



Since its inception, Wi-Fi technology has grown in leaps and bounds. It is now one of the most popular wireless technologies and the burgeoning growth of Wi-Fi 'hot spots' across the globe clearly affirms its popularity. Its potential to spawn innovative applications has also made it a subject of interest for researchers.

In Wi-Fi networks, the localisation of nodes with the help of radio-based information is a critical issue that needs to be considered. This is because Wi-Fi enabled devices have become ubiquitous and localisation of such devices would enable innovative applications. Although global positioning system (GPS) receivers can be used for facilitating localisation, their absence in most wireless clients and their disability to work indoors leaves radio-based localisation as the only viable option.

Existing radio-based localisation techniques such as VORBA and RADAR are primarily suited for localising client nodes. None of these approaches are concerned with the localisation of infrastructure nodes or access points (APs). However, the localisation of infrastructure nodes has tremendous application scope and it could be used to develop datasets for use in social science.

Frost & Sullivan has therefore taken interest in work conducted by researchers from Stony Brook University in the USA. The researchers have developed an innovative system capable of localising roadside Wi-Fi APs with the help of a steerable beam directional antenna mounted on a moving vehicle. Localisation can be achieved by simply driving through the neighbourhood where the APs need to be localised.

In this research work, the researchers have utilised an architecture called MOBISTEER. This architecture, consisting of a steerable beam directional antenna with a Wi-Fi client node placed on a moving vehicle, is used to gather frames that originate from the roadside APs on different directional beams to assess the angle of arrival (AoA) of the frames.

To ensure accuracy, the system collects many samples of AoA data from different locations. Thus, in order to collect these samples with minimal effort, a moving vehicle is required. After collecting the AoA data from different locations, localisation details are calculated.

The researchers have identified that multipath propagation in complex environments, due to reflections from building and other structures, can lead to significant localisation errors. To address this issue, they have come up with an innovative clustering-based technique. The idea is to recognise beforehand that there could be images of the AP and the real AP might be indistinguishable from the images. From the images, the real AP is identified with the help of an heuristic. This clustering method has exhibited high localisation accuracies when compared to existing techniques with omnidirectional or directional antennas.

According to Anand Prabhu Subramanian, one of the researchers involved in this work, "The goal is to localise roadside Wi-Fi APs in urban areas. This means being able to tell where the APs are actually located. We are able to localise APs within an accuracy of about 10 to 30 m. The localisation is completely passive and is based on 'sniffing' wireless data packets and assessing their signal strength values for different antenna beam orientations at different points on the vehicle's driving path, and then analysing this data."

He also mentioned that the technique would help in creating accurate Wi-Fi maps that could provide researchers with significant datasets for simulations and modelling purposes of large scale Wi-Fi deployments.

With Wi-Fi APs being deployed in a chaotic manner in homes, offices, campuses, and hot spots, there is little knowledge about the nature of these networks. This work could be utilised to gain knowledge of these networks and eventually, this knowledge could be used to extrapolate data that might be useful in censuses and for other purposes.