To: National Institute of Informatics (NII), ROIS

Application Date (year-month-date): 2020/09/13

Regarding the use of "High Resolution Floor Plan Image Data"

(hereinafter DATA) provided as a part of the LIFULL HOME'S Dataset

(hereinafter Dataset), I agree to the following three items, and hereby

apply for the use of DATA.

(1) Regarding the use of DATA, I understand and comply to the content

of the document titled "Handling of LIFULL HOME'S Dataset."

(2) I understand that citing a floor plan image in my publication

and/or presentation material includes risks to infringe on privacy

of owners and residents of the property, and will make the existent

real estate unidentified.

(3) Upon expiration or termination of the license for the use of Dataset,

upon termination of the agreement between LIFULL Co., Ltd. and ROIS,

or upon recognition of breach of the LIFULL HOME'S Dataset Terms of

Use by me, I will, according to Article 4.4 of the LIFULL HOME'S

Dataset Terms of Use, cease all use of Dataset containing DATA, and

delete or erase Dataset and all data derived from Dataset.

[Note: NII and LIFULL Co., Ltd. will use information on this application

to judge the qualification. Please understand that the application may

not be approved.]

1. Applicant (Principal Investigator)

\* should be the same as of Dataset

User No. : HOMS-22-13

Name : Bungartz, Hans-Joachim

Title : Dean of Department of Informatics

Affiliation: Technological University of Munich, Department of Informatics, Chair of Scientific Computing

2. Purpose of using DATA (please explain your purpose in detail)

The Data will be used for an honors project for BGCE (Bavarian Graduate School of Computational Engineering), which is an elite master’s program at the Technological University of Munich. The goal of this project is to optimize the heating of buildings. To extract needed information from the building plans such as the size and adjacency of rooms, we want to train a neural network based on the LIFULL dataset in combination with the House-GAN[[1]](#footnote-1) dataset.

The House-GAN Dataset provides bounding boxes of different rooms, the connectivity between these rooms, and a reference to the corresponding image of a building plan of the LIFULL Dataset, which means that it doesn’t contain any images itself. The House-GAN Dataset is not based on the normal LIFULL Dataset, but rather the “High Resolution Floor Plan Image Data”. Thus, we additionally need the High-Resolution Dataset to be able to properly use the dataset.

For our model we decided to use the YOLOv5[[2]](#footnote-2) object detection architecture, since it is easy to use and fast. The then trained model will be used to detect the different rooms of the building plan in the form of bounding boxes. Either we will use the bounding boxes as input for a deterministic algorithm to determine the adjacency of the rooms, or we will use the included information of the House-GAN Dataset to train a neural network, which can detect the adjacencies directly.

The goal of the program is to have a pipeline, which takes an image of a building plan as input. This image will then be processed through the neural network trained by the LIFULL Dataset and House-GAN Dataset. The neural network gives the bounding boxes of the rooms and the connectivity of these rooms. From the bounding boxes we will approximate the sizes of the rooms. We will use this information to build a thermal model, which is like a circuit model where e.g., the walls are represented by resistors. Multiple heaters can then be manually placed by the user into this model. Finally, the control of these heaters will be optimized. Thus, a higher energy efficiency of the heating of buildings can be achieved. This can safe energy, which is especially important during this energy crisis.

(Concluded)

1. N. Nautata, K. Chang, C. Cheng, G. Mori and Y. Furukawa, "House-GAN: Relational Generative Adversarial Networks for Graph-contrained House Layout Generation" In book: Computer Vision – ECCV 2020, 16th European Conference, Glasgow, UK, August 23–28, 2020, Proceedings, Part I (pp.162-177), Nov. 2020, doi:10.1007/978-3-030-58452-8\_10 [↑](#footnote-ref-1)
2. YOLOv5 repository: <https://github.com/ultralytics/yolov5> [↑](#footnote-ref-2)