Minicolloque n° ??   ☒ **Oral**   ☐ **Poster**

Modelling and simulation of visitors' behaviour in an Aquarium with a fixed one-way route

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In this research, we analyse visitors' behaviour in Kaiyukan in Osaka, Japan, which is one of the largest aquariums in the world. Kaiyukan is unique because the visitors walk through a fixed one-way aisle unlike a common museum or an aquarium where visitors can move freely in an open space. Fig. 1 shows the floor map of Kaiyukan. Visitors enter form the 2nd floor then go up to the 8th floor directly then walk on a spiral ramp all the way from the 8th floor to the 3rd floor. We analyse data collected during COVID-19 restriction period from June 2020. Our final aim is to propose a crowd management method which can be adapted to several situations (with COVID, after COVID, public holidays...). We have the data of the entry time and the exit time of the visitors. This dataset enables us to analyse the length of stay and the number of visitors. We present a crowd management method optimizing ticketing at the entrance.

We constructed a model of visitors and simulated the visitors' length of stay using Totally asymmetric simple exclusion process (TASEP) and Zero-range process (ZRP), which has been widely studied to model non-equilibrium systems such as production flow [1], vehicular traffic [2], and biological transport [3]. The simulation results reveal that not only the number of visitors but also the timing of entry of visitors affect the visitors' length of stay. Thus, we can avoid congestion without reducing the number of visitors controlling the ticketing system and timing of entry.

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[2] H. Yamamoto, D. Yanagisawa, and K. Nishinari, J. Stat. Mech., 043204 (2017).
[3] D. Chowdhury, A. Schadschneider, and K. Nishinari, Phys. Life Rev., 2, 318 (2005).
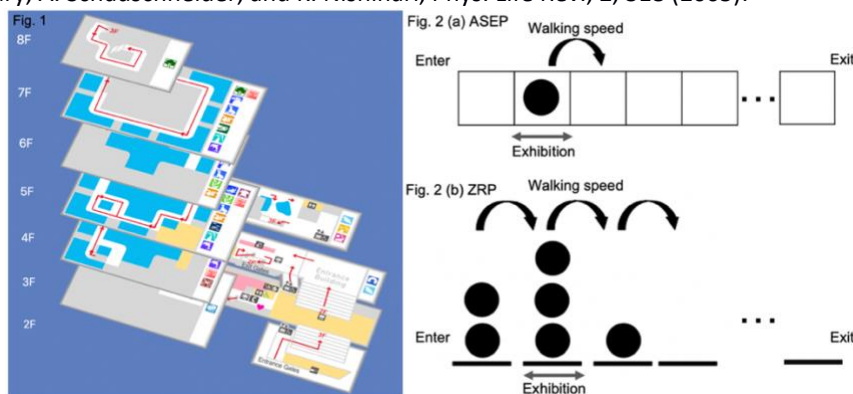
Figure 1 : Floor map of Kaiyukan.
Figure 2 : (a) Totally asymmetric simple exclusion process (TASEP). (b) Zero-range process (ZRP).