

Drone Embedded RFID and EPS Sensor based Military Surveillance

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ABSTRACT: In the present era, military security has become a prime concern. The existing technologies available for military safety are no less prone to attacks by outsiders. So, in this paper we come up with such a system which incorporates the use of RFID(Radio Frequency Identification) and Bio-sensors. The RFID system comprises of 2 components namely RFID reader and RFID(Radio Frequency Identification)tag. This system is used to check the presence of the military person in the authorized region. We use a bio sensor namely Electric Potential Sensor(EPS) to check whether a person is alive or not. The sensor checks the heart beat rate of the person and sends the data to the drone.

KEYWORDS: Biosensor, Drone; Military, RFID, Safety, Security

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1. INTRODUCTION

Military security refers to the ability of a state to defend and/or prevent unauthorized military aggression to ensure effective and complete protection [1]. In the war-field, the soldiers face many challenges that include the possibility of entering a dangerous combat situation. The field situations can change unpredictable consequences, sequels. Moreover, now a days, the battle areas include inside the towns and cities, so soldiers must consider the safety of civilians [2]. The soldiers need accurate inputs to handle the combat situations safely. To address such unwanted situations several military gadgets are available to improve the safety of the battle conditions. An unmanned ground controlled aerial vehicle, known as a drone, can serve the purpose very faithfully giving very accurate inputs about the battle situations.

Drone being a smart vehicle has pulled the attention of the technical generation due to its boundless applications in multiple fields. It has the potential to be expanded to security and surveillance as well. Drone can enter through insufficient and confined areas.

The use of drones, or UAVs (unmanned aerial vehicles) has increased rapidly over recent years, both for military and civilian purposes [3]. Therefore, the researchers initiated to develop drone based military safety devices using various mechanisms. Priyanga *et al.* (2014) has proposed that Drones can be used in military security using video analysis and Raspberry Pi.[4]. However, the system uses video analysis that requires the use of very costly and fragile camera. Even implementation of Raspberry Pi is not cost effective enough for this purpose. Berrahal *et al.* (2016), proposed a set of unmanned aircraft vehicles (UAVs) in the form of quadcopters that interact with

the Wireless Sensor Network (WSN) to monitor the border trespassers [5]. Lin *et al.* (2018) have proposed the use of Internet of Drones surveillance system that can be used in various applications including military security [6].

The increasing use of IoD will also result in more data (e.g., drones' geographical address or personally identifiable and sensitive data) being generated. Such data collectively can be used to profile any individual, and can be used in planning a physical attack on a building, installation, and hence losing the security of our army men. Lagkas *et al.* (2018) have proposed the implementation of security in military using image processing [7].

Most of the works on military security are based on face detection technology which is highly complex. Moreover, the system uses video analysis which requires the use of IR camera which is not cost effective. The system of image processing requires a complex software installation in the drone system. This involves a higher installation charge and hence it is one of the drawbacks.[8]

Besides, the excessive use of IoD (Internet of Drones) results in data (e.g., drones' geographical address or personally identifiable and sensitive data of our men stored in database) generation. Such data collectively can be used to track and follow our army, and can be used in planning a physical attack on a building, installation, and so on by our opponent.

Thus there is a greater possibility that our military database get easily hacked by our opponent army. This is because of the fact that all the Normalization processes are done on cloud platform [9]. This article proposes a RFID and bio-sensor based surveillance technology adopted in Drone.

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2. MATERIALS USED

Drone(size-450mm , 980KV motors , 1045 props, 30A sec , Naza flight controller) RFID Reader and RFID Tags(MFRC-522, Operating Current :13-26mA / DC 3.3V, Operating Frequency: 13.56MHz, Module Size: 40mm × 60mm) ,Bio-Sensor (Electric Potential Sensor)

3. METHODOLOGY OF THE PROPOSED SYSTEM RFID READER

The drone will have an installed RFID reader in it which will send a signal throughout the area covered. It works on the basis of radio waves sent by it. A RFID reader serves 3 purposes which include:-

- i) Induction of enough power into the RFID tag
- ii) Synchronisation clock to tag
- iii) Act as a carrier for return data from tag

3.1 Signal transmission

It continuously sends radio waves and works under Ultra High Frequency (UHF) range(10-15m).

3.2 RFID TAG and Feedback systems

The tag within the range of the RFID reader will receive the radio waves emitting from the RFID

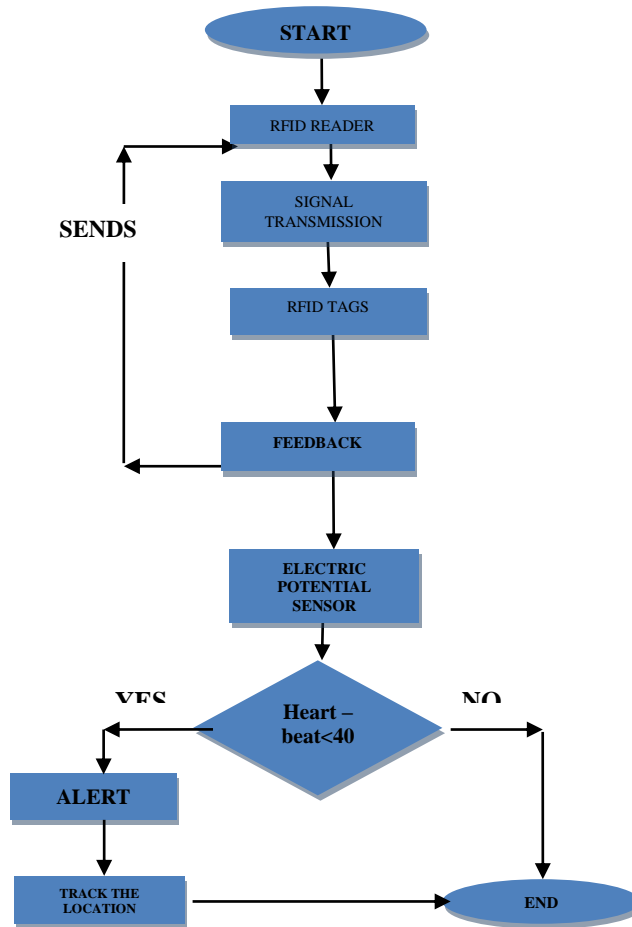
reader installed in drone.After receiving the signal,it provides feedback signal to the reader. Here we will use semi passive tags which have their own power supply. For transmitting the feedback signal it relies on the received signal ,thus it will transmit the feedback signal provided it receives signal from RFID.UHF RFID tags is based on electromagnetic coupling.

3.3 Electric Potential Sensor (EPS)

This sensor is capable of detecting heart beat rate from a higher range [10]. It's a seed sized device which uses an electrode to detect subtle variations in the bodie's electric field .The electric field change caused by variations in heart beat rate is capable enough to trigger the sensor(installed in drone ,several feet away).The sensor then can send data over an internet connection to a drone in order to detect the whether the military person is alive or not.

3.4 Condition checking and alert

If the heart beat rate of the military person is found to be less than 40beats/min then an alert is sent to the drone indicating thatthe army man is in critical condition and hence the GPS tracks it's location and then necessary steps taken.



1(a): Flow Chart

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1(b): Drone System

3.5 Advantages of the Proposed System:

- i) Cost effective and simple to install.
- ii) Also works at night, fog and bad weather condition.
- iii) Fewer possibilities to get hacked since it does not involve cloud data storage.
- iv) Intercepting RFID signal is quite difficult.
- v) High tracking accuracy.
- vi) User friendly, efficient, less complex.
- vii) Capable of detecting the location of a person in places where a camera may fail thus keeping in track the military men all the time
- viii) RFID does not involve any radiations harmful to human health and environment.

4. RESULTS AND DISCUSSION

For our proposed work we have used RC522 module and tags. The sensor has an operating frequency of 13.56 MHz and a supply voltage of 3.3V. The prototype which we have constructed has a sensing range of 3 cm. In this prescribed range the device is working perfectly and it is very much able to recognize the authorized as well as unauthorized entries. For practical and advance applications, higher range RFID modules can be used to recognize the authorized person.

5. CONCLUSION

The UAVs have ample capabilities which are just started to be discovered. The military purposes, haven't been explored to the maximum yet. Civilian uses of the unmanned aerial vehicles are getting updated day by day just from toys up to research levels. There is no doubt that recent reseaches have contributed much that have increased the military value of UAVs. But most of the UAV systems used for military purposes have some flaws. Thus, we come up with the new idea of using RFID and Bio-sensors. Using Bio-sensor we can remain conscious about the health condition of our military army men along with the GPS module to track their location when they need assistance or when died.

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