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WI-FI Access Point (WAP) OPTIMAL Placement in an Indoor Location

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Abstract: ***The popularity of location based applications is undiminished today. They require accurate location information which is a challenging issue in indoor environments. Wireless technologies can help derive indoor positioning data. Especially, the Wi-Fi technology is a promising candidate due to the existing and almost ubiquitous Wi-Fi infrastructure. The already deployed Wi-Fi devices can also serve as reference points for localization eliminating the cost of setting up a dedicated system. However, the primary purpose of these Wi-Fi systems is data communication and not providing location services. This accuracy can be increased by carefully placing the Wi-Fi access points to cover the given territory properly. This method is based on simulated annealing which finds the optimal number and placement of Wi-Fi access points with regard to indoor positioning and investigate its performance in a real environment scenario via simulations.***
Keywords: ***Wi-fi access point (WAP), simulated annealing, router, wireless, placement, locationing.***

I. INTRODUCTION

A Wi-fi access point (WAP or AP) is a device that allows wireless communication devices to connect to a wireless network using Wi-Fi, Bluetooth and related standards. The WAP usually connects to a wired network, and can relay data between the wireless devices (such as computers or printers) and wired devices on the network.An access point is a device that creates a wireless local area network, or WLAN, usually in an office or large building. An access point connects to a wired router, switch, or hub via an Ethernet cable, and projects a Wi-Fi signal to a designated area. Location-aware services and applications become widespread today due to the rapid development of pervasive communication and the proliferation of mobile devices. In these services, collecting or computing position information is a key issue. **T**he number and position of the reference points can influence substantially the accuracy of position computation, too. Hence, the design principles of legacy Wi-Fi systems have to be reconsidered when providing location sensing is also required. Furthermore, we have developed a simulation tool in MATLAB environment for the given problem. We used this tool to implement our algorithm together with the ITU indoor wireless signal propagation model and to investigate the algorithm's behavior.

II. DESIGN METHODOLOGY

An access point is a wireless network device that acts as a portal for devices to connect to a local area network. Access points are used for extending the wireless coverage of an existing network and for increasing the number of users that can connect to it. A high-speed Ethernet cable runs from a router to an access point, which transforms the wired signal into a wireless one. Wireless connectivity is typically the only available option for access points, establishing links with end-devices using Wi-Fi. An access point is a device that creates a wireless local area network, or WLAN, usually in an office or large building. An access point connects to a wired router, switch, or hub via an Ethernet cable, and projects a Wi-Fi signal to a designated area. For example, if you want to enable Wi-Fi access in your company's reception area but don't have a router within range, you can install an access point near the front desk and run an Ethernet cable through the ceiling back to the server room.

A. Adding a wireless network to an existing wired network

Adding a WAP to your existing wired network is useful to accommodate those devices that are only capable of wireless connection. It is like creating another network only for wireless devices but still be a part of your existing wired network. Adding a WAP in the existing network is like joining two networks together to form a single network for both wired and wireless devices such as shown in the diagram.

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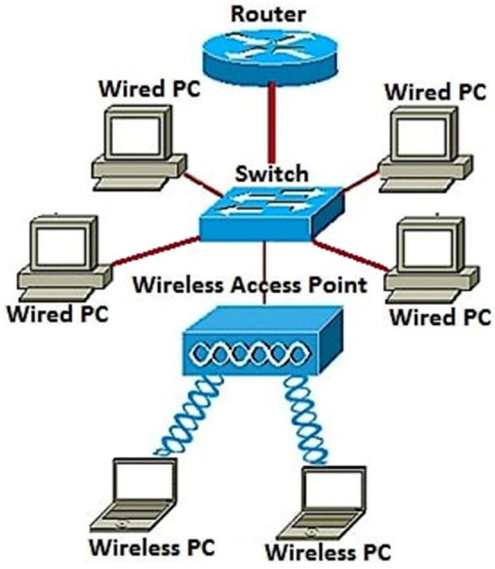

Fig 1: The block diagram of the proposed system

B. Connecting Multiple Access Points Together through Wireless Distribution System (WDS)

WDS lets you connect multiple access points together. WDS allows the connected access points to communicate with each other via wireless connection. This feature enables clients who roam to have a seamless experience. This makes it easier to manage multiple wireless networks as well as reduces the amount of cables required to connect the networks. The WAP can act as a single point-to-point mode access point, point-to-multipoint bridge or as a repeater. On a repeater mode, a WAP can establish a connection between other access points that are far apart. It will simply act as a wireless extender. Wireless clients can connect to this repeater. A WDS role system can be compared similar to the role of the repeater.

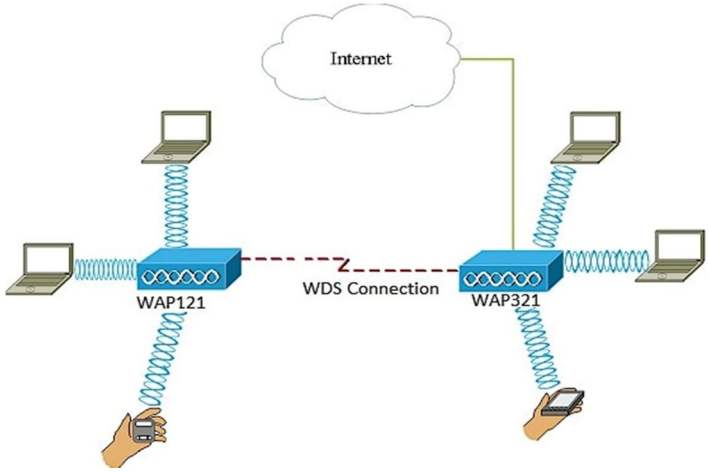

Fig 2: Connecting multiple access points together through Wireless Distribution System (WDS)

Method for optimal Wi-Fi access point placement is following top-down AP placement algorithm to find the optimal AP location setup(s). The first step is to place an AP in every discrete grid junction point of the territory map. In the next step, the coverage area of each AP must be estimated using wireless signal propagation models in order to determine the number of perceived APs in each point of the territory where a mobile terminal can be located. In real environment, this can be almost any point of the continuous space, but we consider only discrete points with high density, equals to the map resolution in our simulations, in order to make the calculations possible. If there is no point on the map where the number of perceived APs is less than three, than one AP can be removed. Simulated annealing is used to approximate the optimal AP setup for Wi-Fi based indoor positioning. Simulated annealing is a generic probabilistic algorithm for the global optimization problem. It tries to locate a good approximation of a given function's global optimum in a large search space even for NP complete problems.

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III. RESULTS AND DISCUSSIONS

In the simulation the performance of different user association rules is evaluated in a WiFi sytem that comprises of K fixed access points. Here the user employ a random access point association rule. The transmission rate uses continues rate model and takes into account. The interference while the concurrent transmission from other APs on the downlink. The bandwidth of each AP is equally shared between all the users associated with this AP.

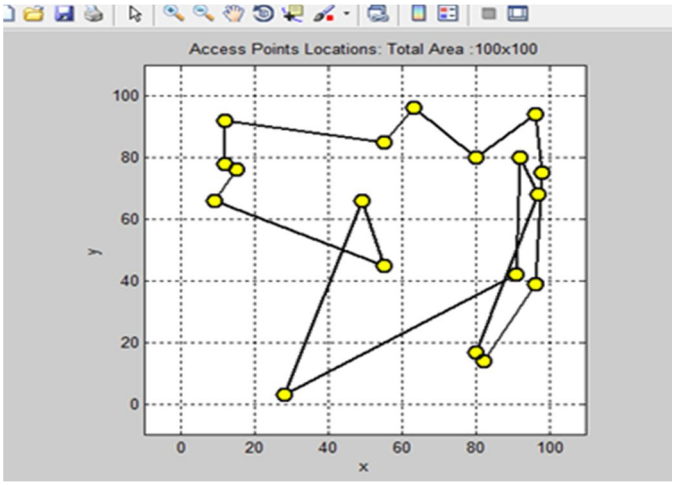

Fig 3: Positioning using annealing simulation

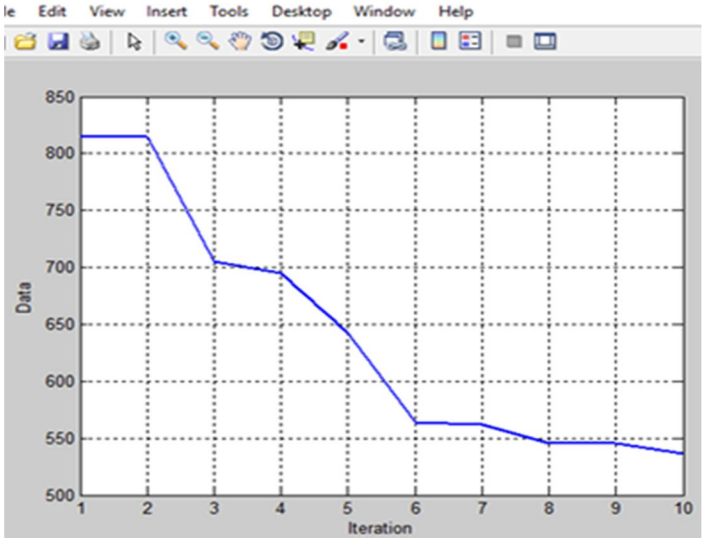

Fig 4: Output of annealing simulation

IV. CONCLUSION

Here we investigated the issue of optimal placement of Wi-Fi access points for indoor positioning. That means, how to place the access points to perceive the signal of at least three reference APs everywhere in the given indoor territory, but keep the number of deployed APs as low as possible. We proposed a simulated annealing based method, showing linear runtime behavior, to find a good approximation of the optimal solution. Furthermore, we have developed a simulation tool in MATLAB environment for the given problem. We used this tool to implement our algorithm together with the ITU indoor wireless signal propagation model and to investigate the algorithm's behavior. Minimizing the amount of required access points the cost of deployment and the operation expenses can be reduced, but still an efficient positioning system can be operated. The developed simulation tool and our simulated annealing based algorithm are generic and they can be useful in planning radio based positioning systems not just focusing on Wi-Fi technology. The simulator is adaptable to different wireless technologies by adjusting the signal propagation parameters or even replacing the propagation model. Additionally, further investigated the performance and limitations of our algorithm. We plan to collect real measurements and compare them with our simulation results.

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REFERENCES

[1] H. Liu, H. Darabi, P. Banerjee, and J. Liu, "Survey of Wireless Indoor Positioning Techniques and Systems," IEEE, Nov. 2017.
[2] O. Baala, Y. Zheng, and A. Caminada, "The Impact of AP Placement in WLAN-based Indoor Positioning System," in Proceedings of the Eighth International Conference, March 2019.
[3] Srinath Mathivannan and S. Shashank proposed the "Indoor Access Points Location Optimization Using Differential Evolution", Global Virtual Conference, March 2018
[4] Shyamala Kumari and M. Deepa Rani proposed the "Rapid Deployment of APs in WLAN Indoor Positioning System," in 10th IEEE International Symposium, June 2019.
[5] P. Bahl and V. N. Padmanabhan, "RADAR: An in-building RF based user location and tracking system," in Proceedings of the 19th IEEE International Conference on Computer Communications, March 2018.
[6] T. King, S. Kopf, T. Haenselmann, C. Lubberger, and W. Effelsberg, "COMPASS: A Probabilistic Indoor Positioning System Based on Digital Compasses," in Proceedings of the First ACM International Workshop on Wireless Network, Sep. 2016.
[7] M. Youssef, A. Agrawala, and A. Udaya Shankar, "WLAN Location Determination via Clustering and Probability Distributions," in Proceedings of the First IEEE International Conference on Pervasive Computing and Communications, March 2013.

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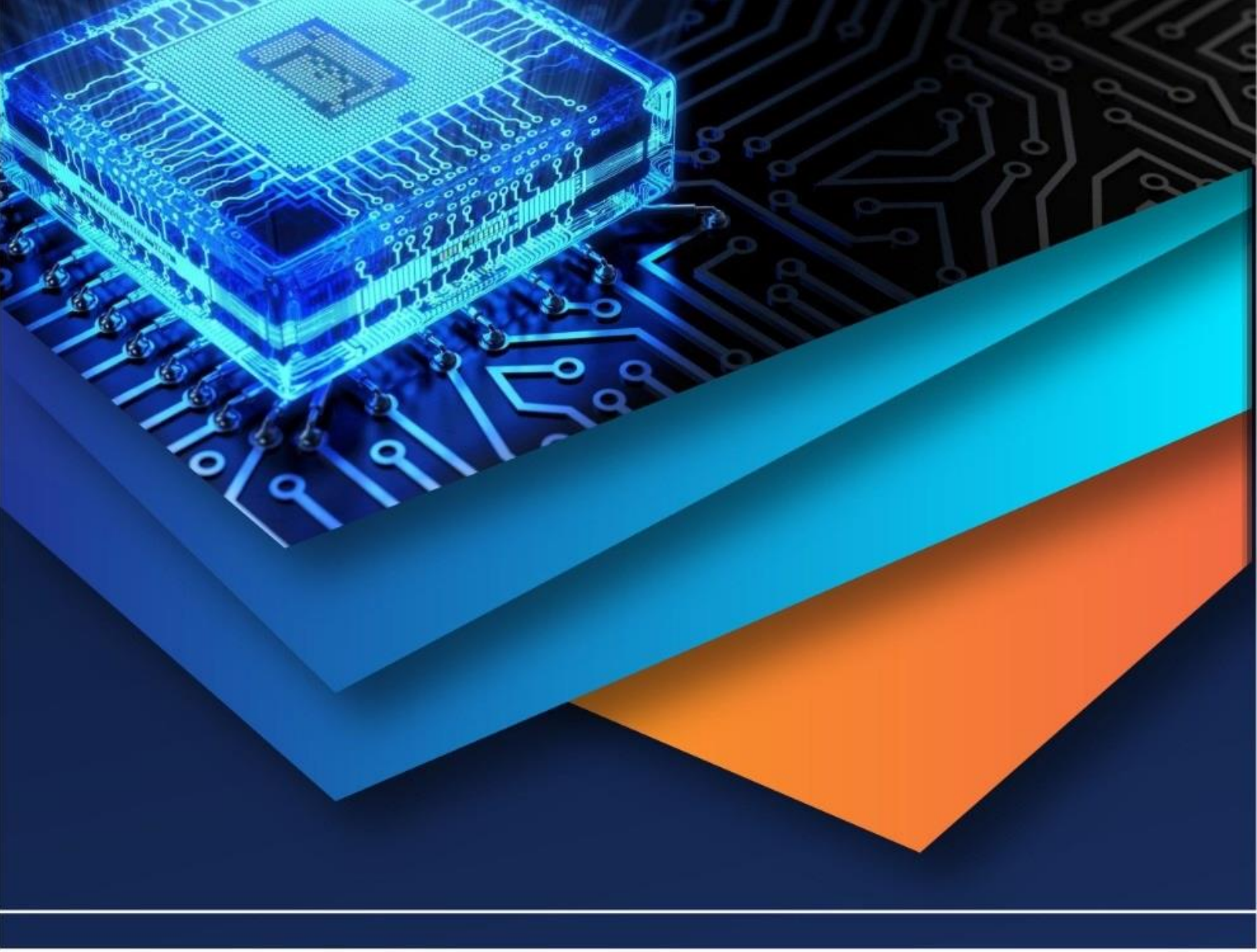

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