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Anti-Drone System

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ABSTRACT- As the civilian drone market is flourishing with smarter, faster and more maneuverable drones, concern grow about their use in a way they are not meant to be used. They can be used to invade a people's privacy. They can also pose a serious threat to public safety and national security for example in airports. This project aims to counter those threats using an Anti-drone system or a counter-UAV which will be more affordable to civilians. The currently available systems are either too expensive or limited to the closed military market. There are many ways in which people are able to immobilize a UAV. The most effective way is to use highly focused energy like laser, microwaves or particle beams. Each has own advantages and disadvantages. This project is going to employ a laser/high power antenna paired with a fully integrated target seek and acquisition system in order to counter drone threats.

I. INTRODUCTION

A drone, is explicitly speaking, is a remotely controlled aerial vehicle. Drones are better known as unmanned aerial vehicles (UAVs) or unmanned aircraft systems (UASs) basically, a drone may be a hovering automaton that may be controlled from a distance or fly independently through the use of externally preplanned software with predefined aerial paths in their embedded systems, operating in synchronization with aboard sensory modules and GPS. Within the current timelines, UAVs were usually and frequently related to the military uses, wherever they were used ab initio for dealing against unauthorized aircrafts, gathering intelligence in uncharted territories and then, additional polemically, as platform for defense uses. Drones square measure currently conjointly employed in a good vary of civilian roles starting from rescue operations, police investigation, observation of situations like traffic and weather as well, unmanned Aerial Vehicles, or drones, that measure aircrafts that may be navigated while not an individual's pilot on board the aerial vehicle. Drones is navigated via management from the bottom, employing a GPS chase system. a number of these drones can measure equipped with cameras that permit the user to record and take footage mistreatment controlled navigation. Drones usually are used for the aim of recording, some at an additional skilled level, however, many that fly drones as a hobby. Drones have matured in quality in recent years, and new models are discharged late with newer and higher options. Some drones are equipped with a memory card that permits the user to record their footage and transfer it to their personal computer. Drones navigate via their channel management and transmitter; the upper the channel management, the higher the user will navigate the drone at the next speed. As the civilian drone market is flourishing with smaller, quicker and additional maneuverable drones, considerations grow concerning their use in an exceedingly approach they're not meant to be used. they will be accustomed invade people's privacy similarly as cause a significant threat to public safety and national security for instance, in airports. This project aims to counter those threats mistreatment Associated with anti-drone system or a counter-UAV system that square measure more cost-effective by civilians. The presently offered systems are either too high-ticket or restricted to the closed military market.

II. LITERATURE SURVEY

There have been a variety of recent studies showcasing uses of Anti-Drone system, detection by means of radar technology is taken into consideration as the most easier and convenient approach. The usage of the conventional detection using radar is not effective because of the low stage radar-move sections (RCS) of drones. Inverse synthetic aperture (ISAR) approach is used in an urban environment, a pulse radar machine is set up on the ground to detect drones. Establishment with

the aid of producing excessive resolution ISAR pics through experimental field take a look at in city area is also done. This paper present experimental check effects of recently executed ISAR experiments on maneuvering multi-rotor drones flying in lengthy distances. ISAR is generally used to gather excessive resolution radar pix for goal recognition purposes. They understand that the use of traditional radar gadget won't be beneficial or effective due to the low radar move-section of industrial drones and they study the concept and geometry of drones and strategies used to detect drones in all climate conditions. They apprehend the simple mechanism of the way an anti-drone gadget works and a device is to be implemented [1].

Drones have been dealt with an exponential growth and development due to how easily the technology the can be operated and ease of availability. Drones were broadly applied in lots of software scenarios, which probably deal with exceptional danger to the protection of people and their privacies. For dealing with these threats, we use anti drone systems in areas of deep importance and sensitivity and to protection towards intruding UAVs. The author gives a complete review of the defensive technologies used today along with all the drone technologies of today, they speak the challenges and open studies problems in such a system. They apprehend the fundamental mechanism of ways an anti-drone device works, surveillance technology used and how and anti-drone gadget is to be implemented. [2].

Drones technology while has enabled people with ese of access to do variety of stuff once considered difficult is a double edged sword as in the sense that it could be used for a variety of illegal activities. Defense against a drone is extremely hard due to fact that drones are small and easily controlled from a remote distance. They learn from this paper the concept of drone detection at night time and low visibility regions by way of thermal imaging structures, how airspace is monitored and how enhancement algorithm can be used for infrared scanner device can be used. [3].

III. COMPONENTS

3.1 IMAGE SENSOR

An image sensor is a device that captures sensitive desired details in a given frame by capturing information from required area to form an image. It does so by converting the variable attenuation of sunshine waves (as they undergo or reflect off objects) into signals, small bursts of current that convey the knowledge. The waves are often light or other electromagnetic wave. Image sensors are utilized in electronic imaging devices of both analog and digital types, which include digital cameras, camera modules, camera phones, optical mouse devices, medical imaging equipment, night-sight equipment like thermal imaging devices, radar, sonar, etc. As technology changes, electronic and digital imaging tends to exchange chemical and analog imaging. The two main sorts of bitmap sensors are the charge-coupled device (CCD) and therefore the active-pixel sensor (CMOS sensor). Both CCD and CMOS sensors are supported metal–oxide–semiconductor (MOS) technology, with CCDs supported MOS capacitors and CMOS sensors supported MOSFET (MOS field-effect transistor) amplifiers. Analog sensors for invisible radiation tend to involve vacuum tubes of varied kinds. Digital sensors include flat-panel detectors. The image sensor is the component which acquires raw visual information from its field of view and then passes it on to the SoC.

3.2 SYSTEM ON CHIP

The SoC is the brain of the system. A SoC is a system which is extremely small in scale which has the functional capabilities of a normal processor. The working is similar to that a personal computer but functionalities is defined to a set of predefined functions and features which can be used for a variety of activities and operations. The predefined operations can be used by people of little to basic knowledge of computational operations to experiment with workings. Operations like signal processing, wireless communication etc. The major use of such a system is for small scale projects requiring low power and less space. The major components are the i/o(input/output) ports, a central processing unit and input ports for analog and digital inputs and an internal memory unit along with external ports for increasing storage space. The SoC used in this prototype model will be a Raspberry Pi 4

3.3 LASER

A device which can emit high intensity beam is referred to as a laser. The output of laser is usually a concentrated point of beam with a short duration. A 450nm class 4 laser is used which can operate in a high output mode to destroy the target drone or a low output mode to warn/cripple the drone. Both the laser and the image sensor are mounted co-axially on the same servo motor with their central view axis facing the same direction. The system will be in seeking mode while inactive, it monitors the airspace to be monitored 24x7 in case a drone or an UAV enters the airspace the image sensors detect the drone by means of an image processing algorithm and goes into action

mode. A operator is however required to confirm the disabling of the rogue drone. After kill command is given, the drone can operate either in low power or high power mode In low power mode the laser will damage the camera or surveillance equipment of drones and in high power mode it damage the drone entirely by damaging its vital components.

3.4 SERVOMOTOR

A servomotor is a device which is used to move about an axis about any axial plane in order to bring about a required motion at a given pace or to move a load at a required speed. A servomotor is used in order for to bring about axial or translational movement of certain objects at predefined angles. It uses servo mechanism. A servomotor rate at 5kg/cm should be able to move loads of 5kg if the load is place at 1cm away from the shaft of the motor.The laser is mounted on a precision servo motor. The servo motor is set by electrical pulse and is placed beside the motor. The presence of a drone is confirmed and the kill command is given, the SoC controls the servo motor and aligns the laser towards the target drone.

IV. METHODOLGY

The basic components used are an image sensor, a system on chip in which we use a raspberry pi 4, there are 2 servomotors and a laser to immobilize the drone which enters the unauthorized airspace. For input we have a keyboard which authorizes the command input to kill the drone. Basic working of the system involves an imaging system which is an 8-megapixel camera for the raspberry pi 4 module. It is a noir camera which is useful for low light environment. The detected object is analyzed by using a pre build library in the raspberry pi 4 module which has tensor flow lite software. An object detection model is used for detecting various kinds and shapes of drones and alerts the system. After the objection detection software detects a 90 percentage match, the system is alerted. Once the system is alerted the SoC will operate the two servomotors, one of which operates in a horizontal way and one which operates in a vertical way. So the laser mounted on the servomotor gets or points towards the current position of the drone. The camera is coaxially mounted with the cable. After we give the kill command the laser shoots down the drone and immobilizes it.

V. CONCLUSION

An Anti-drone system is implemented which can counteract the misuse of aerial space by local handlers of drone or that by skilled users wanting to penetrate the system. As drone technology progresses as rapid as it does the threats it possesses to a person or neighborhoods privacy increases rapidly or exponentially. The one if the major problem in any fields is that with increase in technology our rights to privacy are threatened on a far greater scale every day, a feeling which is well known in this age. Therefore, it is of greater importance that Anti-drone systems are to be implemented in every neighborhood where a threat of breach of privacy may exist.

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