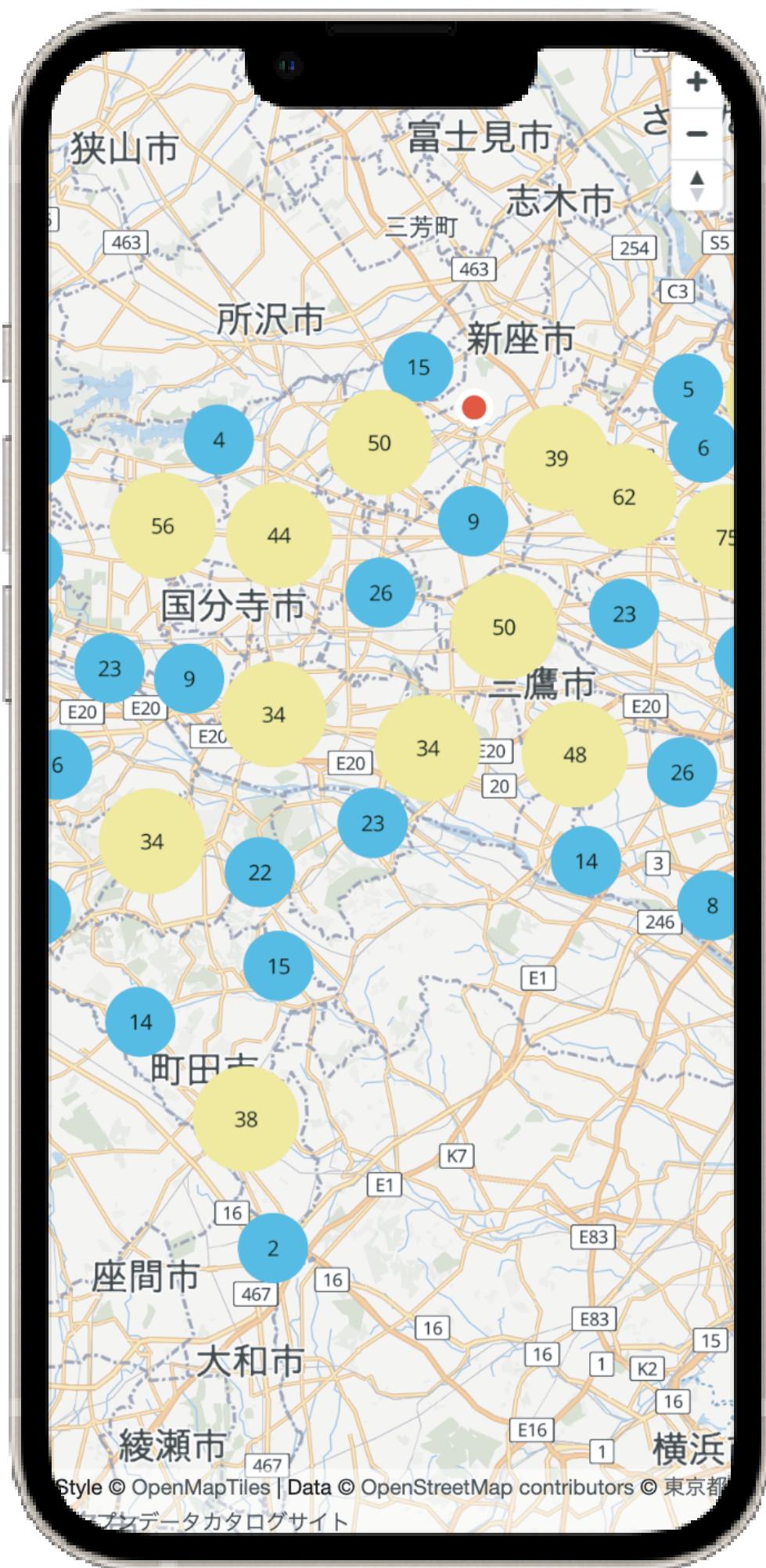


# Development of UNVT Portable, a map server with OpenStreetMap pre-installed using a RaspberryPi on a local network in offline situations during disasters.

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"UNVT Portable" is a package for RaspberryPi that functions as a map hosting server and can be freely accessed from a web browser



<https://github.com/un-vector-tile-toolkit>

## BACKGROUND

The UN Vector Tile Toolkit is a package of open source tools designed under the UN Open GIS Initiative to enable UN Geospatial Information Services, national government. It is designed to enable public basemap providers, such as mapping organizations, to leverage modern web mapping technologies to deliver basemap vector tiles. (Eom et al., 2017; M. A. Brovelli, 2021; UN Open GIS Initiative, 2022)

The UNVT toolkit is packaged with existing proven open source software to generate, host, style, and optimize fast, interoperable basemap vector tiles for use in a variety of application frameworks. (Fujimura et al., 2019, The United Nations Vector Tile Toolkit, 2022)

UNVT Portable is a package for RaspberryPi that acts as a vector/raster tile map hosting server and can be freely accessed from a web browser within a local network. It is mainly intended to function in an offline environment in the event of a severe disaster, and can be used at local government offices where disaster crisis response headquarters are set up to combine aerial drone imagaries with OpenStreetMap and various open data sets that have been prepared in advance and overlay them on a web browser. The system can display an overlay of the images in a web browser. As a result, the system is expected to play an active role in use cases, enabling an efficient grasp of the situation throughout the disaster area and prompt relief and reconstruction work.

## PURPOSE

In this study, assuming the currently available RaspberryPi 4 device, we will build a pre-installed dataset based on OpenStreetMap with realistically available specifications, and the storage method and other tiled dataset, etc., to be combined with OSM and each other. patterns, and calculate the appropriate storage allocation of basemaps, drone aerial photography data, and evacuation shelter and hazard map data for thematic mapping that is available as open data. In addition, we will conduct demonstration tests at local governments to identify issues in using the system on business terminals with secure settings.

## DESIGN

Fujimura, 2019 has already proposed an effective partitioning method for the worldwide OpenStreetMap dataset, and we think this method is still valid as of 2022. Based on the assumption of a RaspberryPi 4, we will compare and evaluate the capacity of the MicroSD card that can be installed and the performance of reading/rendering speed, and define 150 USD as the upper cost limit, which is half the price of 300 USD, the price range of a typical Chromebook. The web hosting server is currently Apache, but we are considering using open source tools such as nginx. For local network communication, wireless connection using Wi-Fi was designed as the highest priority. The connection to UNVT Portable uses an automatic Wi-Fi connection function with QR codes, and each thematic map is displayed with a QR code for each thematic map, etc., designed to allow even municipal staff unfamiliar with digital terminals to easily access geospatial information.



Read the 1st QR code for Wi-Fi connection

## STRATEGY

Our research group has entered into disaster management agreements with several local governments in Japan, and is engaged in information support activities to provide prompt aerial drone photography in the event of a large-scale disaster. In the process of providing data, there is a current situation in which geospatial information is not always transferred smoothly, depending on the information literacy of the local governments to which the data is provided and the operating environment of the available terminals. Furthermore, we hypothesize that an easy-to-use web map-like system that functions properly in an offline environment is needed because the infrastructure was paralyzed by the typhoon disaster in 2019, including large-scale power outages and Internet outages, and will confirm its effectiveness through demonstration experiments. By designing on the premise of RaspberryPi devices, which are relatively inexpensive in terms of both performance and cost, the UNVT Portable terminal completed through this research will be deployed in large numbers to prepare for large-scale natural disasters that may occur in the future.

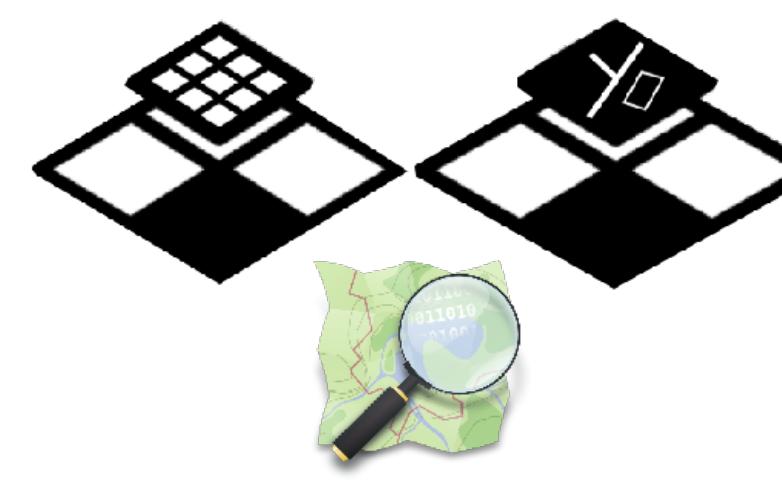
## COMPONENTS OF UNVT PORTABLE

### Access point activation



+ hostapd  
+ dnsmasq  
+ isc-dhcp-server  
+ rng-tools

### Create Tiles



Generate vector and raster tiles from OSM

### Creating a Hosting File



Create CSS, JavaScript, HTML, json files based on Mapbox Vector Tile Specification



## DISCUSSION

We generated multiple variations of tile datasets that are versatile depending on the data source. Specifically, we used OpenStreetMap, SRTM, Landsat imagery, and open geospatial data provided by the Japanese government. We plan to bring the UNVT Portable implemented in this way to local governments and conduct demonstration tests to see if it functions effectively in actual operations.

## REFERENCES

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