香港大學電機電子工程系
The University of Hong Kong
Electrical and Electronic Engineering

From: Prof. Edith C.H. Ngai
Department of Electrical and Electronic Engineering
The University of Hong Kong
Room 608, Chow Yei Ching Building,
Pokfulam Road, Hong Kong
Tel: +852 39172675
Email: chngai@eee.hku.hk

To: The Attention of the IITIS Scientific Council

17 Oct Sep 2025

Dear Sir/Madam,

Dissertation Review Report for Ph.D. Thesis of Yuting Ma

The thesis "IoT-Based Decision Making and Passenger Routing for the Emergency Evacuation of Cruise Ships" written by Yuting Ma addresses the emergency evacuation problem of cruise ships. The author adopts Internet of Things (IoT) infrastructure that can sense the location of evacuees within the ship and help the evacuees to reach the evacuation exits rapidly. The theme of the dissertation topic advances the development of IoT and AI technologies. It supports intelligent decision making and passenger routing for emergency evaluation of cruise ships. The thesis uses an emergency evacuation planning approach considering a ship evacuation system integrating with wireless sensor networks (WSNs), an evacuation server, and individual smartphones. The scientific problem is accurately formulated and systematically addressed by the author.

The author has designed sophisticated algorithms for emergency evacuation on cruise ship. There are totally four ship emergency evacuation approaches, including a centralized single-evacuee emergency navigation algorithm, a two-stage hybrid single-evacuee navigation algorithm, a centralized co-operative multipath multi-evacuee evacuation planning algorithm, and a distributed and decentralized RL-based multi-evacuee evacuation planning method. She has also proposed a ship navigable network construction method based on the Voronoi diagram for building the graph model used by the first three algorithms. The author has developed the right methods to tackle the proposed scientific problem. The author has made original contribution in developing and implementing effective algorithms and emergency evacuation approaches.

In addition, the author has evaluated the impact of IoT system imperfections and passenger errors on cruise ship evacuation. She further proposed an IoT-driven scheduling for congestion avoidance in emergency evacuation based on queuing theory, which evaluates the average evacuation performance of different routing methods, including a two-stage hybrid emergency navigation algorithm. The proposed solution is significant and practical in solving the emergency evacuation problem in the real-world.

The research problem addressed in this thesis is practical and important. The author has developed novel algorithms to address the research challenges. She has evaluated her solutions and conducted the simulations and analysis systemically. The thesis is well-written and easy to follow. The work has led to eight publications in the field. The dissertation demonstrates the author's sufficient scientific knowledge and technical details in the research field.

In conclusion, this thesis in my opinion is an acceptable and substantial PhD dissertation. The submitted dissertation meets the requirements for doctoral dissertation in the field of Engineering and technology, in the discipline of information and communication technology.

Yours faithfully,

香港大學電機電子工程系
The University of Hong Kong
Electrical and Electronic Engineering

Prof. Edith C. H. Ngai
Associate Professor
Department of Electrical and Electronic Engineering
The University of Hong Kong
Hong Kong, China