

# Assessment of outdoor Wi-Fi signals strength in Tsukuba university campus central area

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## 1. Introduction

Most buildings and indoor areas in Tsukuba University are covered by Wi-Fi signal. However, in some outdoor areas, the signal becomes weak or unavailable. When the weather is fine, students tend to spend their time in open spaces using their laptops or smart devices for online calls, checking emails, etc. Thus, mapping wireless signal quality can provide helpful information for students as well as for network administrators for better placement of new indoor or outdoor wireless access points in the future.

## 2. Objective

The main goal is to assess outdoor wireless signals strength: *utwlan-w*, *utwlan-x* and *utwlan-x2*.

## 3. Study area

The central area of the campus along the corridor from student plaza to campus gateway from Ichinoya, through the central library.

## 4. Methodology

The first step was to take the three Wi-Fi signals strength measurements and coordinates of arbitrary chosen points with a distance between each of these points ranging from 5m to 25m. The iPhone application “Airport Utility” was used to measure the RSSI (*Received Signal Strength Indicator*) and Survey123 for surveying. A total of about 230 records were collected. GPS errors become high

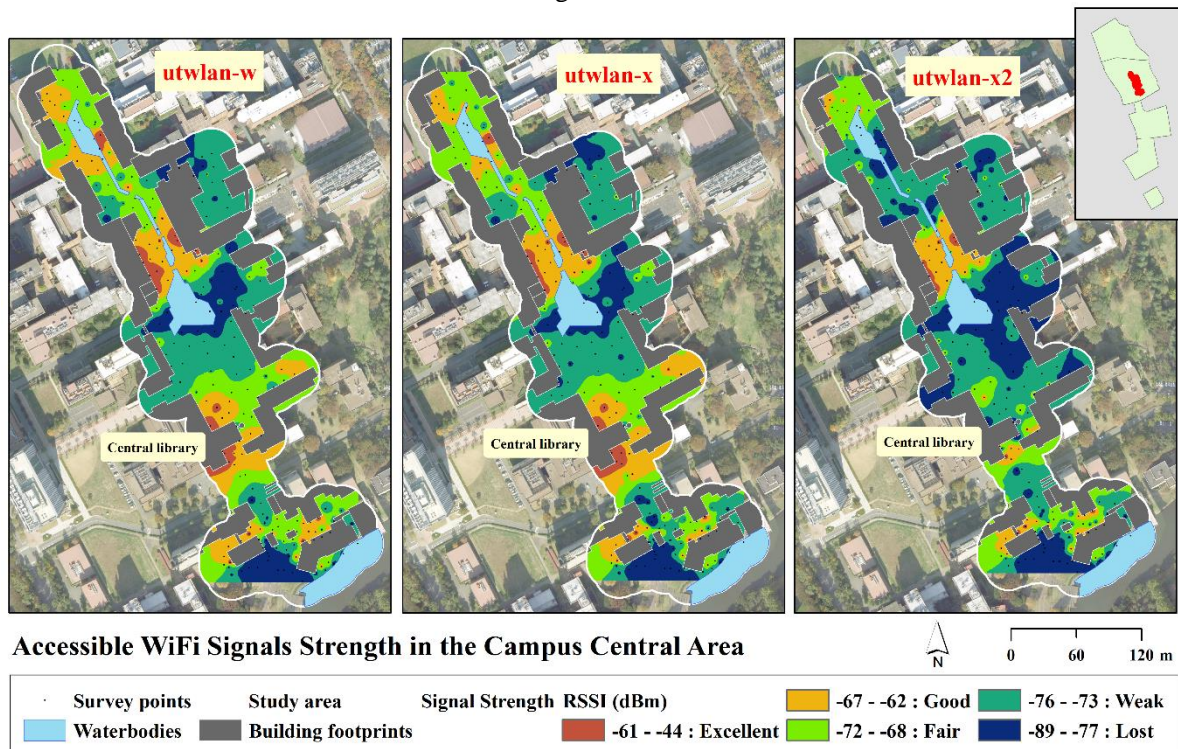
when surveying near buildings, that’s why for each point, a picture of a nearby landmark was taken for later adjustment purposes which was the second step. Lastly, we performed IDW interpolation method to extract the final map of Wi-Fi coverage.

## 5. Results and discussion

**Fig.1** shows maps of the three wireless signals strength in the study area. *utwlan-w* and *utwlan-x* are covering the same areas with relatively similar strength. *utwlan-x2*, on the other hand covers less.

Although outdoor access points could not be found, we could spot four indoor access points located in buildings A, B, C and D (**Fig.1**) which provide the open space beside them with internet coverage. These buildings have either very wide windows or walls covered by glass which doesn’t interfere much with Wi-Fi signals comparing to concrete or ceramic, which is the case of most of other campus buildings. In addition, their first floors are not used as classrooms but as 'Breakout' spaces for students to relax or restaurants and cafeterias.

In general, the area enjoys good coverage of wireless relying only on indoor access points. However, in the center area around the lake to the south, the signal degrades or dies completely. This is due to the long distance between buildings and the fact that water absorbs wireless signals.



*Fig.1:* Wi-Fi Signals Strength Maps