Air Traffic Control Automated System

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Abstract **- Air Traffic Controlling is the most tedious and difficult task in an Airport. Several Life depends upon it. Working of Air Traffic Control System should be error free and there is no chance for any problem or error. There are multiple runways on an airport and several flights are waiting for the Departure of Land, each requires different time and operation. It's not easy to handle such task manually. We are designing an automatic system to control the activity of Runways. It will manage and control routine flights as well as emergency flights. Our aim is to create the system which decrease the waiting time of the flight and should have proper distance between each flights to avoid collision of accident.**

Index Terms **- Air Traffic, Traffic Control, Flight Management.**

INTRODUCTION

Between 1950-2016, air passengers and air traffic grew systematically faster than any other transport system. Its growth depends upon the population, safe flights, and advanced airports. All are key factors for this growing Industry.

During the 1960 to 2016 Air transportation grows in the 10%-40% range. Airports are now increasingly congested and airline companies are looking for fast and better jet planes with higher capacities and security features.

But airports are not updating their facilities; there growth is just 10-15%. There are not sufficient airports to handle such large traffic of airplanes.

Existing airports are heavily loaded and there traffic increased approximately 50-200% in the last 50 years. New York International airport is handling approximately 60 million passengers in a year having more than 90 airlines operating from the airport. It has four runways.

Dubai Airport is the 5th busiest airport in the World. In 2017 it handled 88 million passengers and approximately 4.1 Lakh aircraft movements. It has 3 terminals. This data shows the current situation of the Airports and their traffic. Approximately 5-15 planes are using single runway. This type of traffic requires Intelligent Management System.

This project will be developed for 4 runaways and it's a prototype model which can be used with any Airport Management System.

As discussed above, the task of Air Traffic Control is very crucial and important. It is the backbone of any Airport But and there are chance of several errors. But on an Airport, we can't take risk of 0.0001%, because it is related to the life of Passengers.

Therefore, we are trying to design a perfect and fast algorithm to manage the task of Air Traffic Control [1][2]. Our system automatically allots the runways to the flights and also have provision for Emergency flights with 0% error.

The objective of the project is to develop Simple, Fast and 100% accurate, error free Air Traffic Control System. We will use Java Language to develop this application. Java is secured and Object Oriented and can run on any platform, therefore it is best language to develop such type of applications.

LITERATURE SURVEY

There are lots of work on this topic, and some work done by the professional companies are still hidden, they don't want to disclose their methods and algorithms.

The responsibility to map the flights in real time is given to the air traffic control. It gives cautioning to the pilot from prospective threats which could lead up to impacts or deviations from their schedule ways. Ground control is vital as all the development purposes of the airplane which incorporates all runways, inert runways, holding zones is vital to control upon.

At the point when the signs from the Air Traffic Control (ATC) are lost, because of specialized issues, the pilot faces a great deal of issues. With no guide from the ATC (Air Traffic Control), the pilot has no clue about the approaching air traffic, leeway of air

terminal runways, and so on if in that circumstance the climate turns out to be unpleasant and the pilot needs to set up the air make for a crisis arrival, at that point it turns into an extremely tumultuous and panicky occupation for him to perform. With no feeling of where he is or which is the closest air terminal to land securely, the lives noticeable all around make come into risk.

Terminal control assists with giving a wide range of administrations which are being given by ATC to convey upon inside airspace. Traffic stream is comprehensively separated into takeoffs, appearances, and over flights. The ATC should guarantee that the terminal control gives precise and exact duty with respect to the data about the suitable elevation and setting down of the airplane.

Perhaps the main obligations of in transit is to carry out the responsibility of Air traffic light which is being concurred to numerous little air terminals which range from the freedom at the ground level till the objective being reached. This in transit air traffic regulator is ordinarily alluded as "Center". They help the pilot by giving data and guidance to climb to the attributed elevation while staying away from different airplanes invalidating any danger of impacting. It viably and productively looks toward the security of the airplane when it is being landed. The second the aircraft reaches to the destination it is handed over to the next significant authority center. This act must be done in a consistent way which includes transfer of move of ID between the regulators.

Once in a while when the climate conditions weaken the ATC (Air Traffic Control) demands the pilot to do a crisis arrival in the closest air terminal and get the travelers of that trip to wellbeing. In any case, if the sign is lost and it is highly unlikely the flight can be informed about the circumstance of the closest accessible air terminal, at that point the flight endures choppiness.

WORKING OF ATC

ATC is responsible for the Proper Takeoff and Landing of the Plane, Fig. 1 shows the typical working of a flight where start and end point is controlled by the ATC.

Its shows the Importance of ATC in airline traffic system. Airport regulation is a ground-based assistance provided in the customarily tall air control towers. Individuals, known as regulators, who work in these pinnacles are indispensable for securely coordinating and exploring planes through the nearby airspace, to land and during take-off.

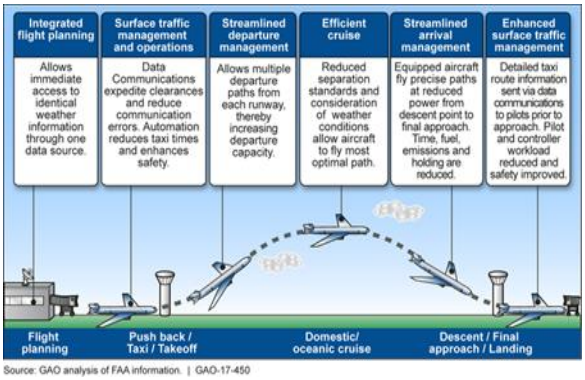


Fig. 1: Working of Air Traffic Control System

Air traffic regulators, or aviation authority officials, have a broad measure of instruction and experience that empower them to order the skies with certainty. An air traffic regulator applies detachment decides to the airplane that they direct. Division rules are utilized to control the distance among planes and airplane by requiring a base distance between them. This is to build wellbeing and decrease superfluous danger for pilots and travelers.

In the ATC calling, regulators should have the ability to settle on split-second choices that will influence many lives. Air traffic regulators have quite possibly the most intellectually requesting occupations on the planet to forestall airborne accidents. This is cultivated by unmatched degrees of correspondence, brisk numerical computations, spacial mindfulness and the capacity to keep the progression of air traffic moving easily.

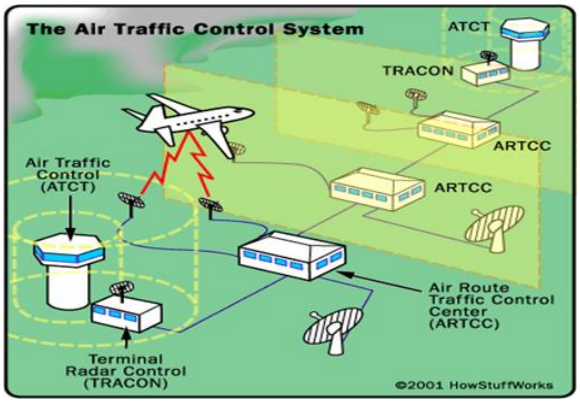


Fig 2: Air Traffic Control System

Structure/Algorithms of the Program:

Assumptions:

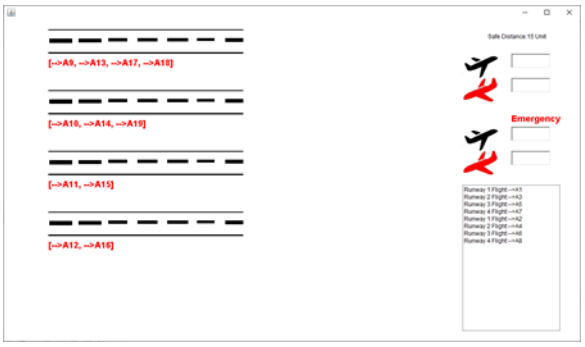
N=number of Runways

T= Time required to take off or to land the Aero plane
Each runway can be use to takeoff or for landing of airplane
We will create queue on each runway, which will give slot on “First Come First Serve” basis [3], but in emergency we will give priority to the emergency landing or emergency takeoff of the plane.
ATC Person enters the details of the Flight Number of incoming and outgoing flights and system automatically gives slots to the flights.
System also has provision for emergency flights.

Initially:
Create N Empty queues
Process to entry and Exit:
While (true)
Start loop
If flight is normal
Enter flight details and select the queue having minimum flights pending and add the flight in the last of the queue
If flight is emergency
Enter flight details and select the queue having minimum flights pending and add the flight in the front of the queue
End loop

Process to assign Slot:
Each second Check for all queues
If queue is not empty then
Check the last plane time if lapse time is >T
Remove the front plane from the queue and assign runway.
Time Complexity is both the algorithms are n/N, where n is the number of Air planes and N is the Total queue, this is θ(1).

INTERFACE OF THE MAIN SCREEN



ALGORITHM

Process SetInFrontOfQueue(Aeroplane)
check Name of the "Aeroplane" in existing queues and if plane is already there display error message
else
check the size of each queue and select the Q with least aeroplanes and add the plan in the front of the queue
end process

Process setInQueue(Aeroplane)
check Name of the "Aeroplane" in existing queues and if plane is already there display error message
else
check the size of each queue and select the Q with least aeroplanes and add the plan in the rear of the queue
end process

Process setInQueue(planename)
n=totalqueues
for i=1 to n
for each plane of Q[i]
if plane.name=planename
return true
end loop
end loop
return false
end process

Process AdjustQueue()
n=totalqueues
for i=1 to n
if Qi is Empty then
Check All Other Queues and select the queue with max pending aeroplane
shift the planes from that queue to Empty Queue
end if
end loop
end process

CONCLUSION

After running several test cases with different datasets our system is working properly. It allots all the slots properly and smoothly and also adjust the emergency flights in front of the queue. We have checked it for 4 runways, but it will also work for more than 4 runways.
We presented an automatic system to control the activity of Runways that will decrease the waiting time

of the flight and assure proper distance between each flights to avoid collision of accident. We checked the implementation of the Algorithm on self-designed stimulator and it's working properly. We also checked the algorithm on high traffic and it's working efficiently. After modification of some factors we can implement this process on any airport.

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