Proposal: 13143

# Taxiway Optimization for Runway Duplication at Fukuoka Airport

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**Page: Abstract Submission Form**

**Abstract Title (Use Title Case)**

Taxiway Optimization for Runway Duplication at Fukuoka Airport

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**Abstract Text ONLY**

**1. Purpose of the Study.** Aviation demand, which declined during the COVID-19 pandemic, is expected to fully recover to pre-pandemic levels by 2023 and continue to further increase. Therefore, there is a need to improve the efficiency of air traffic control in addition to airport capacity. Particularly, congestion among aircraft is an important problem. In recent years, NASA and the FAA have initiated research on this topic to improve the efficiency of ground transfers and departures at airports. Fukuoka Airport has one of the highest congestion levels per runway in Japan, and the resulting delays in takeoffs and landings constitute a major issue. Therefore, we aim to reduce emissions by optimizing routes, operating taxiways at regular intervals, and reducing stop zones. **2. Methods and Results.** Using Dijkstra's method and Queueing theory, we identified the shortest taxiway routes, constructed a program to head to an open runway while maintaining constant intervals, calculated the optimal time for aircraft departing the boarding gate and the associated delay time, and constructed a new takeoff and landing timetable. **3. Discussion and Conclusions.** Airports judge on-time departure or arrival of a flight to have failed in case of delays exceeding 15 min. In 2021, Fukuoka Airport exhibited an on-time departure rate of 95.74% and an on-time arrival rate of 96.05%. This study accomplished 100% on-time departure and arrival rates, assuming that all passengers arrive on time. Furthermore, the program completely prevents traffic congestion on the taxiway, allaying anxiety in passengers over delays in take-off, as it is designed to maintain a constant interval between different runways. In addition, aircrafts are not required to halt on the taxiway in the proposed system; this considerably reduces exhaust emissions by diminishing energy expenditure.

**Abstract Type**

Student Abstract Submission

**Discipline Area**

Natural Sciences, Engineering, and Mathematics

**Natural Sciences, Engineering, and Mathematics Discipline / Field**

Mathematics

**URL (if applicable)**

**1st Choice Presentation Format**

Poster

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**Pledge**

Should my abstract be accepted, I fully understand that to present at the conference I am required to register and pay for NCUR 2023 by Monday, March 13, 2023. I also understand I will be required to prepare materials and present at the time assigned to me by the Program Committee. Requests for specific time slots will not be accommodated.

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I have read and agree to the terms described therein.

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**Special Program Designation**

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**If available, would you prefer your presentation be grouped by the Special Program Designation / theme described above as opposed to being grouped by the primary discipline?**

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**Social Determinants of Health (SDoH)**

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**NCUR Murals Project:**

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**Page: Primary Presenter**

This is the student researcher submitting the abstract and who plans to register for the conference and present (if accepted). Note: Student researchers should be the ones to submit the abstract rather than the faculty mentor.

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**Page: Co-Presenter(s)**

List the names of up to two co-presenters (if applicable). All co-presenters listed here must register separately for the conference.

**Will you be presenting with others?**

No

**Page: Faculty Mentor Information**

A faculty mentor should be a professor who is familiar with your work, who will advocate for you if contacted.

**Faculty Mentor's First Name**

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**Additional Faculty Mentor's Email (if applicable)**

**Page: Campus Coordinator Information**

A campus coordinator should be someone in your office of undergraduate research or someone who will be coordinating the participation of all students and faculty across your campus for NCUR 2023 handling registration invoices, etc. Students, if you do not have an Office of Undergraduate Research or are unsure who to list, please consult with your faculty mentor.

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