



## Paper Review on “A Multi-Target Collision Detection & Avoidance System with Flight Authenticity & Tracking”

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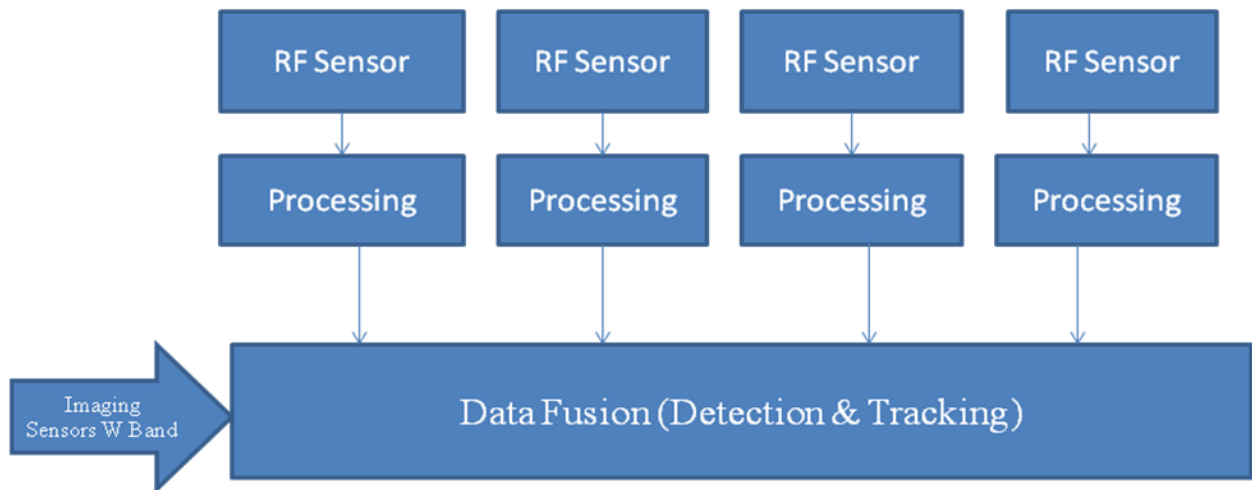
**Abstract** - This paper based on the study and analysis of a radar network for the surveillance of the airport terminal area. The active radar networks will be designed taking into account different constraints related to the system. By performing both tracking and check authenticity, the system is able to obtain a complete coverage on the restricted area and to improve the truthiness' of the system with respect to a radar node with number of airplanes. Most current systems use RADAR (Radio Detection and ranging). System that transmits radio waves and sense the waves which reflects for angle-of-arrival or time-of-arrival information. These radar systems may also offer information on speed, position & distance. Automatic Dependent Surveillance-Broadcast is an Air Traffic Management and Control Surveillance systems that is in to replace traditional radar based systems and is to expected become an essential part of the Next Generation Air Transportation System. Proximity sensing technology identifies the collision on runway. Collision on runway is an human error. Proximity sensing technology reports it to ATCA (Air Traffic Control Area). ATCA detects the collision and avoid it. Automatically collision detection and avoidance is an advance area of this research paper.

**Keywords**— Radar system, Target localization, Tracking of flights, Authenticity, Proximity Sensor, Automatic Dependent Surveillance Broadcast, and wireless security.

### I. INTRODUCTION

Every mechanism, which is having moving parts, needs some safety measure. This paper will be focused on the study and the analysis of radar network for the surveillance of the Airport terminal area. The proposed system will be designed the main concepts of a modern surveillance system that requires accuracy, separation and combination and capability of the network. The system will be made up of several active radar nodes with the aim to obtain a complete coverage of the restricted zone and to improve the accuracy with respect to radar nodes. The tracking will be performed for the identification of dangerous materials exploiting the information from Wide band imaging radar (Figure 1). This paper will present a possible architecture of this system. A general overview of the signal processing chain will be given. Then a preliminary solution for tracking and track fusion will be presented and the results will be analyzed in different simulated scenario. The localization problem by Exploiting the Range and Doppler information will be taken into account.

A possible approach able to combine the different information coming from the Range and Doppler analysis will be presented. The different point of view in which the target can be seen by using the range and the Doppler information can be useful to solve the multi target localization problem where some drawbacks (first of all the ghost targets problem) can arise.



*Fig.-1 Active Radar System*

Radio-frequency sensors are the wireless use of electromagnetic fields to transfer the data, for the purpose of automatically identifying and tracking tags attached to objects. Data merger is the process of integrating of multiple data and knowledge representing the same real world objects into a consistent and useful representation. Active radar system works on imaging sensors Wide band for detection of Flights using number of sensors applying on it. Wideband is a transmission medium and channel that has a wider band-width than one voice channel. This term is usually contrasted with narrowband. Figure-1 shows the exact process of active radar system.

## II. DESIGN METHODOLOGY

We are using 1 Radar as we mentioned that, this is multiple collision detection & avoidance system. This is the block diagram for this system. The input for this radar is, number of flights for tracking and time for each flights to park at a particular place.

Radar is an object detection system which uses the radio waves to determine the ranges, angle, speed and velocity of object. It can be used to detect air-craft, shipping, space craft, vehicles, whether forecast, and terrain. Radar transmits the radio wave and micro-waves that can be reflected from any object in their track. A receive radar, which is generally the same system as that of transmitting radar, receives the waves and processes these reflected waves to determine properties of the object. The overall system architecture clears the views of related system. This radar will track the flights position and will check the authenticity of flights. Then information will hand over to ATCA. (Air traffic Control area) A localization technique that could be integrated in the tracking algorithm. For example, the presence of 1 radar and 3 targets produces the effect that each receiver will provide two measures, which could be either related to Target 1 or Target 2 since the right measures assignment is unknown.



Figure-2. Overall system architecture

For this reason, by considering all the possible combinations, false targets (ghosts) are impossible to distinguish from the true targets. Therefore we fixed range in graph. That range target comes then radar detected its ghosts target true or false. When it is ghost then we will avoid it. Ghost target means if the flight is not authorized to land at a particular stop, then we will avoid it. This radar will also trajectory the aero plane, means it will shows the accurate direction to flights whether to go and by which direction. We are using 3 aero-planes for this system at one airport and use of radar for tracking and check authenticity. This aero-plane will check the collision detection with the help of proximity sensor and also will check the collision avoidance without any damages material.

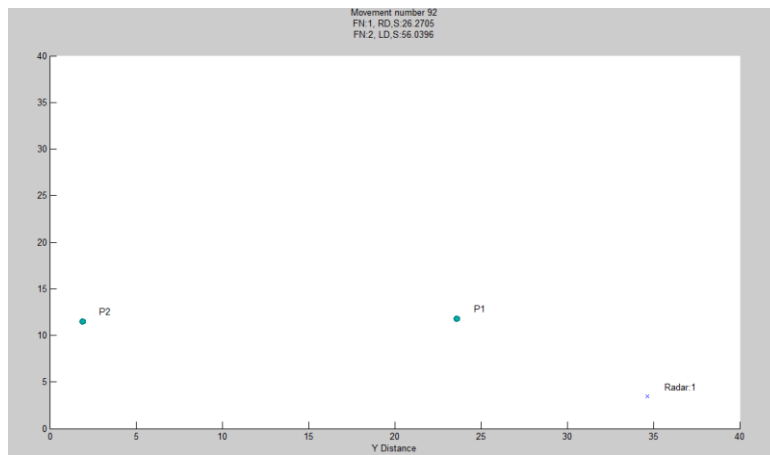
### III. SYSTEM COMPONENTS

#### A. Proximity Sensors

Proximity sensors are used to detect collision and to avoid it. A collision detection and avoidance system is an automatic self driven system which is used for the safety of airplanes. Such system is designed to reduce the surveillance of accidents. The major part of the system to track will be camera, sensor, and micro controller (at Mega 128). System is designed in such a manner so that it should be more dependable and effective for detecting not only the impendent crash but also low cost and power effective system. As soon as the detestation is there the system either warn or will take immediate action without drivers input. Also the processer based on ARM is being used for making Anti Collision Detection. Wireless networks are founded on the principles of collision detection and avoidance. This paper fixes an attempt to detect and abort collisions in proximity algorithm. This system is working for only small ranges of operation and collision is being detected and when collision being detected it might stop or slow as per program develop.

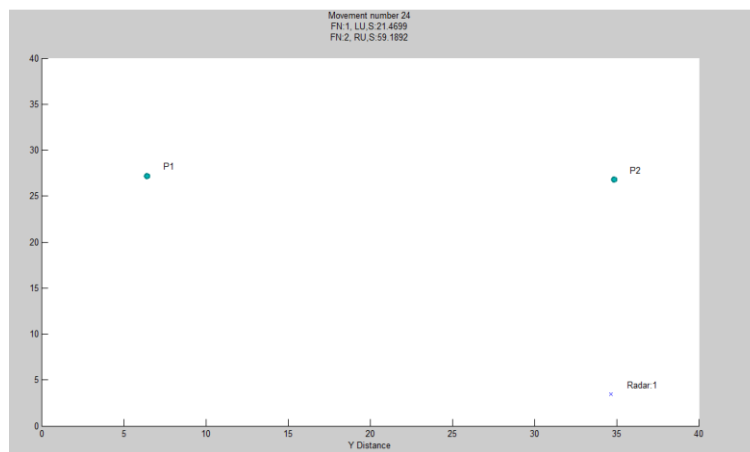
#### 3.1.1 System simulation for arrival and Departure

When aero plane arrive to airport that time it shown position in Mat lab LD (left down) and RD (right down). Its speed shows to screen. Speed depends on distance upon time. As shown in diagram P1 (target1) and P2 (target2). Target2 arrival in LD (left down ) side position and Target1 arrival in RD (right down) side position.



*Fig. 3 arrival targets from airport*

When an aero plane departs from airport at that time it shows position in Mat lab LU (left up) and RD (right down). Its speed shows on screen. Speed depends on distance upon time. As shown in diagram P1 (target1) and P2 (target2). target1 departure in LU (left up ) side position and target2 departure in RU (right up) side position.



*Figure-4-Departure targets from airport*

### 3.1.2 System simulation for tracking of airport

Airport is considered in 5 km of radius. In this Airport two runways are available. Targets are landing in airport then traveling towards runway from landing point to parking place. ATCA (Air Traffic Control Area) tracks the target from landing place to parking place. Speed and position detected in fig5. P1(target1) is landing first and park into North East side then P2(target) is landing and park into North West side of the Airport as shown in fig.5.This process is continuous for Tracking of the planes. Landing place and Parking place of these planes are fixed by ATCA department. Radar shows only those planes which have tracked in Airport.

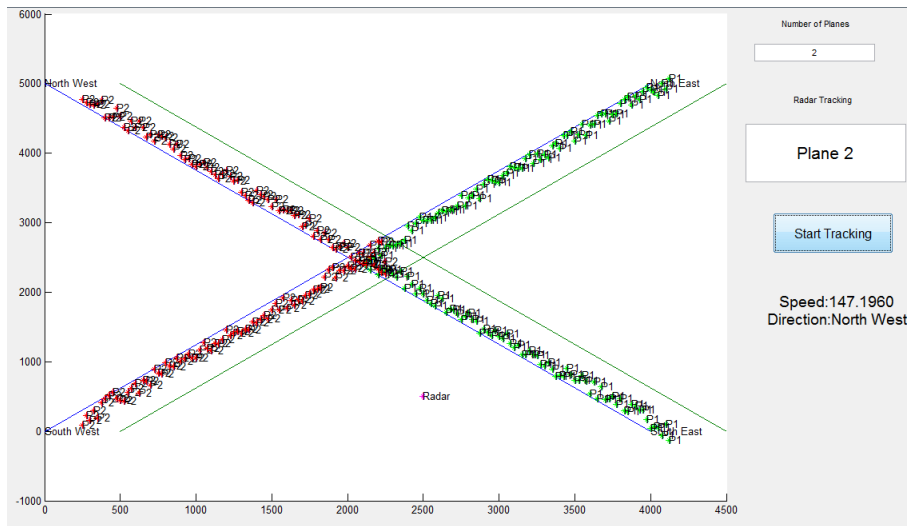


Figure-5-Tracking of target

### 3.2 Radar

The word "radar" stands for radio detection and ranging. Radar used for detection of aircraft. It rotates steady, sweeping the air space with a narrow beam. A radar system usually operates in the ultra-high-frequency or microwave part of the radio frequency spectrum, and is used to detect the position and the movement of the objects. Suppose an airplane is flying at night through cloud. The pilots can't see where they're going, so for that sake system uses the radar to help it. An airplane's radar is like a torch that uses radio waves instead of light. The plane channelize an intermittent radar beam (so it sends a signal only part of the time) and, for the rest of the time, "listens" out for any of reflections of that broadcast from nearby objects. If reflections are detected, the plane knows something is which is nearby and it can use the time taken for the reflections to arrive to figure out how far away it is. In other language, radar is flake like the echo sounding system that "blind" bats use to see and fly in the dark. Light and radio waves are part of the magnetic spectrum, it means they are made up of fluctuating patterns of electrical and magnetic energy zapping through the air. The waves of magnets which produce are actually microwaves, similar to the ones generated by a microwave oven.

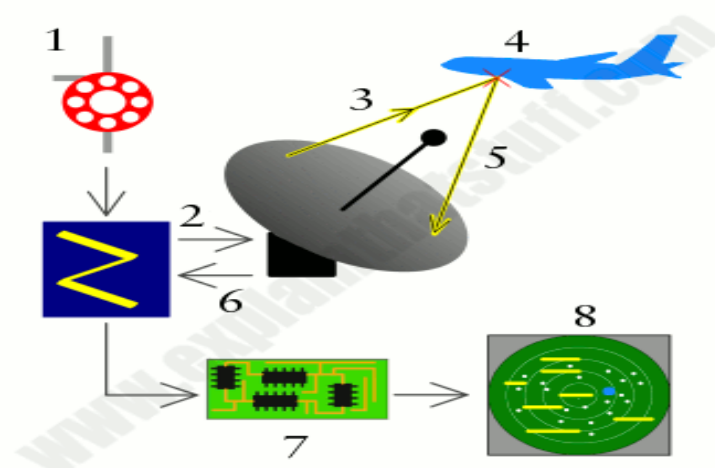


Fig.6 Summary of Radar works

Here is a Summary of how radar works:

1. Magnetic electrons generates high-frequency radio waves.
2. Duplex switches the magnetic electron through the antennas.
3. Antenna acts as a transmitter and it sends narrow beam of radio- waves through the air.
4. Radio wave hit enemies airplane and reflect back.
5. Antenna picks up reflected waves during a break between transmission. Note that the same antenna acts as both transmitter and receiver, alternately sending out radio waves and receiving it.
6. Duplexer switches antenna through to the receiver unit.
7. Computer in receiver unit processes reflected wave and draws them on a TV screen.
8. Enemy plane shows up on TV radar display with any other nearby targets.

#### **IV. ADVANTAGES AND DRAWBACKS**

The aero plane with automatic collision detection system will increase the reliability and it increases capacity to roads and higher speed limit. This will also help in reduction the physical road signage. This aero plane can operate themselves in the environment like where impossible to go for human and operate it automatically. The aero plane can detect collision and slow speed to avoid it.

The main disadvantage of this system is that, we can't totally reliable on systems response. Information given by the sensor can mislead the person if the orientation of the sensors and cameras are changed from a particular position. The collision detection and avoidance system is also get established by the environmental conditions like by dust, cloud, bad whether etc. The Algorithm Designed will be more complicated because different tasks are being given to single processer when there are multiple tasks in a self directed aero plane. Tasks are chosen to be done according to the precedence and stiffness. Response of the system should be in fraction of second otherwise impendent crash can happen.

#### **V.FUTURE WORK**

Future work foreseen new activities able to optimize the sensor parameters and configuration. In particular, a detailed analysis on multi target Range Doppler localization will be performed on new scenarios, by applying the study presented in the previous sections. Possible commercial solution to set up the radar network is under investigation.

There are endless scopes of this research. This idea is easily adaptable with latest technology. We can unite unlike technology for making one of the best automatic collision devices. These devices can use in aero space, military, vehicles, hospitals, traffic signals application etc.

#### **VI. CONCLUSION**

The system is able to obtain a complete coverage of the surveillance area and to amend the accuracy with respect to a single radar node. Then the localization problem was taken into account by propose a possible solution. The implanted system for collision detection can ensure the protection and operation of the independent robots in the condition where zero human interaction. If we see this technology with its future there are endless development and scope to the respected technology we can merge with it. Everything will become automatic and also sending status information to owner about collision detection and avoidance.

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