INTRODUCTION

Airports are major centers of attraction in urban areas. Their impacts are many and usually include economic, environmental and land-use issues, all of which may affect the future development of the airport. One of the major problems affecting the people living and working around airport is noise due to aircraft operation. Accordingly, residential developments near noise-sensitive airport have generated all sorts of complaints and community actions aiming to reduce noise due to aircraft operation. Today’s new generation aircraft are about 75% quieter than those built 40 years ago. However, the issue of concern for many people living in these areas is not due to the level of noise generated by individual aircraft, but rather the cumulative impact of a large number of over flights. They perceive that the periods of respite are rapidly disappearing and the noise events are becoming more frequent in the sensitive time periods such as evenings and nights. This change in the nature of the noise pattern would appear to be a significant factor in the widening geographic range of adverse community reaction to aircraft noise for the community residing in the proximity of airport globally.

Domestic (INDIA) and International Scenario

Domestic Scenario

The noise levels have been broadly classified under four categories by Ministry of Environment & Forests vide The Noise Pollution (Regulation and Control) Rules, 2000:

| Sl. No. | Category          | Limits in dB(A) Leq Day Time | Night Time |
|--------|-------------------|-------------------------------|------------|
| 1.     | Industrial area   | 75                            | 70         |
| 2.     | Commercial area   | 65                            | 55         |
| 3.     | Residential area  | 55                            | 45         |
| 4.     | Silence area      | 50                            | 40         |

An airport though falls under industrial area category however, the noise levels are expected to be higher in the vicinity of the airport due to frequent aircraft movements. Most of the busiest airport world over has defined a separate area known as “Airport Vicinity Zone” wherein the ambient noise levels are expected to be higher than any other category of noise levels due to arriving and departing aircraft. Considering the fact that airport are usually located within the limits of large urban areas, in order to minimize the adverse impacts of its operation, it is necessary to organize the airport and surrounding areas through the development and adoption of a set of plans that govern urban planning and management with respect to the airport. It is important to notice that each airport is different in its operational characteristics, its social, economic and political situations, as well as in the type of landuse in its surrounding areas. All of these factors must be taken into account when planning land use in the vicinity of airport.
However, in absence on a dedicated Airport zone and improper land planning in the vicinity of airport in India, the community residing in these areas are facing day to day problem due to large volume of aircraft operation. At one hand, the growth in aviation sector and airport developments is favorable to have growth in national Gross Domestic Product (GDP) but at the other hand, it leads to large annoyance to the communities residing in the vicinity of the airport.

**International Scenario**

Several international standards and methods to measure sound already exist to determine noise limits during the day/night due to aircraft operation in the airport vicinity. All the above mentioned standards are developed taking into account the number of aircraft movements, type of aircraft operating at that airport, geographical location of the airport, etc. Some airport also provide Noise Limits for aircraft, essentially to control engine noise during approach/take off from runways. Some of the airport with noise limits are listed in table2

| Sl. No. | International Airport | Country | Permissible Noise Limits (peak values) |
|---------|-----------------------|---------|----------------------------------------|
| 1.      | JFK - New York        | USA     | 99dB (A)                               |
| 2.      | Midway - Chicago      | USA     | No limits                              |
| 3.      | Rio de Janeiro        | Brazil  | 118.4dB (A)                            |
| 4.      | Brussels              | Belgium | 100dB (A)                              |
| 5.      | Rome                  | Italy   | 103dB (A)                              |
| 6.      | Gatwick - London      | UK      | 94dB (A)                               |
| 7.      | Heathrow - London     | UK      | 94dB (A)                               |
| 8.      | Stansted - London     | UK      | 94dB (A)                               |
| 9.      | Manchester            | UK      | 92dB (A)                               |
| 10.     | Hong Kong             | Hong Kong | No Limits                           |
| 11.     | Melbourne             | Australia | No Limits                               |
| 12.     | Osaka                 | Japan   | 107dB (A)                              |
| 13.     | Kuala Lumpur          | Indonesia | No Limits                              |
| 14.     | CDG - Paris           | France  | 104.5dB (A)                            |

It is pertinent to mention that permissible noise limits at above mention airport varies primarily due to the difference in their topological locations. The airport situated in the northern hemisphere have lower noise limits than those located near the equator due to the fact that the air is more cold and dense which acts as a medium to absorb some noise.[11]In line with International Civil Aviation Organization’s (ICAO) mandate to reduce or minimize aircraft noise through an established noise management programme, DGCA has initiated a proactive role to minimize the airport noise in whole. Besides reducing the noise at source, emphasis is being given to reduce the airport noise by sources other than aircraft also.[14] It has been observed that noise due to aircraft movement add to the problem of the community noise in the vicinity of the airport apart from airport noise.

**Assess the aircraft noise**

When assessing the environmental affect of aviation noise, the air transport method as a whole wishes to be regarded in view that overall noise and the reduction of the same is to be established. Explanations akin to plane utilization and routing grow to be very fundamental in terms of whole noise and operating costs.[12] This is a exchange from the historical plane design philosophy which makes a speciality of minimizing charges on a small set of missions.[13] There has been some latest work on the design of aircraft for single hub route networks, however it didn’t include environmental performance as an objective or constraint.[11] An method is provided in this paper that allows to optimize a set of a number of aircraft at a conceptual design stage for a detailed route network.[9] The targets of curiosity comprise the financial and noise performance of a fleet over the route network. There are a lot of choices to be made by way of the airlines to fulfill market demand. The most important picks are the size and performance of the aircraft themselves.[6] The route community over which the aircraft operate additionally has a gigantic impact on the monetary efficiency and total noise in the environment. In this study we consider both the route network and the noise reduction which indicates that two objectives has to be satisfied.

**Bio-inspired Algorithms for optimization of air route**

We are opting for nature situated meta-heuristic algorithm considering, heuristics are in general main issue-elegant, in which we define an heuristics for a given problem to find the best solution. Meta-heuristics algorithms are challenge-independent methodologies that may be applied to a huge variety of issues for analysis among which the bio-inspired algorithms have now taken their chance to prove their efficiency. An heuristic can be like opting for a random aspect for pivoting in Quicksort. A meta-heuristic is aware of nothing about the situation it is going to be applied, it will possibly deal with functions as black bins. We can say that a heuristic exploits obstacle-elegant understanding to finda most finest or first-rate technique to an targeted predicament, while meta-heuristics are like design patterns, general algorithmic recommendations, which will also be applied to a large variety of problems. On this learn, the route profitability is optimized making use of bio-inspired algorithms like Firefly algorithm (FA), Bat algorithm (BA) and Cuckoo search algorithm (CSA), hybrid approach (BCF).[4,7] Dynamic Programming (DP) utilizing PL/SQL is used to search out the expected price of every route generated via FA, BA and CSA. Results: the target is to scale back the total expected price or maximize profit per airliner per route. The health worth of a airline and route is calculated utilizing DP. In the proposed model, we are making use of three algorithms wherein the initial particles are generated, centered on Nearest Neighbor Heuristic (NNH) which deals with the airliners. The algorithm is applied utilizing PL/SQL and tested with issues having unique number of aviation knowledge set from Australian transportation from the 12 months Jan 2009 to Nov 2014. The outcome got are aggressive and confirmed some large growth over revenue, in phrases of execution time and memory usage as good.

**Analysis of Algorithms in the given data set**

The proposed multi-purpose BCF, firefly, bat and cuckoo search is implemented in PL/SQL to perform route profitability analysis on airline information set gathered from Australian aviation data. Firstly we have now verified the algorithm effects for these three algorithms utilising aviation data for November 2014 which has 124 records along with 33 Australian ports and 57 2009 to November 2014 that contains 30,000 files of exact aviation ports which is the sample data set.[4] The time series plot for each algorithm along with the actual data is given in figure 7, figure 8, figure 9, figure 10, figure 11, figure 12. The results shown a great difference in the performance overseas ports. We have now carried out giant
Table 3 comparison of the algorithms over the parameters

| Parameters          | Original data | Firefly | Bat         | Cuckoo       | Hybrid Approach BCF |
|---------------------|---------------|---------|-------------|--------------|---------------------|
| Month               | 14-Nov        | 14-Nov  | 14-Nov      | 14-Nov       | 14-Nov              |
| Year                | 2014          | 2014    | 2014        | 2014         | 2014                |
| # Airliners         | 27            | 27      | 27          | 27           | 27                  |
| # Australian ports  | 9             | 9       | 9           | 9            | 9                   |
| # Countries         | 32            | 32      | 32          | 32           | 32                  |
| # Foreign ports     | 55            | 55      | 55          | 55           | 55                  |
| Total distance      | 765696        | 745398.69 | 646873    | 712188      | 765696              |
| Total Pax Capacity  | 995113        | 995113  | 995113     | 995113       | 995113              |
| Total Paxin         | 865678        | 865678  | 865678     | 865678       | 865678              |
| Total Freight Capacity | 42400    | 42400   | 42400      | 42400        | 42400               |
| Total Freight in    | 22557.4       | 22557.4 | 22557.4    | 22557.4      | 22557.4             |
| Total mail capacity | 12400         | 12400   | 12400      | 12400        | 12400               |
| Total mails         | 1638.2        | 1638.2  | 1638.2     | 1638.2       | 1638.2              |
| Total Fuel capacity | 1301683.2     | 1301683.2 | 1301683.2 | 1301683.2    | 1301683.2           |
| Total Fuel used     | 1225113.6     | 1192637.904 | 1034996.8 | 1139500.8    | 1225113.6           |
| Total Income        | 29900812861   | 29249682013 | 25461304048 | 29797861751 | 30200675073         |
| Total Expenses      | 2722855965    | 26409068885 | 22657951619 | 27028323820 | 27058044202         |
| Total Profit        | 2860481165    | 2864478392 | 2918265155 | 2865026062   | 3264923343          |
| Total loss          | 185524268.9   | 105781264 | 114912726 | 95488131     | 122292472           |
| Nett                | 2674956896    | 2758697128 | 2803352429 | 2769537931   | 3142630871          |
| Total dB(s)         | 47488465.92   | 46310611.8496 | 40189344.8 | 44169899.76  | 47488465.92         |

Figure 7

Figure 8

Figure 9

Figure 10

Figure 11

Figure 12
data analysis on aviation knowledge from January. The performance of each algorithm over the original data is displayed in the table 3.

**CONCLUSIONS**

The data set when run in the algorithms got to show more advantageous results more than expected. All the algorithms performed well but the best is the bat and the BCF algorithm in which the profit is increased by optimizing the routes. As per the objective the bat algorithm shows considerable change in the noise level in the atmosphere triggered by the aircraft during the flight. And there is 8.39% reduction when compared to the BCF algorithm which counts really great for the noise in the atmosphere is reduced considerably by optimizing route of the aircraft. The matrix plot for all the algorithms over the original or the actual data is given in figure 6. The hybrid BCF algorithm integrated the route seat allotment thereby increasing the net amount which is far more than the other algorithms. The performance of the Bat and the BCF algorithm is compared in the figure 4, figure 5. The integration of the hybrid algorithm with the other algorithms may be considered in future so as to reduce the noise level also simultaneously.

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