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Features of measuring the distance between objects of sensor networks in the conditions of indirect visibility

In this paper, the problem of determining the distance between sensory transceivers of chaotic radio pulses, in zones of indirect visibility is investigated. The distance calculation is based on the propagation time of the signal on the air. Estimates the accuracy of the definition between the transceivers, based on the time of the signal passage.

The effectiveness of the algorithm for the environment, in the absence of direct visibility of nodes (hereinafter, NLOS) [1], the radius of distribution within 100 m is shown in Fig. 1.

In this case, the device was located at different points in this area, as expected, it was confirmed that the accuracy of the algorithm is more dependent on the medium of propagation of the signal [2].

The average error value under NLOS distribution is 13.8 meters, which is almost twice the error rate compared with the spread of LOS.

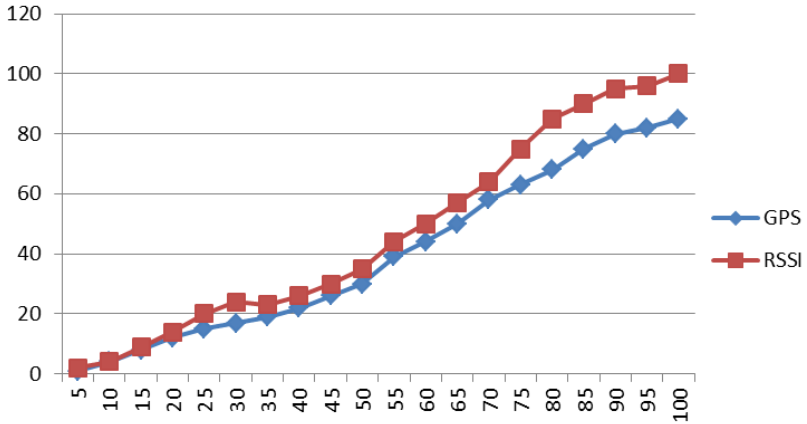

Fig.1 - Accuracy of localization in conditions of signal propagation in the absence of direct view of NLOS, for RSSI and GPS

For visibility, the network was modeled in the absence of direct visibility, and 25 nodes were selected for localization with a radius of 50m [3].

But you can see Figure 2 shows the stages of deployment of the network, and in Figure 2, it is shown that the coordinates of each node are calculated with error, the reason for this is the reflection of the signal from the obstacles [4].

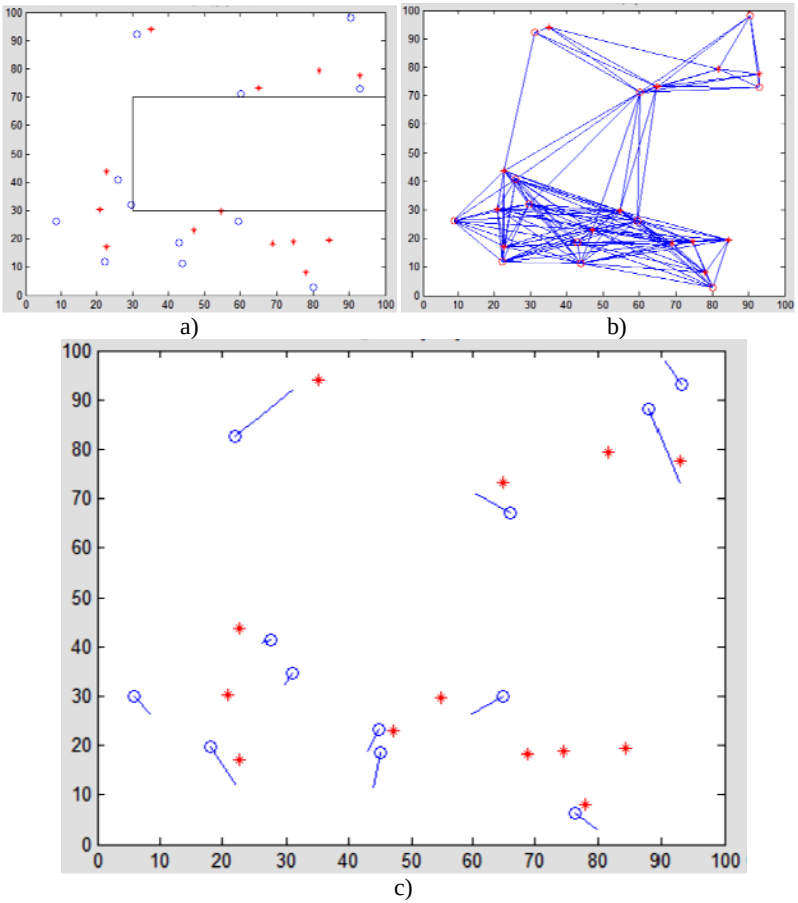

Fig. 2. - Localization of the sensor network using 25 nodes: a) the location of nodes; b) localization of the network; c) estimation of the error

In order to avoid large errors in the localization of the sensor network in conditions of indirect visibility, it is necessary to increase the signal transmission power. In several experiments, it was discovered that the radius of the signal of the nodes should be increased to 75m, the result is depicted in Fig. 3 [5].

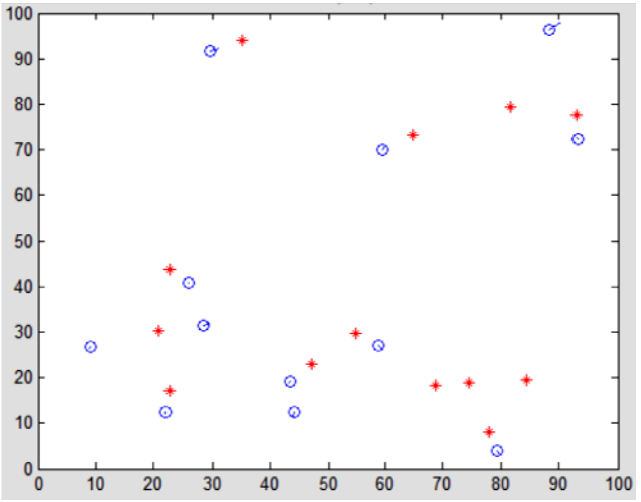

Fig. 3. - Error estimation, with an enlarged radius of up to 75m

Conclusions: The research of localization of nodes of sensory network in the absence of direct visibility of nodes was conducted.

Therefore, in order to obtain the best localization result under conditions of indirect visibility, it is necessary that the radius of nodes action be maximally accessible.

References

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