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Mobile User Location Tracking System for Indoor Technologies Using Radar Application

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SUMMARY

The paper is based on user location identification and tracking system using RADAR system. The RADAR system is work on a radio frequency system and the system is used for location identification and tracking a user's inside an organization, buildings and research center. This system operated with the help of recording and processing of signal strength information at the multiple base stations inside the area of interest and its combines the observed measurements range with transmission signal modeling for determine the mobile user location. It is enabling the location aware services and all these application which are related to the mobile user range estimation which tracks user location that experiment done using Simulink 8.1. Additionally, we have added a number of new enhancement, together with an actually range of mobile user and estimated range of mobile user for continuous tracking user locations.

Keywords: Electromagnetic; Mobile user location; Matlab software; Radar system; Transceiver; Wireless.

I. INTRODUCTION

User location identification and tracking system is based on Radio-Frequency (RF) which is useful from the perception of mobile user in local-area networks, widespread use over the last few years of the radar system. Ability to locate the mobile users that allows a system to tailor itself about changing network topology and to provide services based on user location. This research paper reviews some of the recent application areas and discussed the benefits, issues of Radar monitoring and tracking system. It presents a mobile framework that implements a general tracking and estimation of the actual range system. This framework helps to locate lost or misplaced mobile devices, and finds use in a variety of other related scenarios if tracking and monitoring the system.

Our experimental outcome is quite encouraging with high probability RADAR which has the capacity to evaluate a mobile user location inside of a couple meters of his/her genuine area. This suggests that a large portion of area aware administrations can be constructed more than a RF neighborhood information system.

To the best of our insight, past exploration on in-building of location based system has large dependent on particular equipment and advancements that experience the bad effects of huge restrictions and require broad arrangement of infrastructure singularly for finding users? As an illustration, systems that used the infrared (IR) with wireless technology have been accounted for in (Nelson, 1998; Want *et al.*, 1992; Azuma, 1993; Adams *et al.*, 1993; Harter and Benett, 1993; Ward *et al.*, 1997). The constrained scope of an IR system, which encourages user location, is an impediment in giving universal scope. To conquer this issue,

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a couple of scientists have also created RF-tag based location system (Christ *et al.*, 1993; Werb and Lanzl, 1998). Tragically, these systems having a similar to their IR partners are regularly fabricated for the sole motivation behind deciding user location. They do not give any information about system administrations. Moreover, the specific equipment shows that system requirement is frequently cost restrictive.

Here some more research are exhibited who have concentrated on creating administration architectures for area mindful system (Maass, 1998; Nelson, 1998) and less consideration has been paid to the basic and testing issue of finding and following portable clients, particularly in-building situations. The couple of endeavors that have tended to this issue have normally done as such in the connection of Infrared (IR) wireless network systems. The restricted scope of an IR system, which encourages client area, is an impediment in giving universal scope. Additionally, the IR system is frequently sent for the sole motivation behind finding individuals and does not give customary information about system administration. To evade these impediments, we concentrate on RF remote systems in our exploration. We developed to implement a general tracking system to locate user location and estimate the actually range of the user.

The summary of this proposed research is prepared as follows. In Section 2, discussed the literature review study based on mobile user location estimation and actually range calculation. The Radar system and its mathematical model are illustrated in Section 3. The main design of the mobile location identification and tracking system where we evaluated the observed radar signal using the mathematical model on the MATLAB platform explained in Section IV. Finally, we present our conclusion and future scope in Section V.

II. RELEATED WORK

It is the zone of user location network and tracking falls into the accompanying general classes: (1) in-building IR systems, (2) wide-region cell systems (based on RF) (3) The Global Positioning System (GPS) to calculate the mobile user position and actually range. The Active Badge networks (Want et al., 1992; Harter and Hopper, 1994) were an early and critical commitment to the field of location aware systems. In this system, an identification worn by a person emanates a special IR signal each 10 seconds. Sensors put at known positions inside of a building get the interesting identifiers and hand-off software for manage the mobile user location.

Although these systems gives exact location data, it experiences a few downsides: (a) it scales inadequately because of the restricted scope of IR, (b) it acquires huge establishment and support expenses, and (c) it performs ineffectively in the vicinity of direct daylight, which is liable to be an issue in rooms with windows. Another system taking into account IR technology is depicted in (Azuma, 1993). IR transmitters are joined to the upper limit at known positions in the building. An optical sensor on a head mounted unit detects the IR guides, which empowers the system software to focus the user location. In which system experiences comparable disadvantages as the Active Badge of the system.

As of late, a few location systems have been proposed for wide-region cell system (Tekinay, 1998). The scientific choices for finding cell phones include measuring the signal lessening, the Angle of Arrival (AOA) and the Time Difference of Arrival (TDOA). While these all systems have been discovered to be shows possible in outdoor and indoor situations, there is restricted by the numerous reflections endured by the RF signal, and the failure of off-the-rack and cheap equipment to give fine-grain time synchronization.

Another system is based on the GPS (Misra and Enge, 1999), while extremely helpful outside, and are ineffectual indoor on the grounds that structures block of the GPS transmissions. The Daedalus project (Hode *et al.*, 1997) built up a system for coarse-grained mobile user location. The base stations are transmitting signals enlarged with their physical directions. Versatile host devices have area to be the same as that of the base station to which it is connected. Subsequently, the accuracy of a system is restricted by using the cell size.

Our work contrasts from past work in that we handle the issue of mobile user location and tracking on a generally accessible radio frequency based on the wireless system in an in building environment. RF systems offer a noteworthy point of preference over IR arranges regarding reach, versatility, organization, and upkeep. With rates of up to 11 Mbps, these systems have increased fast acknowledgement and are in effect generally sent in workplaces, schools, homes, and so forth, although their work and our own are comparable in a few ways, it is likewise vary in huge ways. These system are clarify in quickly (1) it is subject to concentrated equipment of the system, (2) it cannot use any spread demonstrating to fabricate a radio guide of any building, (3) it could not an component of user body introduction (4) it is obliged infrastructural sending more than a neighborhood system.

III. RADAR SYSTEM

Essentially Radar is acronym for radio distinguishing, location (range and bearing) and development of moving and non-moving target. It is based on an arrangement of off-the-rack wireless LAN innovation. The base stations are positioned so as to give covering scope in the region. A convenient user conveys information with him/her by a processing device well-appointed with a wireless LAN card equipped for bidirectional correspondence with the arrival applications.

The basic thought in RADAR is that in a RF system and the energy level of the RADAR or signal quality of a package is an element of the receiver location. Thus, it gives a mean to deriving the mobile user location. There is a reasonable pattern in signal strength as a user strolls about the building. As anyone might expect, the sign got at the portable is most grounded when the receiver is near to the access point and weakest while it is extreme away. This solid pattern, watched for every neighboring access point in competition, is demoralized by the given system to approximation the mobile user location.

The significant part of the exertion in sending RADAR goes into making the Radio Map of the building. We assessed two methodologies for this reason. The principal system for making a Radio Map includes a mobile strolling to distinctive locations in the building, ideally near to each other, and expressly measuring and recording at every area, both the physical directions and the signal quality of the guide bundles from each of the access point inside of extent. The second system to build a Radio Map includes processing and recording the signal quality from every single neighboring access point using a scientific model of indoor RF signal spread. We have built up a basic yet authentically exact model that obliges diverse building formats while considering both free-space path loss and decreasing due to obstruction between transmitter and receiver of mobile signal. To find the position of the versatile user continuously, the mobile measures the signal quality of each of the access point inside of extent. It then inquiries through the Radio Map database to focus the sign quality that best matches the sign qualities it has measured. The system assesses the area connected with the best-coordinating signal quality, to be the location of the mobile users.

In the present research we implement a radar locater using MATLAB Simulation model. In which we have the calculated antenna area, noise of antenna, antenna gain, calculated SNR, estimated range of mobile signal and checked SNR using Simulink block designed by using radar mathematical equation.

Pulse of radar is used for predicting the range with by measuring the difference time between the transmitter and receiver of every single pulse. Whenever the pulse widths determined the range resolution and Pulse Repetition Frequency (PRF), it estimates the range of RADAR pulse where estimation results are instantly recognizable. Here we show a Simulated block of radar locater in which all parameter are shown clearly, every block have own mathematical equation and different functionality.

IV. MATLAB SIMULATION STAGE: RADAR LOCATER

When measuring the performance of radar several parameters are influenced, all parameter are inter-related to each other. There are all blocks of radar locater which gives a specific outcome and have a certain

characteristics is shown in Fig. 1. The "Radar Equation" significant echo signal power P_r based on the given parameters:

$$P_t = \frac{P_t G^2 \lambda^2 \sigma}{(4\pi)^3 R^4}$$

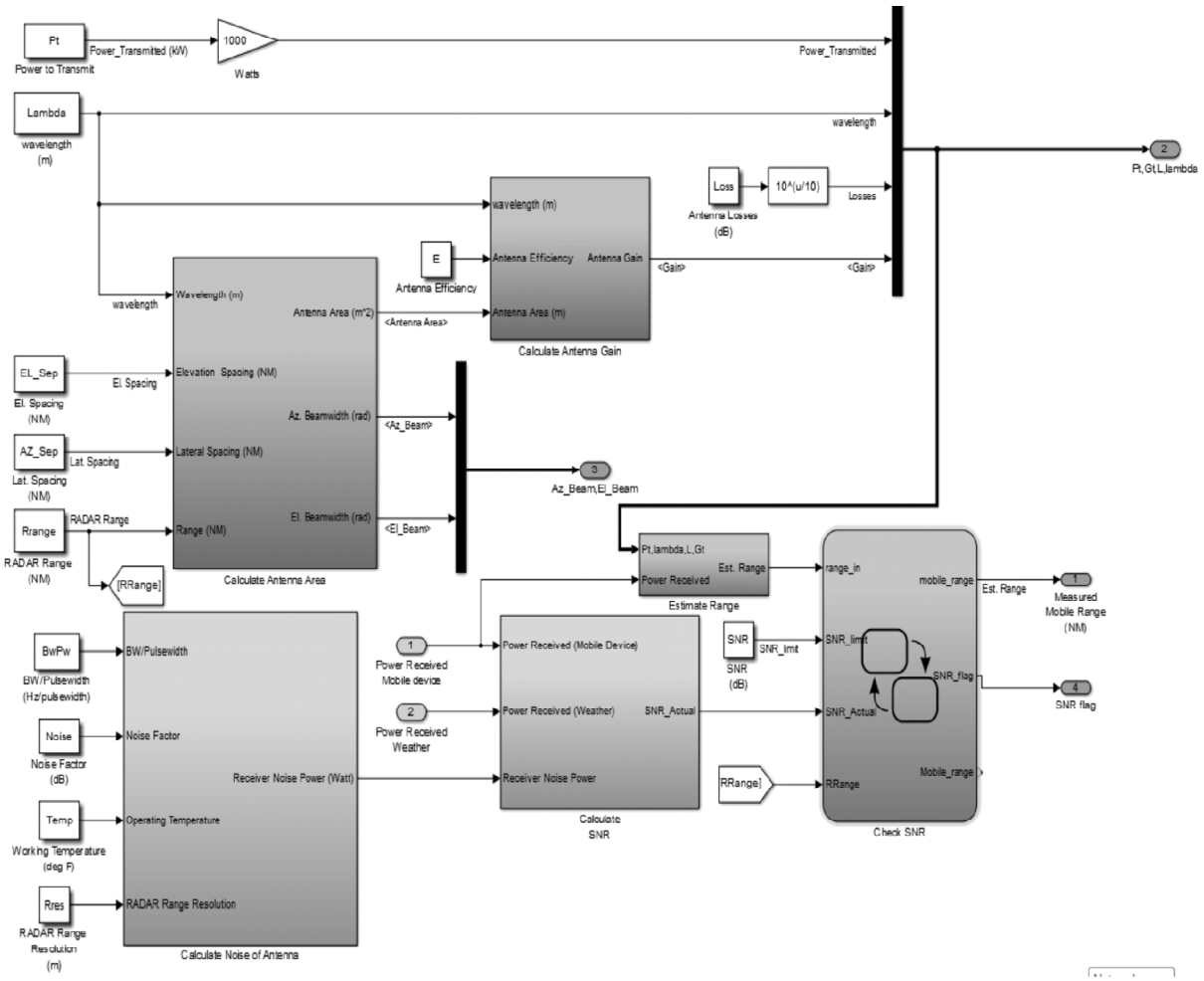

Figure 1: The complete RADAR locater implemented using simulation technique.

(A) Antenna Gain of Radar System

Antenna gain of radar system is depends on the transmitter and receiver power of the antenna squared inside the radar equation. We have implement radar gain equation in the Simulink, the gain of radar system have the antenna area, antenna efficiency, squared of the wavelength and one constant (4ð), the implementation is exactly shown in the fig. 2. All these parameter gives the value of the antenna gain for example 12-dBi is taking for biquadrate antenna and 70-dBi is used in the extremely focusing on the parabolic antenna.

(B) Receiver Noise Power of Radar System

The simulation result of the receiver power was implemented with using the signal bandwidth, speed of light, radar resolution and noise factor and operation temperature. The receiver noise power of radar system is calculated in watt as shown in fig. 3.

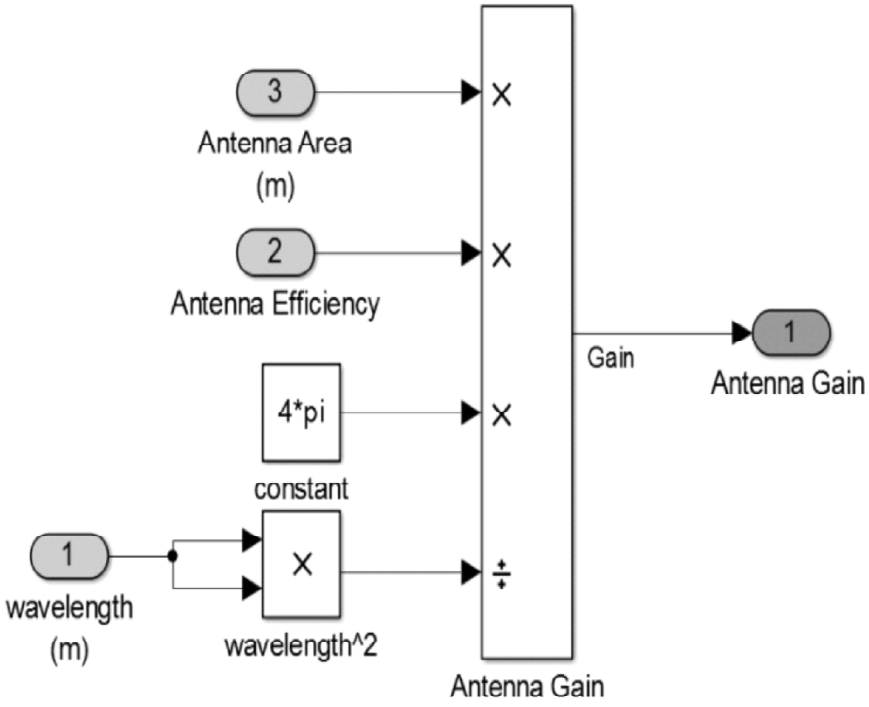

Figure 2: Antenna gain of RADAR System implemented using matlab simulink.

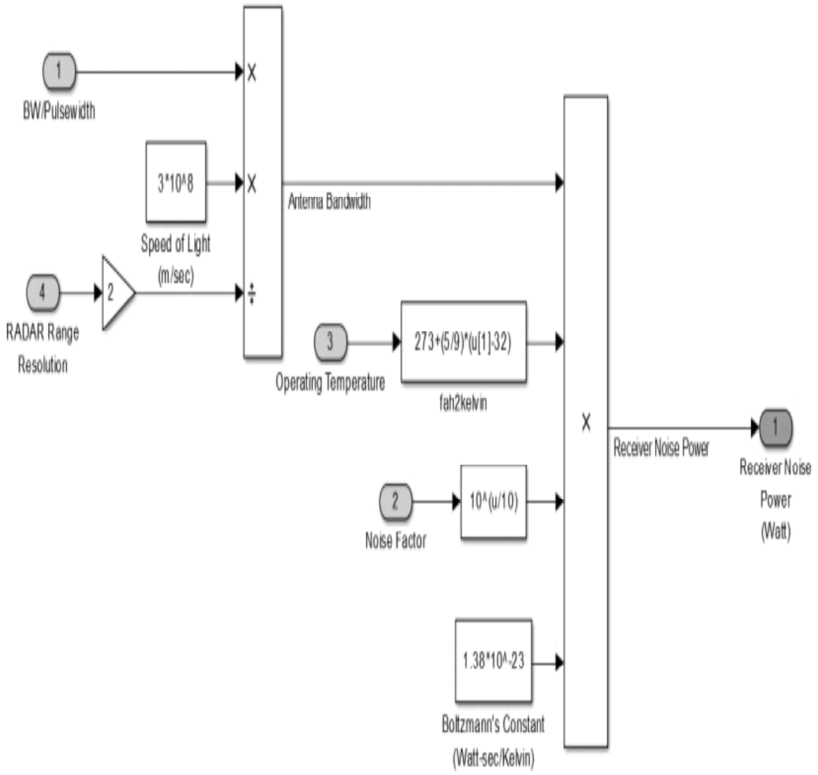

Figure 3: The receiver noise power of RADAR System implemented using Simulation technique

Signal Bandwidth (BW): The Signal bandwidth of the Intermediate Frequency (IF) securing system must be adequate to precisely that are representing the ascent time of the pulsed signal. The data transmission is likewise straight forwardly identified with reach determination, Time between measured signals: The time between the signals are measured because of the Pulse Repetition Interval (PRI) of the deliberate

signal, the nearby in stage clamor of the estimation system should be considered because of combination time at lower balance frequencies.

(C) Signal to Noise (SNR) of Radar System

The Receiving a radar echo signals from the Radar receiver with an adequate signal-to-noise (SNR) are the biggest challenge of radar systems, SNR determines discovery likelihood and estimation precision of any target. A simulated block of SNR has some parameters which implement power received from mobile signal, power received from weather signal and receiver noise signal. All the parameters are built using the MATLAB built and SNR values are calculated.

(D) Signal Range Estimation

In the previous section we have discuss about the radar with all parameters. After getting the estimated range of signal from the radar block, we will connect our mobile device with the radar and locates the location of mobile user and tracks the direction. The implementation of the mobile signal in the MATLAB shown in fig. 4. and shows the actually user mobile range and returned signal from the mobile user to the radar.

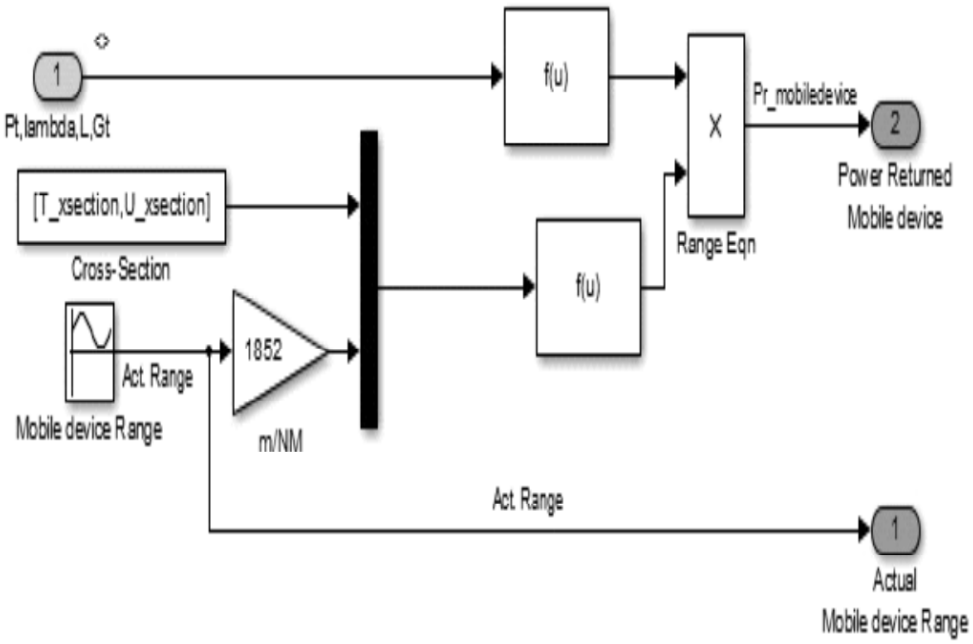

Figure 4: The mobile signal range estimation block implemented using Simulation technique.

When we simulated our designed model in Simulink 8.1 than we got two range of mobile signal such as actual and estimated range is shown in Fig. 5. The Actual range (Yellow Shade) and estimated range (Magenta Shade) are showing the magnitude at vertical with respect to different time slot.

V. CONCLUSION AND FUTURE WORK

We designed a system that works on Radar principle and methodology, which are using location identification and tracking of mobile users inside an organization or building. While the observed method is greater in the provisions of accuracy and signal propagation technique was made deployment easier. We are showing here the unsympathetic nature of radio channels. It can be able to locate and track mobile users with high degree of signal accuracy.

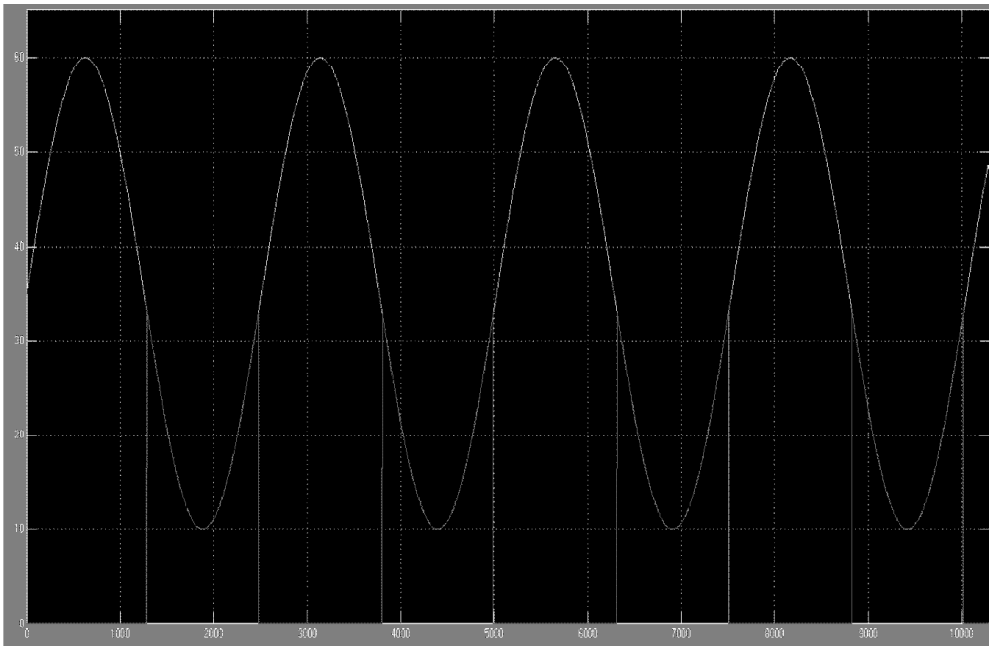

Figure 5: The Simulation result of mobile signal actual and estimated range

The middle solutions of the RADAR system have the range 2 to 3 meters, in relation to the size of characteristic office room.

Our results point toward with the purpose of it is possible that construct an exciting category of the location-aware services, like as printing some document from nearest printer, the navigation from end to end a building having large number of the people, etc., thereby adding value inside such type of network. We have got the effectual outcome of the tracked mobile user estimated and actual range using the radar system. Our ultimate plan is that combines location information services with RADAR system and organize within any organization. We are also investigating how a mobile user tracked data will save in the radar database. In the model we can use a database to save a tracked location data as well as information of the mobile user as a future use.

REFERENCES

[1] Nelson, G. J., Context-aware and location systems (Doctoral dissertation, University of Cambridge), 1998.

[2] Want, R., Hopper, A., Falcao, V., & Gibbons, J.,(1992),The active badge location system, ACM Transactions on Information Systems (TOIS), Volume 10, Number 1, pp. 91-102(12).

[3] Azuma, R., (1993), Tracking requirements for augmented reality, Communications of the ACM, Volume 36, Number 7, pp. 50-51(2).

[4] Adams, N., Gold, R., Schilit, B. N., Tso, M. M., & Want, R., (1993), An infrared network for mobile computers. In: Proceedings of the USENIX Symposium on Mobile & Location-indpendent Computing, Volume 10.

[5] Harter, A., & Bennett, F., (1993), Low bandwidth infra-red networks and protocols for mobile communicating devices, Olivetti.

[6] Ward, A., Jones, A., & Hopper, A., (1997), A new location technique for the active office ,Personal Communications, IEEE, Volume 4, Number 5, pp. 42-47(6).

[7] Christ, T. W., Godwin, P., & Lavigne, R. E., (1993), A prison guard duress alarm location system. In: Proceedings of IEEE,pp. 106-116.

[8] Werb, J., &Lanzl, C., (1998), Designing a positioning system for finding things and people indoors, Spectrum, IEEE,Volume 35,Number 9, pp.71-78(8).

[9] Maass, H., (1998), Location-aware mobile applications based on directory services, Mobile Networks and Applications, Volume 3, Number 2, pp.157-173(85).

[10] Harter, A., & Hopper, A., (1994), A distributed location system for the active office, Network, IEEE, Volume8, Number 1, pp.62-70(9).

[11] Tekinay, S., (1998), Wireless geolocation systems and services,Communications Magazine, IEEE, Volume 36, Number 4, pp. 28-28(1).

[12] Misra, P., & Enge, P., (1999), Special issue on global positioningsystem. In: Proceedings of the IEEE, Volume 87, Number 1,pp. 3-15.

[13] Hodes, T. D., Katz, R. H., Servan-Schreiber, E., & Rowe, L., (1997), Composable ad-hoc mobile services for universal interaction. In: Proceedings of the 3rd annual IEEE international conference on Mobile computing and networking, pp.1-12.