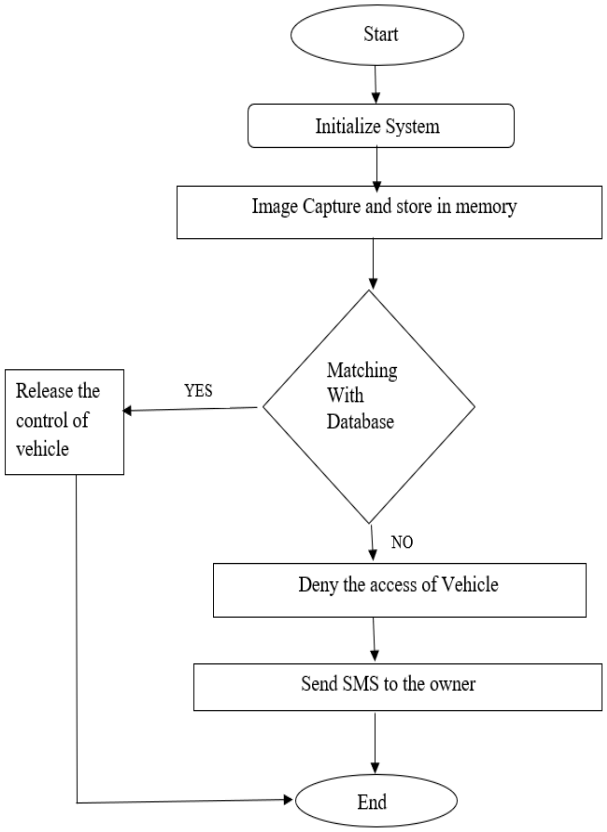

Fig2: Flow Chart

Algorithm Details

STEP 1: The first and foremost step is to register image of authorized person. Then next time whenever owner want access to vehicle, owner can start vehicle only by face.

STEP 2: The pi camera will first take the image and send it to the raspberry pi module and then compare the captured image with the stored images in database.

STEP 3: Based results, if the result is positive then person can start the vehicle; the system informs the authorized user that known person has got access.

STEP 4: When the result is negative, the system blocks the access and the system sends the message to the authorized user.

STEP 5: There is option to clear previous registration, but before clearing it send SMS to authorized person then only new registration will add in system.

Acquisition and pre-processing phase

The aim of image acquisition is to obtain the video images of vehicle driver face in real-time using an pi camera and stored in the database for the training and testing process.

The pre-processing steps should implement are as follows:

1) Start the camera and set to capture video stream.
2) Grab a frame from the video stream. If frame is grabbed, continue with the process.
3) Else stop and Initialize the frame as the current frame
4) Conversion of Gray-scale image: Gray-scale images means that the image colour information is missing and it converted into grayscale format represented as a number from decimal 0 to 255, or binary 00000000 to 11111111.

Face Authentication phase

The result of the recognition phase will be used in this phase. Since the image is converted into binary form; so, this label is used to assess a specific value and matching it to the value of a authorised person's image in the database. Therefore, if the value match, then the name will successfully be returned. Otherwise, the system will return predefined as "unauthorised person".

Mobile Application Control and SMS notification

In this subsection, Raspberry Pi connect with the android application through firebase server to create a mobile application for the person who is an actual authorized driver. Such that, Raspberry Pi send data to database and pusher take action like send notification (SMS) to the android application named "Car Locked" to alert vehicle's owner.

Merits:

1) Each time they enter the vehicle again, the system "recognizes" them and gives them access to predefined functionalities such as the permission to start the car
2) a simple camera with a face recognition system could help recognize unattended children in vehicles and warn parents on time. Accurate information about the milk will be stored at server
3) Reduce the man power

Demerit:

As a whole system is dependent on the electricity that is it requires power to carry out the task successfully.

Conclusion:

The system proposed here is overall efficient in all the way. Hence it is important to have an efficient and reliable quality control system that will daily monitor. By using this particular system we can increase and maintain the safety of the vehicle by providing special programmed functions to it. If any unauthorized user tries to use or steel the car the central controller will stop its working immediately and appropriate SMS will be sent to the authorized user through an application.

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