Research Article

RtC Drone: Implementation of intelligent autonomous patrolling using Round the Clock Drone

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Abstract: Drones are used in daily life for security purpose, farming, video shooting and product delivery. drones are working on the principal of The Newton's Third law of motion that is also known as action and reaction. Mostly used in Aerial photography for films express shipping, gathering information, Geographic mapping of the location. Drones are also used for patrolling by the government police they are monitoring the particular areas by the drone camera for this work there is a need of skilled drone driver for flying and monitoring. We present a model of drone which is Automatically flying around particular areas in fixed timing and automatically detect the objects, Animals, humans and their Activity and it will detect fire, violence. If any criminal activities are detected by the drone then it is directly reported to the end device. In this model we used the satellite communication for the controlling drone and information transmission, Internet of things and machine learning & computer Vision model for crime detection.

Keywords: Drone, Satellite, Activity, Criminal, Internet of Things

1. Introduction

In last decades, growth of crime has been impressive. A smart RTC Drones are special type of drones which works on the basis of previously set location that is being set by following certain steps as mentioned in the paper. These drones revolve around in a particular area as fixed before and collect any type of information and happenings as needed by the user and as programmed before and send the whole information to the Ground Control Centre from where the authorities extract the information and take required action. Since these drones work with the help of satellites so it can be used anywhere without depending on the location of the Ground Control Station. These drones are useful for authorities like defense, police, security agencies. In this model we identify the fire, vehicle and their speed, live gun detection, accident by vehicle and crowd. Multitasking microcontroller (raspberry pi 4) is used as a processing device and camera module use for the capturing video. Round per clock drones flying around per given time in fix area using google map. RTC drones is designed for Indian people activity according to their life style.[1] author implanted a model for crime detection and identification using data mining techniques and he presented 35 predefine crime attribute he used KNN classification and k-means clustering Algorithms.[4] author presented a model in for crowd identification using computer vision he found motion based human analysis. By using the all classification model like crowd identification,36 crime model database, plate number identification, live gun identification and vehicle identification done this model. Computer vision can be detected fire, violence [12] computer vision can detect events, crowd using object level detection. In daily life we are facing lots of problem with human crime and accidents. We will use computer vision and machine learning algorithms and then we implement every model computer vision will detect live crimes and accident.

2. Related Work

Lots of solution have been proposed in last few years [1] Author Devendra Kumar Tayal in 2013 presented a method for crime detection and crime identification using data mining techniques for Indian people using 5038 crime instance data set and CDCI data set and used KNN Algorithm [2]. In 2005, a model for fire and flame detection using computer vision was presented [3]. Larry S. Davis presented in 2011 a model for video surveillance system using detect shadow as a foreground region [4]. Julio Cezar Silveira Jacques Junior presented in 2010 a model for crowd analysis using computer vision techniques by using extract real data information using computer vision [5]. Author presented in 2013 a model for gait verification system using footage from surveillance camera using decision support system in computer vision [6]. Rajalingappaa Shanmugamani presented in 2014 a mode for classification and detecting for surface defect of gun by using computer vision [7]. Jianping Wu, Zhaobin Liu presented in 2014 a method for vehicle speed detection using video camera by using geometric optics [8]. Justin Lai presented a method for real time gun detection method using CNN Algorithm and computer vision, tensor flow implementation [9]. Guoru Ding presented in 2019 a method for Amateur Drone Surveillance System Based on the Cognitive Internet of Things using [10]. G.Maria presented in 2014 a model for car and transport detection system using drone using image [12]. Julio Cezar Silveira Jacques Junior, Soraia Raupp Musse, and Cláudio Rosito Jungthey have presented an model for crowed analysis, event detection and

violence detection using computer vision and computer graphics.Rohit kumar [13] publish a paper for live gun detection he proposed color based segmentations for live gun detection in surveillance camera. Mohammad Nakib [14] presented a model for knife detection using CNN Algorithms. A model was also proposed for fire detection in color video that modelcan be detect flame from video database [15].

3. Literature Study

Components for drone

Drones are the unpiloted aircraft or spacecraft in aviation areas in drones there are many components are used in this section we discuss the all components of the drones and process of assembling drone. In this Model we are use Quad-Copter which having four arms for flying. In drones used some mechanical component and electronic component we have to use these all component. The component is following-treatment-

PCV Frame and HIGH Landing Gear- It is a four-motor arms body which is used for flying and fit the all component in it. In this also included the landing gear arms.it is the base of the drone for flying. In this also including the PCV (Printed circuit board). In this mode we have to use low weight frame because we have to mention lots of devices. If frame weight is too high there is problem in flying. It is a S500 Model Frame which I used in this model the frame weight is 405gm, Wheelbase is 500mm, size of the arm 220x40mm and length of the landing Gear is 200mm

Fig 1: PCV frame HIGH Landing Gear

Flight Controller Board-Flight Controller boards are used for the controlling the all fans speeds, give the direction to fan rotation, information receives and transmission to the end user device and also keep the battery information. It's also known as drone microcontroller which is used for control the hole drone and connect to all motor and camera module. In this model We used KK2.1.5 Multi-rotor flight controller board which have 6050 MPU and Atmel 644PA microcontroller chip.it is fully automatic controller it takes input voltage 4.8-6.0 Volts DC (Direct current). In this have 6 AVR Interface pin which is used for to connect all the motor and other communication divice.it have 5 channels for receive the information. Flight controller board are electronics devices which made by the some active and passive electronic component.it is Advance model of flight controller which have some function for automatic calibration of the drone.

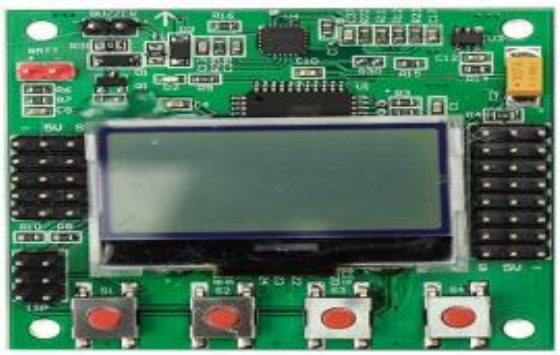

Fig 2: Flight Controller Board

Electronic Speed Controller- It is a electronic device which is used for the control the motors speeds which is provided by the main flight controller.it takes instruction by the controller and send to the motor to control the

speed of the motor.in this model we used Emax BLHeli Series.it burst current 40A up to ten seconds, voltage of input takes 16 voltage and it maintain the constant current 30A.

Fig 3: Electronic Speed Controller

Lithium polymer battery-Battery the power source of the drone.it gives the 6 voltage to the drone for flying drones consume the more power for flying and gives to power to all the devices 10 which is connected to the drones. We used 2200 mAH lithium polymer battery in this type of battery have the good tempters control. It produces the high voltage energy which is best for the drone charging and discharging are very fast timing in polymer battery.

Fig 4: Lithium polymer Drone Battery

Brushless Motor- Brushless motor are the motors which are used in drones. It has enormous influence on the aircraft drone flight characteristics of the multi croft drones. In this model we used the A2212 10T 13T model motor the capacity of the motor is 16A/60s and it takes maximum current is 6-12 A. In Brushless motor have very fast rotation speeds and it is best for drone flying because if motor is fast the drone will be flying very smooth and fast. We used four motor in this model.

Fig 5: Brushless Motor for drone

Propellers-Propellers are the plastics fans which is used for the flying drones in this model we have to use the four propellers. Propellers length should be 10 inches, pitch is 4.5 inches, shaft diameter 6mm and weight less than 15 gram. In drone used two type of propellers 2 fan are clockwise rotation and 2 fans rotate anticlockwise that why needed two different types of propellers. We used 4 propellers in this model.

Fig 6: Propellers for drone

Drone Compass- Drone compass is also known as magnetometer.it sense the direction of the drone. Drone compass tells the cardinal direction to the drones. Compass gives the direction of drone movement.

Raspberry Pi-Raspberry pi is the microprocessor based electronic device which is used for the multitask at a time we can use camera module, mice and it has 40 General input output pins for connect different-different digital and analog sensors .It has A 1.5 GHz quad-core processor,2GB LPDR4 SDRAM, full speed ethernet ,WIFI, and also have two USB 2.0 and 3.0 . In this model we use Raspberry pi 4 for Detect the criminal Activity by using camera module. It has 2 GB RAM (Random Access Memory) and support 100GB external Memory for storage operating system and system data. It is working with operating system and support various operating system Linux, windows, Raspbian Operating System. In this model we use Raspbian operating system. Raspbian operation system supports the various application system like browser, application program and also support python programming language. We used python programming language for implementing crime identification and detection system.

Fig 7: Raspberry pi 4

Camera Module- Camera modules are electronic devices which are used for capture images and recording videos.it has a flex cable which is fixed in CIS interface port. By this camera we identify the criminal activity using Computer vision and machine learning.in this model we use 13.2- megapixel sonny camera. We use the Hight quality camera in model because drones are Hight flying is more that why for proper identification of video we used Hight quality camera. It's zooming quality good.

Fig 8: camera module

4. Methodology

Crime Detection Model

In this section we have done the all crimes detection using the camera module and raspberry pi. Camera module is connected to the raspberry pi 4 using serial communication port which is alible in raspberry pi 4 and Apply some machine learning Algorithms and open cv of computer vision. We use python programming and their library for implementation.

Video Streaming- Video Streaming is done by the camera module it takes the video of the location continue in frame then after apply the CV2 and machine learning algorithms and detect the criminal activity.

Frame Separator-Frame Separator is used for the extract frame by using the video. It is done by some following steps- • Fetch all the video frames using globs • Read all the video frames using cv2.imread() • Store all the frames into a list • Create a Video Writer object using cv2.VideoWriter(). • Save the images to video frames using cv2.VideoWriter(). write () • Release the all cache of Video Writer and destroy all windows.

Feature extraction- it is the process of extracting feature from a frame in a streaming video. Video is taken by the raspberry pi camera module which we used in this model. Extract the past and feature frame independently. Feature is anything like gun, bike number plates, criminal activity etc. That why it refers to the detecting the object, motion and shape in a video.

Algorithms-In this model we use the unsupervised machine learning Algorithms to classifying the which types of crimes id detected.it is done by the k-means clustering algorithms. Value of the k is depending on the how many types of criminal activity you have to detected. In this model we use number plate detection data set, gun sample data set, human face detection data set, Animal data set etc. Then after fit the all data set in training model to classifying the criminal activity types.[1] by use WEKA and KNN classifier and k-means clustering and CDCI data set classify the different types of crime. We use CDCI database in this model for classifying the types of crime and apply on the drone camera. When drone will detect the any crime Sean by this way automatically classifying which types of crime is happing there.[6] surface defect by gun identification is done by Support vector machine Algorithm and 1000 sample dataset select 200 samples per class according to different defects. Showing the sample data in figure number 9. [7] vehicles speed detection is done by the computer vision showing the figure number 9. fire detection from color video used and for gun detection using CNN algorithm. We combine all of these in a model and used for different object/crime detection. First, we prepared all crime detection model and apply in raspberry pi device.

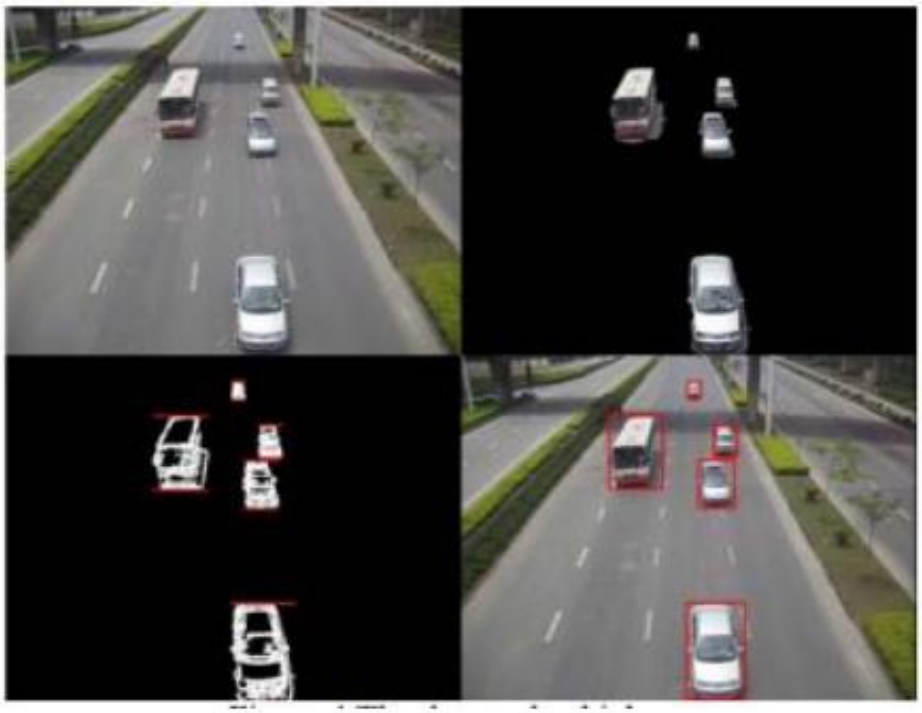

Fig9: Vehicles speed detection

Send activity information- when any activity is found that acuity name sends to the ground control station by using the satellite communication and GSM module.

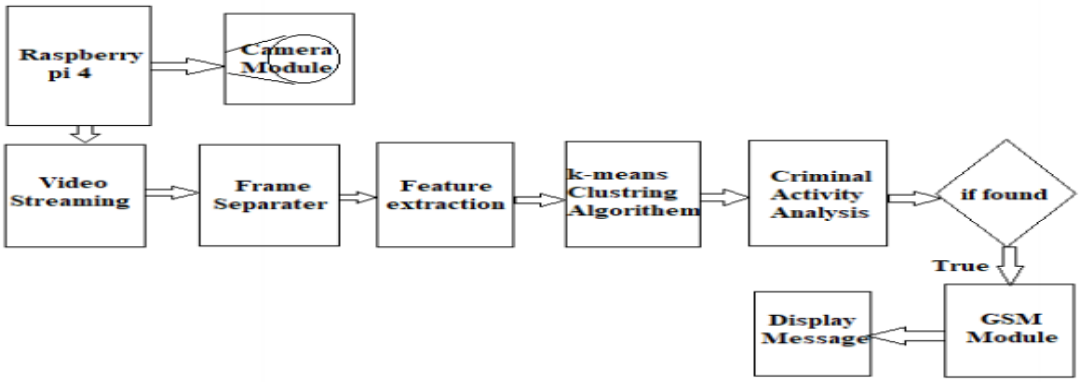

Fig 10: Block Diagram of Crime Detection

Round per clock drone rotation

Round per clock rotate the drone using the google map API which is draw for the any particular areas. Areas is mapped by the google map. Drone is rotate inside the area decided by using GPS module. GPS module pass the location of the area to the drone and drone is flying according to the map. Timing of the round is fixed in the raspberry module when raspberry pi model gives to signal for flying. Starting position of the drone is identify by the GPS Module and after complete the one round rotation drone land Automatically the same position.

GPS Module- GPS module is used for navigation of the location. It is an electronic device which is made by nano technology. We used ready to sky GPS which have 72 receivers channels.it is a low cost and effective dive for the navigation the path of the drone.it give 1.4-1.6-meter accuracy and GPS antenna is protect to the GPS prevention.

Communication model

Communication is very important for any IOT (Internet of things)in this model we use the satellite communication system .Satellite communication gives the signal around the hole earth allowing communication between electronics devices .satellite communication device are connected to the drone and through the drone connected all the electronic device to the satellite drone is connected by the BLOS(Beyond Line-Of-Sigh) line to the satellite and we have a ground Control System Station which is used for the receive the all information of the drone ground control system is also connected to the satellite by BLOS((Beyond Line-Of-Sigh) link by this way drones and ground control Station are communicated to each other. Mini control Computer or multi-tasking microcontroller are used for the give's direction to the drones. Compass, GPS and camera is the drone flying Components.

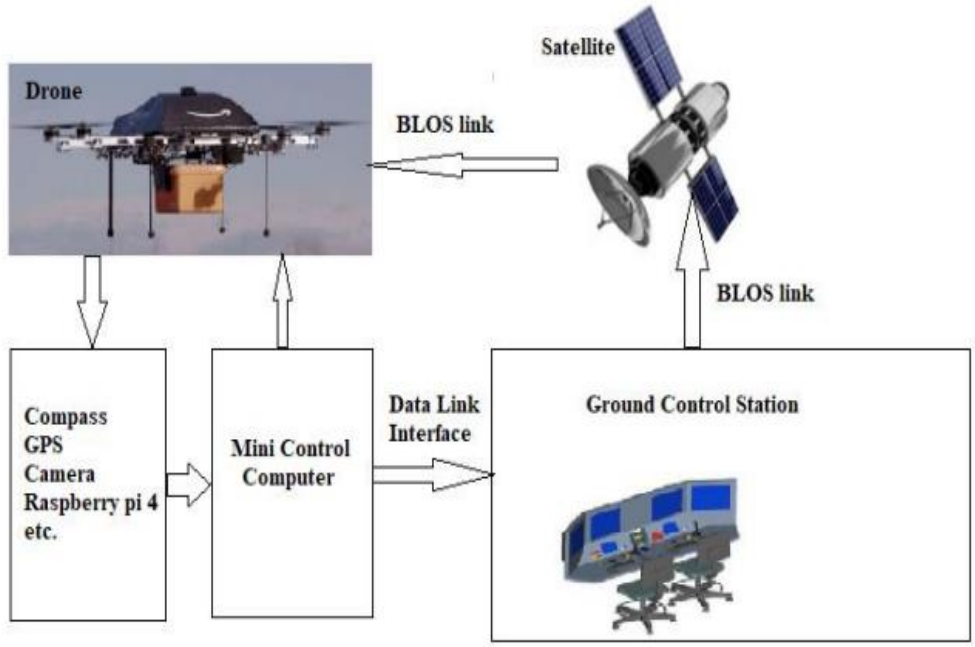

Fig 12: Block Diagram of Satellite Communication System

Drone Implementation

we have to connect the all component properly one by one first all the motors should be connected properly in the frame after that connect the electronic speed controller to the all motor electronic speed controllers are used for the control the motors according to the drone controllers electronics speed controllers takes the information from the drone controllers and give that information to the motors then we have to insure that two motors are clockwise and another two motors are fix anti-clockwise then after connect all the electronic speed controller to the flight controller board and ensure that all pins are connect properly and then after connect the GPS module to the flight controller board and then connect battery to the main board. It's all the basic connectivity of the drone after done by the all process, we have to drone calibration. Calibration is the process of ensuring all the devices which is connected to the drone are properly working or not. Drone calibration are the process of setting or correcting error which is occurred by the incorrect measurement of the sensors.by this process we check the all sensors are working properly or not.

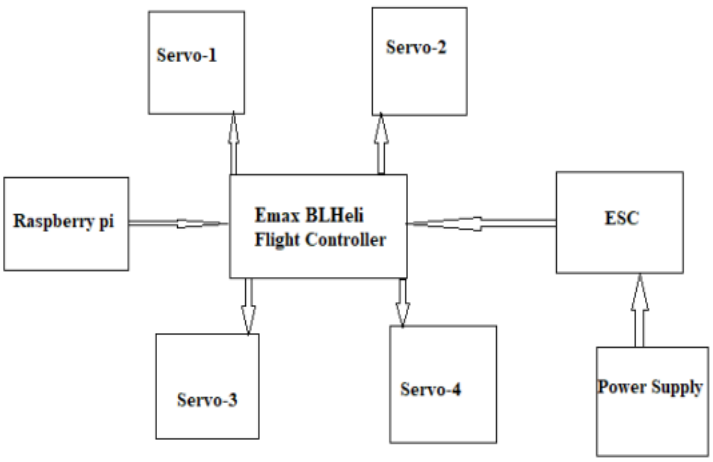

Fig 11: Block Diagram of drone

Create drone flight map plans

Google map is used to select the area for which we want to flying. We draw the area manually and generate the API (Application program interface) key of google map that particular area and set in GPS of the drone.by this drone is flying only selected areas only inside the boundary of the map. This feature is provided by google map for the mapping specific areas and access the all position of the areas by the drone and drone device are not cross the boundary of the map flying only inside the map.

Steps for draw the Maps plans-

Step 1-Open www.google.com/map

Step 2-Open menu and click on 'Your places' .

Step 3-click on MAPS.

Step 4-Click on 'create map' .

Step 5-click on 'base map'.

Step 6- select map design template.

Step 7-click on 'add line or shape'

Step 8-search your area where you want to fly drone.

Step 9-Draw the specific area boundary.

Step 10-finally generate the API of the MAP.

With The help of Following Steps, we can decide the MAP for flying Drone Round per clock After done all the steps automatically generate the API (Application Programming Interface) key. API key used in the programming in the microcontroller. Using GPS microcontrollers tells to the flight controllers the drones are

flying a round of the given decided Map. Using Google MAP, we draw a boundary of a particular areas for drone flying map is showing in figure number 9. We draw map for hole Amity University drone is flying inside the Amity University which is decided the timing clock per round.

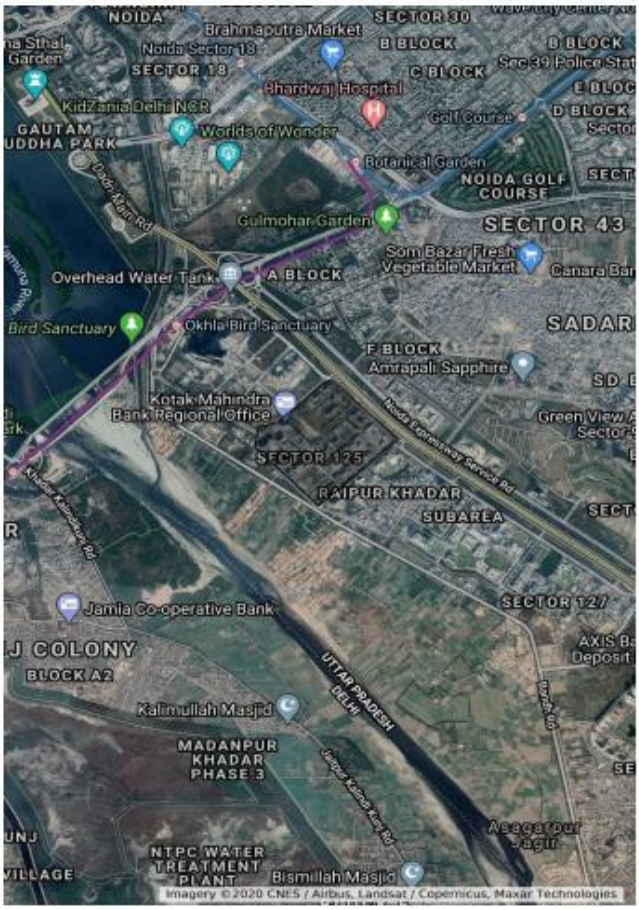

Fig 13: MAP Boundary

5. Conclusion

In this work, RTC drones thus helps us to detect any type of crime scenes by revolving around a particular area as fixed previously through the process as mentioned above. Thus, using these drones, it is easier for the authorities to detect any sort of crime scenes that might take place throughout the day, and thus helps the authorities to take quick and prompt action. These drones also help the authorities to estimate the damages caused due to the crime or due to the accident caused and thus take proper precaution so that the incident is not repeated further. Since these drone works and communicates with the help of satellites so these drones can be used at any time and at any place without depending on the location of the Ground Control Centre. These types of drones are very much useful for the armies, police, security agencies and help them to work more effectively.

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