The 2nd Workshop on User Experience in Urban Air Mobility: From Ground to Aerial Transportation

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ABSTRACT

Urban Air Mobility (UAM) is expected to pave the way for a new mobility experience by providing air travel services around cities and urban areas. However, few studies have derived user needs and requirements from a transportation experience perspective. Therefore, we propose an interactive workshop to discuss people's expectations when experiencing UAM actively. We want to extend on the prior workshop held at AutomotiveUI 2021 which will continue the discussion about user experience for different types of UAM operations. The workshop includes keynote presentations, position paper presentations, and interactive group discussions with the following objectives: 1) to understand the role of UAM in future transportation, 2) to understand the way that people expect their transportation journey when using UAM, and 3) to collect design considerations to support the transportation journey in UAM.

CCS CONCEPTS

• **Hardware** → Emerging technologies; Analysis and design of emerging devices and systems; • **Human-centered computing** → Human computer interaction (HCI); HCI design and evaluation methods; User studies.

KEYWORDS

Urban air mobility (UAM), User experience research, Research agenda, Emerging technologies

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1 INTRODUCTION

1.1 Background

The development of transportation has allowed human society to expand the living area. Those who lived in ancient times stayed in a very limited area during their whole lifetime. These days, we can easily move around from place to place, city to city, and country to country using personal vehicles, buses, trains, and airplanes. However, rapid population growth in large cities has imposed strains on their transport system, and mobility needs are increasing to resolve traffic congestion in those areas [4]. For example, INRIX reported that drivers in global metropolitan cities such as London, Paris, and New York lost more than 100 hours in 2021 due to the traffic congestion [12]. Urban air mobility (UAM), which is defined as safe and efficient air traffic operations in a metropolitan area for manned and unmanned aircraft system, is expected to alleviate transportation congestion on the ground by using three-dimensional airspace [7, 16].

As the introduction of UAM is in a very nascent phase, much of research has been conducted in the fields of aerospace and focused on the development of aircraft technologies and operations [5]. Only a few papers and market studies, which mainly relied on the survey method, have focused on the investigation of factors that could affect the adoption of UAM [1–4, 13, 15]. Several studies reported that safety concerns are major factors in the adoption phase of UAM [1-3, 13-14]. As UAM is one of the urban transportation means, its travel time also influences the users' intention to use [4, 17]. A recent market study conducted by Booz Allen Hamilton pointed out the importance of noise and privacy issues of UAM [15]. Respondents strongly preferred to impose a minimum flight altitude on UAM so that passengers on the UAM could not see people on the ground or from buildings [15]. Demographics such as age and gender were also found to be important factors of perception of UAM. Female and elderly were reluctant to use UAM than male and young groups [13, 15].

While these studies provide some clues for the user demand factors of UAM, little has been investigated about user experience (UX) of UAM. Especially, we need to understand pragmatic and hedonic aspects of UAM that users expect [6]. As UX deals with the user's internal and physical state resulting from prior experience, attitudes, skills, abilities, personality, and the context of use, UX research can provide unique contributions to the overall development and design of systems [8-9]. Without a careful preparation of what people expect and how it should be addressed, the emerging technology might not be successful. From this background, our research group suggested a series of workshops to explore important issues for the technologies such as plausible user scenarios, user needs, factors, and design requirements. The first workshop was successfully organized and hosted at the ACM AutomotiveUI 2021 [10]. Last year workshop helped us get basic insights into people's expectations of UAM compared to current public transportation means, including bus, taxi, train, and airplane. From the workshop, three types of user groups were identified based on the expected role of UAM within the existing transportation system: *inter-city, intra-city*, and *private UAM*. *Inter-city UAM* was regarded as a transport that is comparable to the airplane or train, which travel relatively far distances and have stations/ports which are distant from the traveler's final destination. *Intra-city UAM* was identified to be alternatives for helicopters, subways, and buses, allowing a short distance travel to avoid traffic congestion in an urban area. Lastly, *private UAM* is characterized by associating the concepts of taxis or owned vehicles, which operate flexibly by accommodating to the users' transportation needs. In addition, specific use cases for both intra- and inter-city travel were elicited, and the motivations for such use cases were found and classified into pragmatic and hedonic qualities. We were able to share this knowledge with researchers in the field of human-computer interaction at the CHI 2022 conference [11].

Based on prior experience and results, we planned for the next workshop to elicit more topics and issues in this area. In the second workshop, we will focus on the journey of passengers using different types of UAM, their needs at each stage of the journey, and design ideas that can satisfy their needs.

1.2 Objective and Topic of Interest

The current workshop will explore and discuss UX topics and issues in UAM from human factors and human-computer interaction (HCI) perspectives. In particular, the primary goals and research questions (RQs) of this workshop are as follows:

Goal 1. To understand the role of different types of UAM in future transportation

RQ1.1: How will the different types of UAM affect the current urban transportation system?

RQ1.2: What are the collaborative and competitive transport modes for UAM?

Goal 2. To understand the way that people expect their transportation journey when using UAM

RQ2.1: How do people expect their transportation journey when using UAM?

RQ2.2: How to connect UAM and existing transportation systems?

RQ2.3: How to design UAM-related transportation systems considering last-mile distance?

Goal 3. To collect design considerations to support the transportation journey in UAM

RQ3.1: What will be the motivations and user needs of using UAM?

RQ3.2: How can the current automotive UX applied to the UAM?

2 PRE-WORKSHOP PLANS

The following activities will be performed before the workshop.

Build workshop website: The website which will be used to promote the workshop is opened (https://sites.google.com/yonsei.ac.kr/uam-workshop). The webpage presents information about the workshop goal, topics, activity, schedule, and organizers. After completing the workshop, discussion outcomes will also be presented on the website.

Promote the workshop: We will broadly advertise the workshop through social media (e.g., Twitter, LinkedIn) and related academic communities by connecting them to the workshop website. Meanwhile, we will also send out personal invitations to potential participants interested in this topic, e.g., former participants of the prior workshop.

Call for keynote speakers, presenters, and potential participants: We will solicit position papers for keynote sessions, presentations, and participants. The position papers will be received in the extended abstract format of ACM. For each submission, two organizers will be assigned to review the position paper. We will not require participants to submit the final results, but rather have them promote their ongoing works and ideas that can give insights to other participants.

Develop a final schedule and plan of workshop activities: The detailed plan and schedule of workshop activities will be determined considering the number of presentations and participants. We will announce the final plan and schedule through the website and also email directly to the participants.

3 WORKSHOP ACTIVITY AND SCHEDULE

This workshop will be conducted in-person. We expect to have 30 participants at maximum for the workshop session to promote active interactions and discussions, excluding the organizers. The tentative plan of the workshop is presented in Table 1 with 4 hours schedule in total. The schedule consists of keynote speeches and position paper presentations, speed-dating and group discussions, and final group presentations. Depending on the number of participants, the details of workshop activities and structure will be adjusted.

4 POST-WORKSHOP PLANS AND EXPECTED OUTCOMES

The workshop results will be documented and made available through the workshop website. The results include videos and screenshots of the presentations and documented summaries from interactive sessions upon the agreement of participants. Also, the organizers will email the participants, including the results and future plans related to the workshop.

Table 1: Workshop activity and schedule

Activity	Time	Description
Introduction and welcoming statement	15 min	Introduction to the topic and organizers. Overview of the workshop agenda.
Keynote presentation & position paper presentation	60 min	One keynote speaker who is an expert in the UAM field. Position paper presentations (Participants can submit their prior or ongoing works before the conference.) The number and available time of presentations will be decided depending on the number of submissions.
Break time	15 min	
Group discussion 1	45 min	Organizing small groups of up to 5 people & speed dating. Discuss on the first research objective and its RQs. The potential effects of UAM on the current transport system. Comparative advantages and concerns in the adoption of UAM.
Group discussion 2	45 min	Covers the second and third research goals. Imagine & draw a *user journey map* of future UAM service. Discuss design considerations of UAM based on the journey. Outlining the design requirements of UAM from both vehicle and service aspects.
Break time	15 min	
Final presentation	30 min	Present the results from 1st & 2nd group discussion sessions. Sharing the future research direction with the participants.
Wrap-up	15 min	Closing the workshop with the summary of presentations, follow-up activities, and future plans.

After summarizing all the results from the workshop, we will seek academic publication in related venues, e.g., ACM Interactions or future CHI submissions. Also, we are planning to prepare a special issue of journals following the series of workshop activities. Depending on the participants' preferences, we will organize virtual spaces for continued discussions (e.g., Zoom and MS Teams) and explore the possibilities of future workshops in various venues.

5 BIOGRAPHIES

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Sol Hee Yoon is an Assistant Professor of the Department of Safety Engineering at Seoul National University of Science and Technology. Her research focuses on the design of safe transportation systems based on human factors and ergonomics methodologies.

Mark Colley is a PhD candidate at the University of Ulm in the Institute of Media Informatics. His research looks into communication possibilities between automated vehicles and vulnerable road users such as pedestrians and cyclists with a particular focus on accessibility.

Luca-Maxim Meinhardt is a Ph.D. candidate at the University of Ulm in the Institute of Media Informatics. He is researching future mobility, Calm technology, and Explainable AI to create better-adapted technology for humans.

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