

GPS on every roof
— Post-seismic Building-wise damage identification system using sensor network
equipped with affordable GPS —

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Tokyo is well-known as one of the most earthquake-prone cities and as one of the most integrated cities in the world. If a huge earthquake strikes Tokyo, many houses may collapse and the roads will be closed by the collapsed houses. Especially when the earthquake is strong enough for destroying the whole city, the precise information of the damage can not be gathered. The authorities such as fire departments have to start actions with a lack of information. This may result in delay and/or suspension of the rescue actions.

Recent developments in sensor and wireless communication technologies make it possible to distribute sensor platform in the environment. One of the final targets to apply this network sensing system is civil infrastructures and the buildings in the city. High resolution sensing and on-site simulation using dense sensor network on civil infrastructures can be regarded as a typical example of sensor embedded society. The sensor network applied to civil infrastructures should cover wide area with high spatial resolution. This results in the requirement for numerous sensor nodes with low cost.

In this presentation, the author talks about the project GPS on every roof. To obtain the information regarding the damage on every house due to earthquake, the author's research group is carrying out the project to install a sensor node equipped with an affordable GPS unit, an accelerometer, a wireless communication unit and a microcontroller on the top of the roof of every house in Tokyo. We aim at a system which can i) identify the displacement of the roof of the house with a few centimeter accuracy, ii) collect the information of displacement of the roof of the houses in the area of 3km x 3km within 30minutes. Distributing this system, we plan to cover the whole Tokyo area.

Technical contents to be discussed in the presentation are:

- i) Localization algorithm for enhanced accuracy with cost effective GPS hardware,
- ii) Wireless communication for a large scale static sensor network with possible damage on some nodes.

Keywords: GPS Global Positioning System