

DRONE WITH FACE RECOGNITION WIRELESS CAMERA

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Abstract—Face detection is the process of identifying one or more people in images or videos by analyzing and comparing patterns. Algorithms for face detection typically extract facial features and identifying them in the given video or image. In addition to this process we add the tool of drone, which is used to monitor the activities at a next level. Face detection is typically used in security systems. Besides that, it is also used in human computer interaction. It has received significant attention up to the point that some face recognition conferences have emerged.

A general statement of the problem can be formulated as follows, given still or video images of a scene, one or more persons in the scene can be identified using a stored database of faces. The solution of the problem involves face detection, feature extraction from the face regions and recognition.

Keywords— Drone, Quadcopter, Face Recognition System, Face Detection, Drone With Camera, Arduino Duemilanove.

● Introduction

Face detection is typically used in security systems. Besides that, it is also used in human computer interaction. A general statement of the problem can be formulated as follows, given still or video images of scene, one or more persons in the scene can be identified using a stored database of faces. The solution of the problem involves face detection, feature extraction from the face regions and detection.

A set of eigenfaces can be generated by performing a Mathematical process called principal component analysis (PCA) on a large set of images depicting different human faces. The key procedure in PCA is based on Karhunen-Loeve transformation. If the image elements are considered to be random variables, the image may be seen as a sample of a stochastic process.

● About the Project

Quadcopter, also known as quadrotor helicopter or quadrotor, is a multicopter that is lifted and propelled by four rotors. Quadcopters are classified as rotorcraft, as opposed to fixed-wing aircraft, because their lift is generated by a set of rotors. In a quadcopter, two of the propellers spin in one direction (clockwise) and the other two spin the opposite direction (counter clock wise) and this enables the machine to hover in a stable formation. Firstly the motors which we used have an obvious purpose: to spin the propellers. Motors are rated by kilovolts, the higher the kV rating, the faster the motor spins at a constant voltage. Next the Electric Speed controller or ESC, is what tells the motors how fast to spin at any given time. We need four ESCs for a quadcopter, one connected to each motor. The ESCs are then connected directly to the battery through either a wiring harness or power distribution board. Many ESCs come with a built in battery eliminator circuit (BEC), which allows you to power things like your flight control board and radio receiver without connecting them directly to the battery. Because the motors on a quadcopter must all spin at precise speeds to achieve accurate flight, the ESC is very important. Our Quadcopter uses four propellers, each controlled by its own motor and electronic speed controller. Using accelerometers we are able to measure the angle of the Quadcopter in terms of X<Y and Z and accordingly adjust the RPM of each motor in order to self-stabilize itself. The Quadcopter platform provides stability as a result of the counter rotating motors. For Hovering over the skies the flight controller which is used is the 'brain' of the quadcopter. It houses the sensors such as gyroscopes and accelerometers that determine how fast each of the quadcopter's motors spin. Its purpose is to stabilize the aircraft during flight and to do this, it takes signals from on-board gyroscopes (roll, pitch and yaw) and passes these signals to the Atmel644PA processor, which in-turn processes signals according to the users selected firmware (e.g. Quadcopter) and passes the control signals to the installed Electronic Speed Controllers (ESCs) and the combination of these signals instructs the ESCs to make fine adjustments to the motors rotational speeds which in-turn stabilizes the craft. Face detection is typically used in security systems. Besides that, it is also used in human computer interaction. In order to develop this project 720P Face Recognition IP Camera is used for training and testing faces. It has received significant attention up to the point that some face detection conferences have emerged.

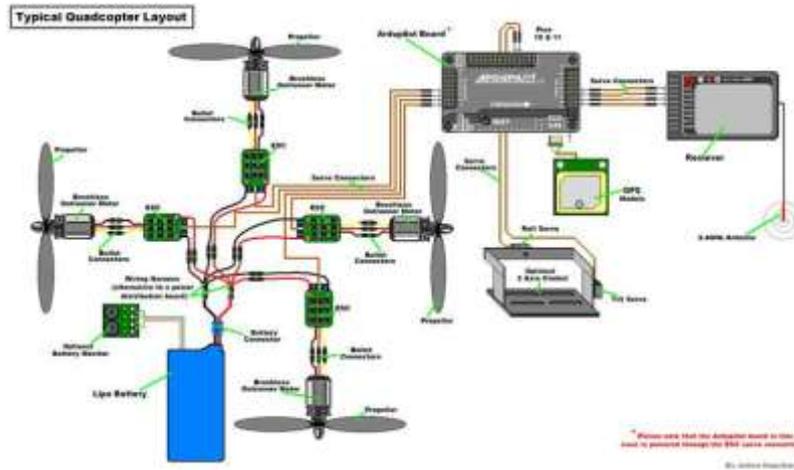
A general statement of the problem can be formulated as follows, given still or video images of scene, one or more persons in the scene can be identified using a stored database of faces. The solution of the problem involves face detection, feature extraction from the face regions and detection. To develop this project we used the 720P Face Recognition IP Camera.

Specifications:

- Frame
- Control Board
- Sensor
- Electronic Speed Controller (ESC)
- Motors
- Transmitter & Receiver

- propeller
- 720P Face Recognition IP Camera

Block Diagram



Block Diagram of Drone[1]

- Analysis of a Drone

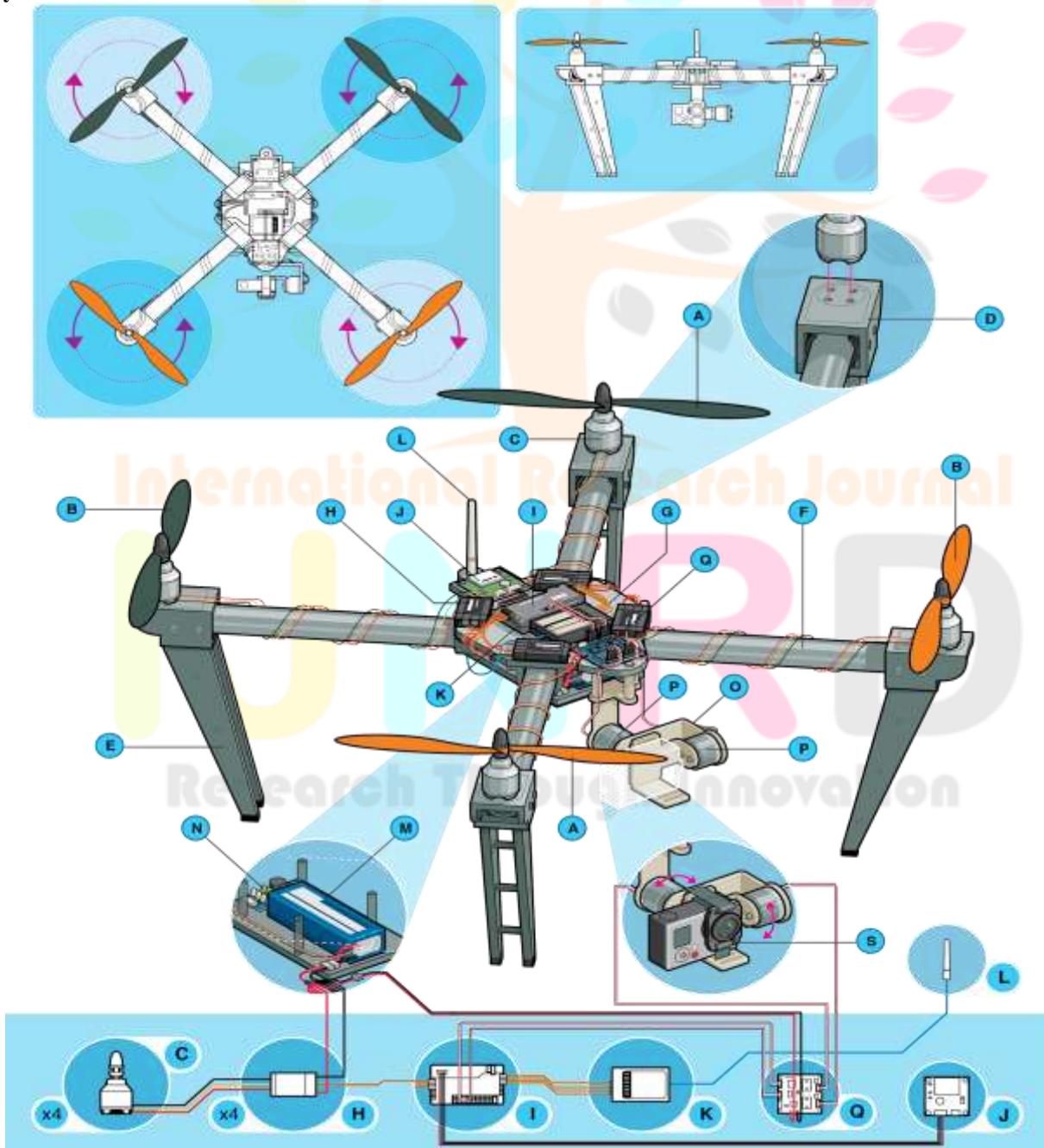


Figure 2 Analysis of Drone[2]

A. STANDARD PROP

The same “tractor” propeller used on standard front-engine R/C airplanes.

B. “PUSHER” PROP

These contra-rotating props exactly cancel out motor torques during stationary level flight. Opposite pitch gives downdraft.

C. MOTOR

Usually a brushless electric “outrunner” type, which is more efficient, more reliable, and quieter than a brushed motor.

D. MOTOR MOUNT

Sometimes built into combination fittings with landing struts.

E. LANDING GEAR

Designs that need high ground clearance may adopt helicopter-style skids mounted directly to the body, while designs with no hanging payload may omit landing gear altogether.

F. BOOM

Shorter booms increase maneuverability, while longer booms increase stability. Booms must be tough to hold up in a crash while interfering with prop downdraft as little as possible.

G. MAIN BODY

Central “hub” from which booms radiate like spokes on a wheel. Houses battery, avionics, cameras, and sensors.

H. ELECTRONIC SPEED CONTROLLER (ESC)

Converts DC battery power into 3-phase AC for driving brushless motors.

I. FLIGHT CONTROLLER

Interprets input from receiver, GPS module, battery monitor, and onboard sensors. Regulates motor speeds, via ESCs, to provide steering, as well as triggering cameras or other payloads. Controls autopilot and other autonomous functions.

J. GPS MODULE

Often combines GPS receiver and magnetometer to provide latitude, longitude, elevation, and compass heading from a single device.

K. RECEIVER

Often a standard R/C radio receiver unit. The minimum number of channels needed to control a quad is 4, but 5 is usually recommended.

L. ANTENNA

Depending on your receiver, may be a loose wire whip or helical “rubber ducky” type.

M. BATTERY

Lithium polymer (LiPo) batteries offer the best combination of energy density, power density, and lifetime on the market.

N. BATTERY MONITOR

Provides in-flight power level monitoring to flight controller.

O. GIMBAL

Pivoting mount that rotates about 1, 2, or 3 axes to provide stabilization and pointing of cameras or other sensors.

P. GIMBAL MOTOR

Brushless DC motors can be used for direct-drive angular positioning, too, which requires specially-wound coils and dedicated control circuitry that have only recently become commercially available.

Q. GIMBAL CONTROLLER

Allows control of direct-drive brushless gimbal motors as if they were standard hobby servos.

R. CAMERA

720P Face Recognition IP Camera With Viewing Angle (Degree) -360° and Memory -64GB max (not included)

Features:

Feature 1- Face Recognition

Feature 2- One Key Playback Alarming Video

Feature 3 -Video Sharing Authority Management

Feature 4- AES 128 Bits Dynamic ID

- **Algorithm:**

Facial recognition system:

A facial recognition system is a technology capable of identifying or verifying a person from a digital image or a video frame from a video source. There are multiple methods in which facial recognition systems work, but in general, they work by comparing selected facial features from given image with faces within a database.

OR

Facial recognition is a Biometric Artificial Intelligence based application that can uniquely identify a person by analysing patterns based on the person's facial textures and shape

Face Matching:

One of the major advantages of the Facial Recognition Solution is the level of control it gives you from a central point of management. Thanks to the direct connection between camera and server, you can control and gather insight from up to 20 remote cameras from one server, at the same time. With face matching and visual analysis carried out by the system in real time, your operator can easily access any recorded images related to that face or customer, via the GUI in their monitoring software.

- When it is matched with registered people, alarm of face matching is output in real-time, and display an alarm history in the list.
- Specified screen image can be played back on control monitor with double-clicking on an alarm history.

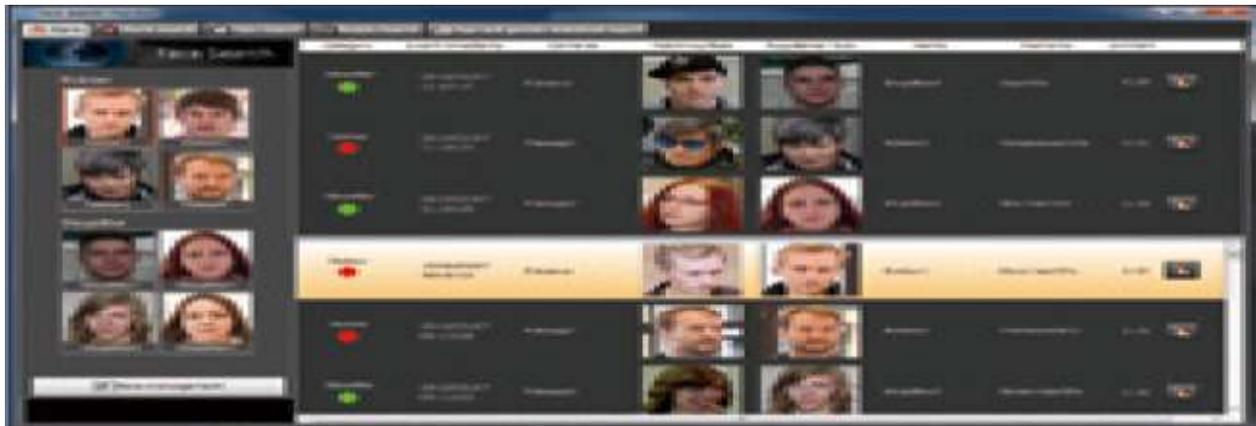


Figure 3 Face matching[3]

Face Search:

The facial recognition software runs silently in your system, collecting data on each face that it detects; this data is then stored within an easily accessible database.

A user will then be able to access this database, and will be given the option to select a particular face. With this functionality, the user can choose to set an alarm to be sounded upon future detection of this subject, or simply track a particular person's movements in chronological order throughout all of the cameras in the system.

- Face images that camera detected are stored, and it can be searched later.
- By searching the face DB, you can display the result of each cameras in chronological order and find movement locus of persons.
- Specify camera or date in detected face images and display the result in the list in similarity order.

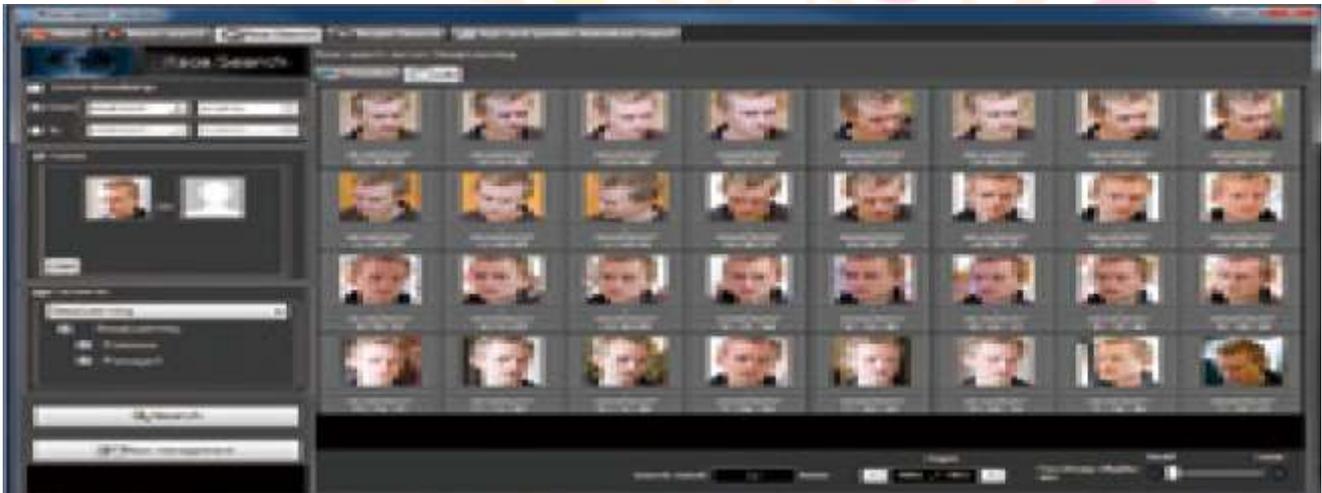


Figure 4 Face Search[4]

Face Registration Up to 30,000

The software also features an analytics section. In this area, a user is given the ability to analyse statistics such as people counting, and also allows them to detect age and gender. The system will then display the relevant information in an accessible manner.

- Count people of detected face and evaluate their age and gender.
- Display the result on the screen with statistical graph.
- The statistical data can be saved as a CSV file for analytical use.



Figure 5 Statistical graph[5]

Future Scope:

Our project “DRONE WITH FACE DETECTION” is mainly intended to control the robot with a wireless camera using a wireless RC remote, wireless technology.

It can be extended to the recognition technology and used as a real time security purpose. This project finds its major applications while we are monitoring larger areas like Crop monitoring, banking, Cold storage etc. This project assures us with more reliable and confident security system.

Reference

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4.https://security.panasonic.com/Face_Recognition/

5.<https://makezine.com/2014/01/07/anatomy-of-a-drone/>

