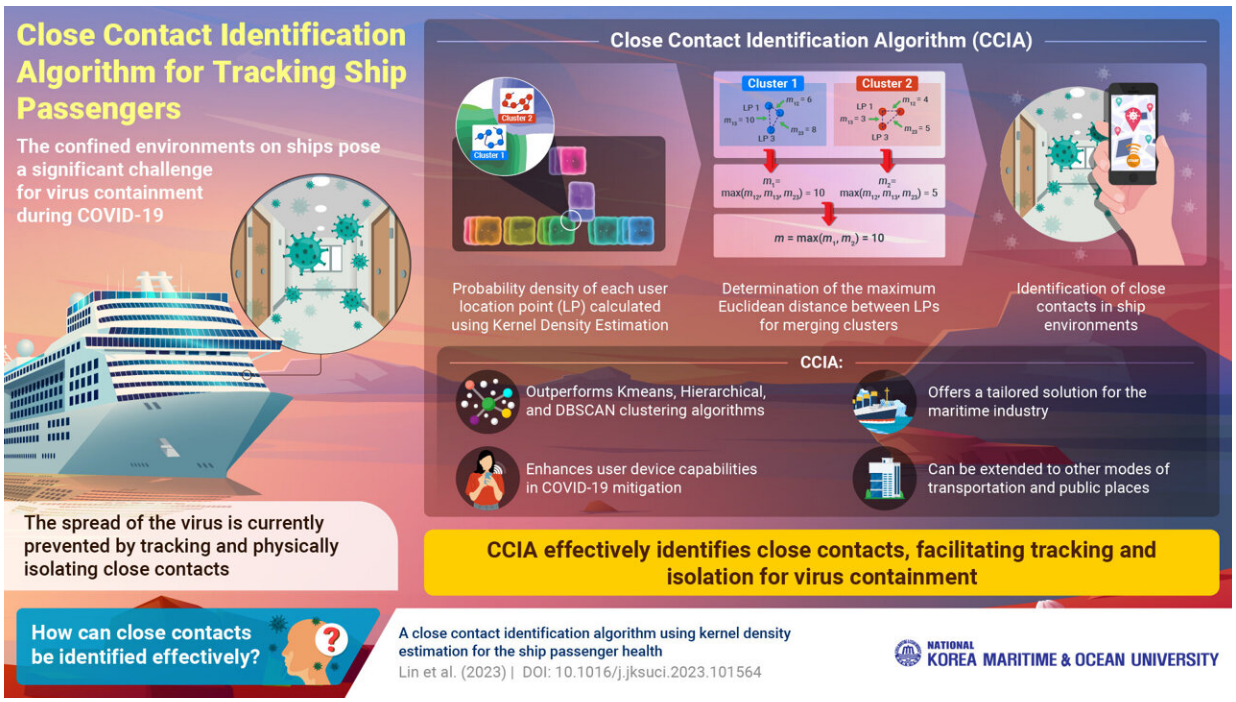
Researchers develop a novel algorithm for mitigating COVID-19 spread in ships

August 28 2023



Researchers from KMOU have developed a novel algorithm that determines the Euclidean distance between user location points to effectively identify close contacts in confined environments (such as in ships), facilitating the tracking and isolation of potential virus spreaders. Credit: Professor Jooyoung Son from Korea Maritime and Ocean University

The COVID-19 pandemic has drastically affected human lives and the global economy. In particular, cruise ship companies around the world are among the worst hit industries, with ships becoming a hotbed of viral infection owing to their confined environment. With the economy slowly recovering in the post COVID-19 period, ship companies hope to return to normal operations by adopting a sustainable management model that prioritizes the health of ship passengers.

However, the close-quartered environment in ships pose a significant challenge for virus containment. Tracking and physical isolation of infected passengers remains the standard protocol for preventing the spread of virus. Unfortunately, an effective identification of individuals in close contacts, who have potentially been exposed to the virus and can spread it, remains challenging.

Now, Mr. Qianfeng Lin, a Ph.D. candidate at the Department of Computer Engineering at Korea Maritime and Ocean University (KMOU), and Professor Jooyoung Son from the Division of Marine IT Engineering at KMOU have developed a novel close contact identification algorithm (CCIA) that enables an accurate identification of close contacts. Their work was published in *Journal of King Saud University—Computer and Information Sciences*.

"Through our research, we aim to provide a technology-driven solution to this challenge and contribute to the health and safety of the maritime industry," explains Mr. Lin.

CCIA utilizes a statistical method, called "Kernel Density Estimation," to calculate the probability density of each user location point. This density is then used as the weight of each user location point. The center of these location points, which form a cluster, are then calculated based on each location point and its corresponding weight.

Next, CCIA determines the maximum Euclidean distance between the location points in each user cluster, denoted m. For any two clusters in which the Euclidean distance between their centers is less than m, CCIA merges them. As a result, the number of clusters that remain in the end can be used to accurately identify close contacts, facilitating their effective tracking and isolation within ship environments.

The researchers next conducted close contact tracing experiments on the HANNARA ship, a training vessel for KMOU. To their delight, they found that CCIA outperformed conventional clustering algorithms, such as Kmeans, Hierarchical, and DBSCAN, which cannot calculate the probability density of each location point.

Moreover, although CCIA has been primarily developed to offer a customized solution to the maritime industry, it could potentially be applied to other modes of transportation and public spaces as well. Furthermore, CCIA also enhances the capabilities of user devices such as smartphones in mitigating the spread of COVID-19.

"Amid the current global health crisis, this study presents a technology-driven method that can effectively track and isolate potential virus spreaders, contributing to halting further spread of the virus. In effect, we have developed a general methodology for preventing future infectious disease outbreaks," says Prof. Son.

More information: Qianfeng Lin et al, A close contact identification algorithm using kernel density estimation for the ship passenger health, *Journal of King Saud University—Computer and Information Sciences* (2023). DOI: 10.1016/j.jksuci.2023.101564

Provided by National Korea Maritime and Ocean University

August 28) retrieved 28 April 2024 from https://medicalxpress.com/news/2023-08-algorithm-mitigating-covid-ships.html