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МЕТОДИ ПОЗИЦІЮВАННЯ ОБ'ЄКТА З ВИКОРИСТАННЯМ БЕЗПРОВОДОВОЇ ТЕХНОЛОГІЇ IBEACON

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METHODS TO IMPROVE THE POSITIONING OF OBJECTS USING WIRELESS TECHNOLOGIES IBEACON

It is hard to find a user who didn't uses a mobile phone or tablet without a Bluetooth. Indoor navigation is one of most fast grooving technology. The popularity of this service is growing every day, this technology allows you to track objects (personnel, goods, transport), equipped with special equipment (laptops (notebooks, tablets, laptops), phones, and other devices using Bluetooth, with precision 1 meter, the technology requires large investments of money and requires no training staff.

The main problem is to develop a method for determining the distance between the signal source and receiver. These sensors signal levels are reduced exponentially depending on the distance between the transmitter and receiver, and the noise factor. Thus, this relationship can be seen as a function of distance. Distance estimated signal strength is represented as a circle with a radius around the access point. The intersection of the three hotspots radii determines the point or zone receiver. This model can be represented by the following system of equations:

$$r_1^2 = (x - x_1)^2 + (y - y_1)^2,$$
$$r_2^2 = (x - x_2)^2 + (y - y_2)^2, \tag{2}$$

$$r_3^2 = (x - x_3)^2 + (y - y_3)^2,$$

where x_1, x_2, x_3, y_1, y_2, y_3 - coordinates access points, r_1^2, r_2^2, r_3^2 - appraised range.

Solving this equation system gives the point of intersection of circles that determine the localization (Figure 1).
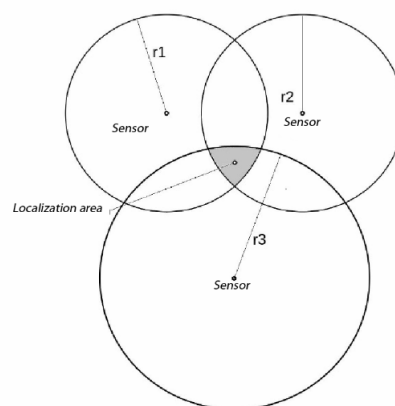

Fig. 1. Definition area of the object by trilateration

It had conducted text classification sentiment analysis of internet comments to films. The frequency of occurrence of words in the text was determined and on the basis of an analysis of words belonging to a particular type comments like "positive" or "negative" and were found 5% most popular and most used words on "positive" and "negative" comments.

Measurements made at a distance of 1 to 6 meters in 6 points on one line within the premises where the sensor is located. Signal strength is measured 10 times in each of these 6 points. Carpet area is 25 square meters. Presented in Table 1 shows a comparison of the model signal propagation in free space is not effective for use in the same room. This approach requires a model that allows for reflection and distortion signal which will provide greater accuracy., One of the solutions to improve the accuracy is the use of probabilistic estimation of parameters of signal propagation.

The study, using the software for the Smartphone, the measured average value of a single sensor signal. In Table 1, the measurements taken with the device, compared with measurements, calculated based on the equation in which the initial level of the signal measured device deductible loss of signal strength in Table 1.

Table 1. Comparison and evaluation of the measured signal levels

Distance,m	The actual signal level, dBm	Rated signal level, dBm
1	-8.3	-4.0
2	-14.7	-8.0
3	-17.9	-13.5
4	-19.7	-17.0
5	-21.8	-18.9
6	-22.4	-20.5

Currently, card facilities available in any digital format or can be created using a wide range of available software. When you create a positioning system inside advisable to use a building that can impose natural limits on human trajectory. During the movement of people can not cross the wall or suddenly move to another part of the building. To reduce the impact of these effects can be applied partial necrosis filter that uses a set of particles distributed in a digital map. Each share has a weight can estimate the most probable location of the receiver.

Variability of Cluster Count: Based on variability of cluster count, clustering schemes can be classified into two types: fixed and variable ones. According to the methods of inter-cluster routing, clustering routing manners in WSNs also include two classes: single-hop intra-cluster routing methods and multiple-hop ones. For the manner of intra-cluster single-hop, all MNs in the cluster transmit data to the corresponding CH directly. Instead, data relaying is used when MNs communicate with the corresponding CH in the cluster. Inter-Cluster Routing: Based on the manners of inter-cluster routing, clustering routing protocols in WSNs include two classes: single-hop inter-cluster routing manners and multiple-hop ones. For the manner of inter-cluster single-hop, all CHs communicate with the BS directly. In contrast to it, data relaying is used by CHs in the routing scheme of inter-cluster multiple-hop.

Wireless sensor networks have attracted significant attention over the past few years, and can be employed in a wide spectrum of applications in both civilian and military scenarios. The design of effective, robust, and scalable routing protocols for WSNs is a challenging task. On the other hand, clustering routing algorithms, generally, can well match the constraints and the challenges of WSNs. As a result, it is clearly seen so far that, significant efforts have been made in addressing the techniques to design effective and efficient clustering routing protocols for WSNs in the past few years.