The 29th International Workshop

Examining the Mobility Pattern of the Transient Population in Seoul in Response to Air Temperature Variation

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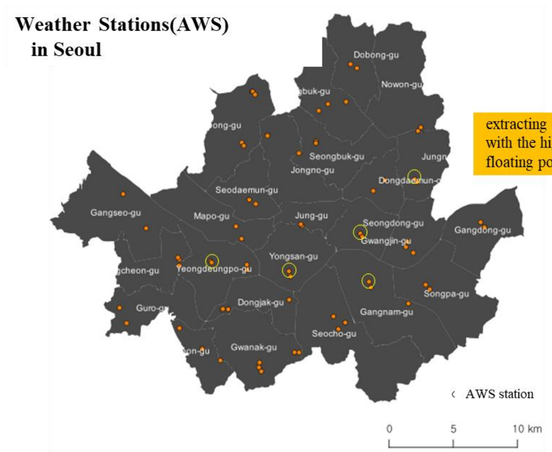
INTRODUCTION

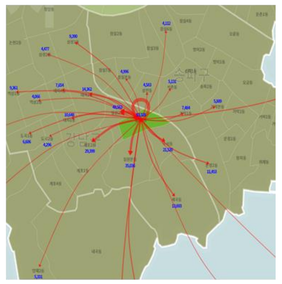
- Due to climate change, urban population has been growingly exposed to urban heat. Urban Heat Island(UHI) effect poses a major threat to human health as it is accelerating with rapid urbanization.
- As response, politicians, scientists and various practitioners have strived to establish effective strategies to mitigate/adapt to UHI by a set of policies, guidelines, and various technologies like early warning system, cooling fog/roof, planting trees, etc.
- However, the planning stage of such technological implementation lacks understanding of urban mobility although UHI is critically related to demographic characteristics.
- In this study, we analyzed the mobility pattern of floating population in Seoul in response to air temperature.
- By comparing the mobility pattern in terms of urban heat characteristics between the normal and the group that is vulnerable to UHI, we could provide relevant policy guidelines to design strategies reflecting dynamic properties of demography.

METHODS



extracting 5 areas with the highest floating population

Match with the mobility data and explore the trend



- **Data Collection**

Meteorological Data

29 weather stations(AWS) located within Seoul that record five climate conditions at the time scale of an hour:
air temperature, (wind direction, wind speed, precipitation, humidity)

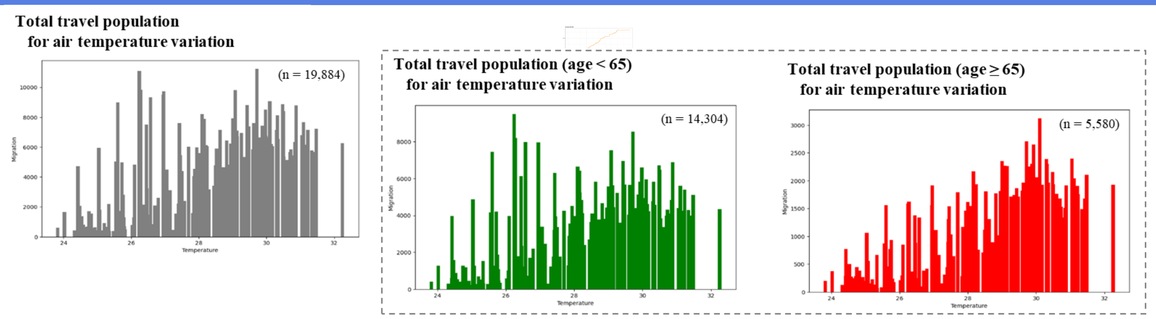
Mobility Data

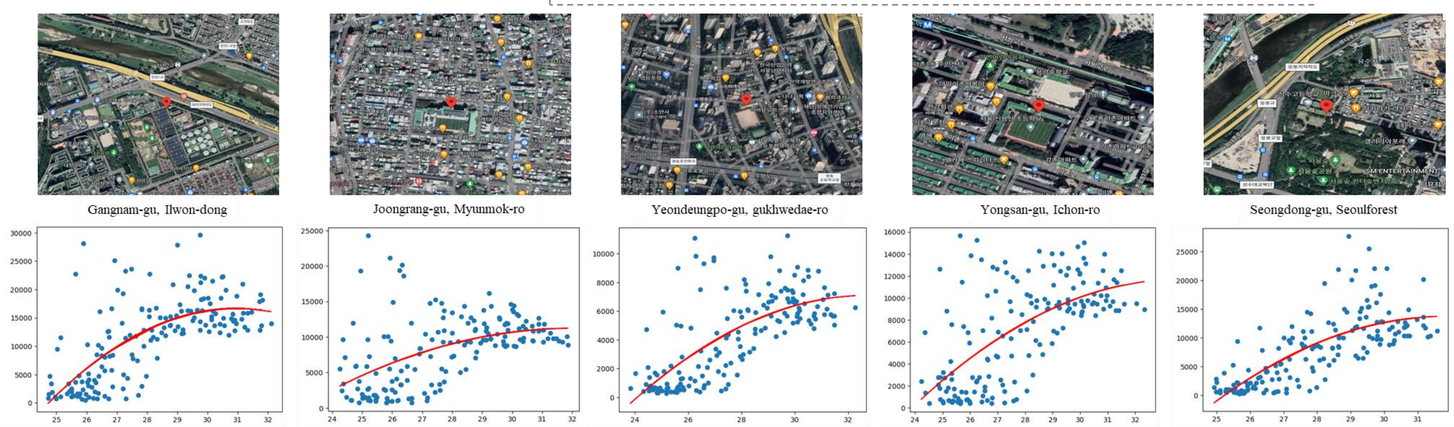
Seoul floating population data extracted from Seoul Big Data Campus that consists of 6 variables:
travel population, (OD-pairs for every hour, travel distance, travel time, sex, age)

- **Data Analysis**

Explored the trend and relationship between the air temperature and the travel population for the summer of 2022 in Seoul (Jul.-Aug)

RESULT





Total travel population from each district for air temperature variation

- Total travel population in 5 districts in Seoul with the highest floating population showed different trend in mobility pattern between two age groups (<65 and ≥65) in terms of air temperature.
- The total and the normal group(<65) showed the similar mobility pattern that has two peaks around 26 and 29 Celsius whereas the heat vulnerable group(≥65) shows only a single peak around 30 Celsius.
- For precise comparison between the air temperature and the travel population, we investigated whether geographic characteristics associated with the mobility pattern because the extracted 5 districts have not only different geographic characteristics but also different social and cultural aspects that could influence travel population.
- In general, all 5 districts share the similar trends of concave to some extent. However, the point of air temperature that converts the linear pattern into concave one showed difference among districts. The most clear difference was observed between Gangnam-gu and Jungrang gu, which are mainly characterized by high-rise commercial buildings and low-rise residential buildings, respectively.

DISCUSSION

- The difference in mobility patterns of transient population in terms of age and locations can be interpreted in many ways. However, this discrepancy in travel peak between those groups in terms of air temperature insinuate the importance of reflecting mobility patterns in UHI mitigation and adaptation.
- There is inherent geospatial inaccuracy in coherence between mobility and meteorological data due to data availability despite the effort to match geolocation of weather stations with the travel origins.
- A variety of influence factors that motivates the travel in urban areas is not considered in this study. In response to minimize the influence from the various travel motivations, we performed a comparative analysis only between the air temperature and the travel population while managing to keep other conditions as similar as possible.
- The time-span of our analysis is limited to July and August of 2022 which produced the total sample size of 19,884. However, the temperature-span within the time frame is limited to maximum of 31.29 Celsius so that the mobility pattern at the more extreme heat conditions could not be analyzed.

This work was supported by Korea Environment Industry & Technology Institute(KEITI) through Climate Change R&D Project for New Climate Regime Program, funded by Korea Ministry of Environment(MOE)(RS-2023-00221110)
This research was supported by the BK21 FOUR (Fostering Outstanding Universities for Research) funded by the Ministry of Education(MOE, Korea) and National Research Foundation of Korea(NRF)