NON-CONVENTIONAL ALGORITHM OF RADIO TRANSMISSION SOURCES POSITION LOCATION

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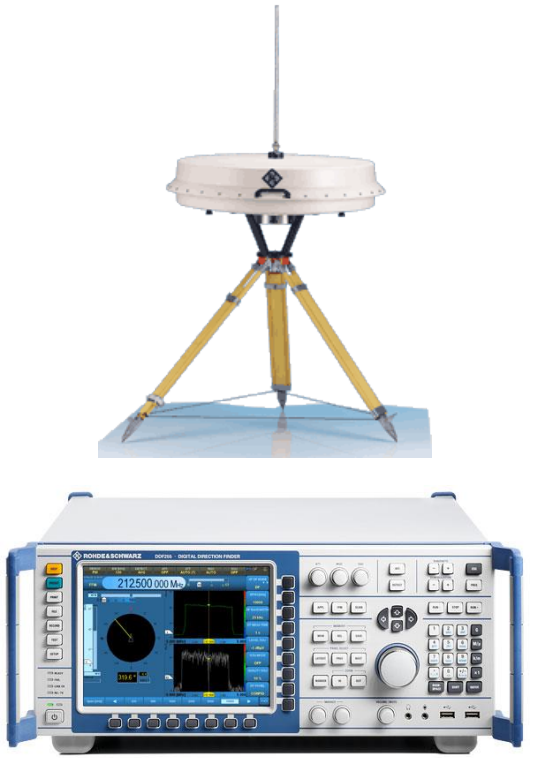
Hardware Position Location

Antenna system for
Stationary Direction Finder



Rohde&Schwarz One Channel DFS

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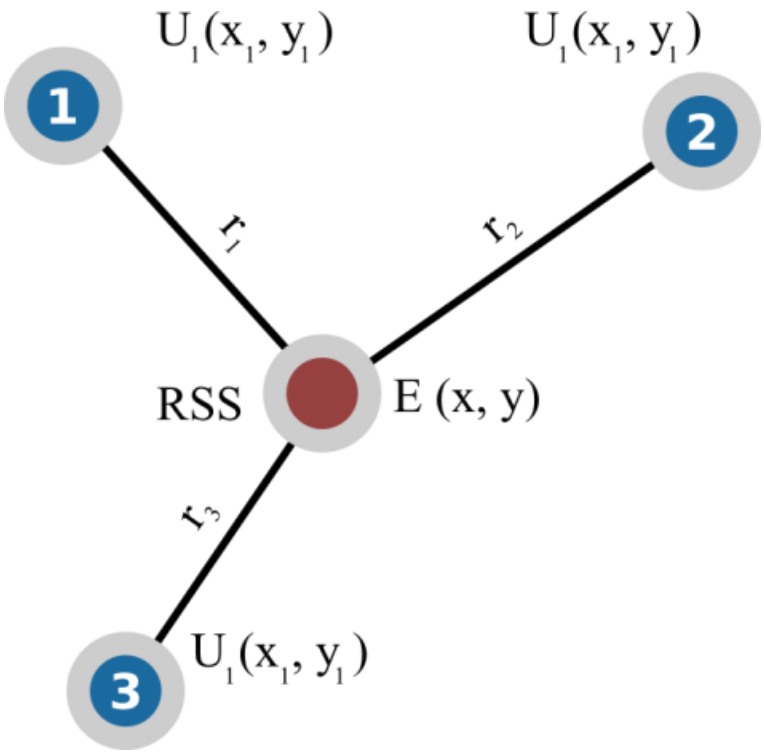
Setting Up of the Problem

1. The transition from the analytical solution of the set of equations to numerical methods of function extremum finding.
2. Working out of the most appropriate way to select the site for RSS signal levels measurements providing the most accurate information concerning its position location.
3. To use the algorithm of level measurement results in different sites processing which is tolerant to RSS signal fluctuations.
4. Working out the software implementation of the RSS position location algorithm putting into force the modified energy method.
5. Algorithmic validation under the real-life conditions.

Transition from Analytical Method to Numerical One



$$U_i = K \cdot \frac{E}{r_i^2}, \quad i = 1 \ldots 3$$

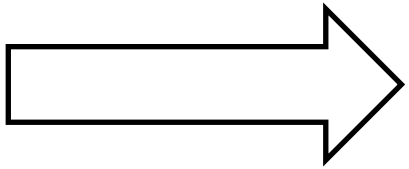
$$r_i^2 = (x - x_i)^2 + (y - y_i)^2$$

Transition from Analytical Method to Numerical One

$$\frac{U_1}{U_2} = \frac{r_2}{r_1}$$

$$\frac{U_1}{U_3} = \frac{r_3}{r_1}$$

$$\frac{U_3}{U_2} = \frac{r_2}{r_3}$$



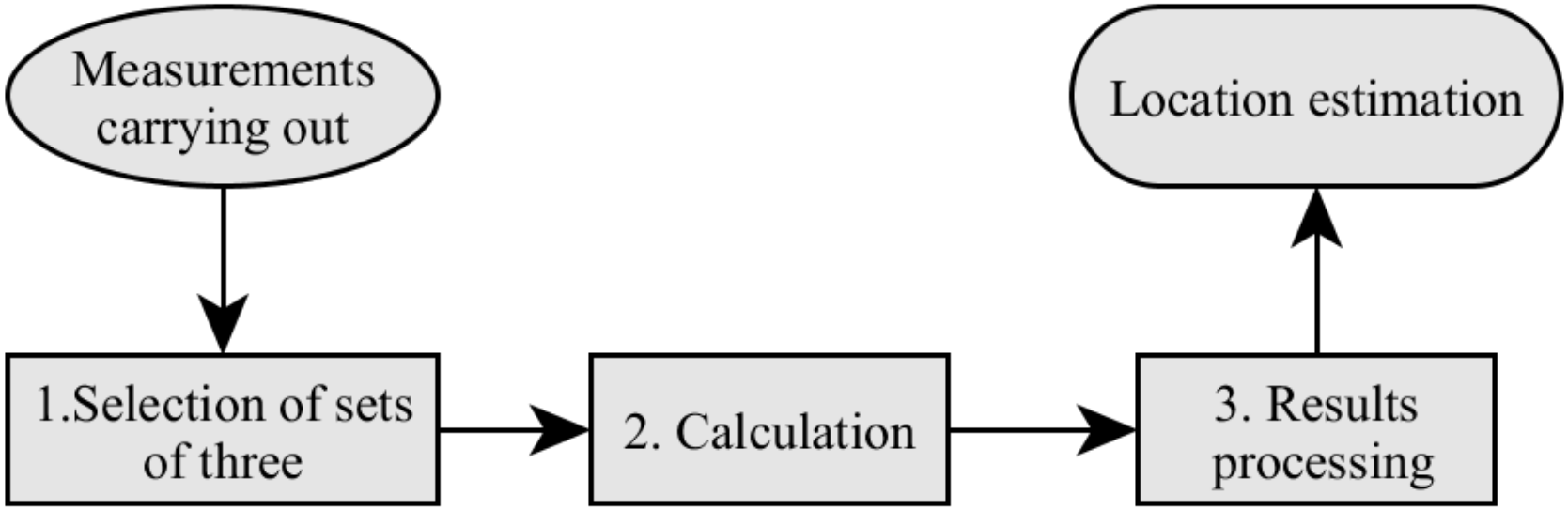
$$F = \sum_1^3 F_i^2 \rightarrow \min$$

$$F_1 = \left(\frac{U_1}{U_2} - \frac{r_2}{r_1} \right)$$

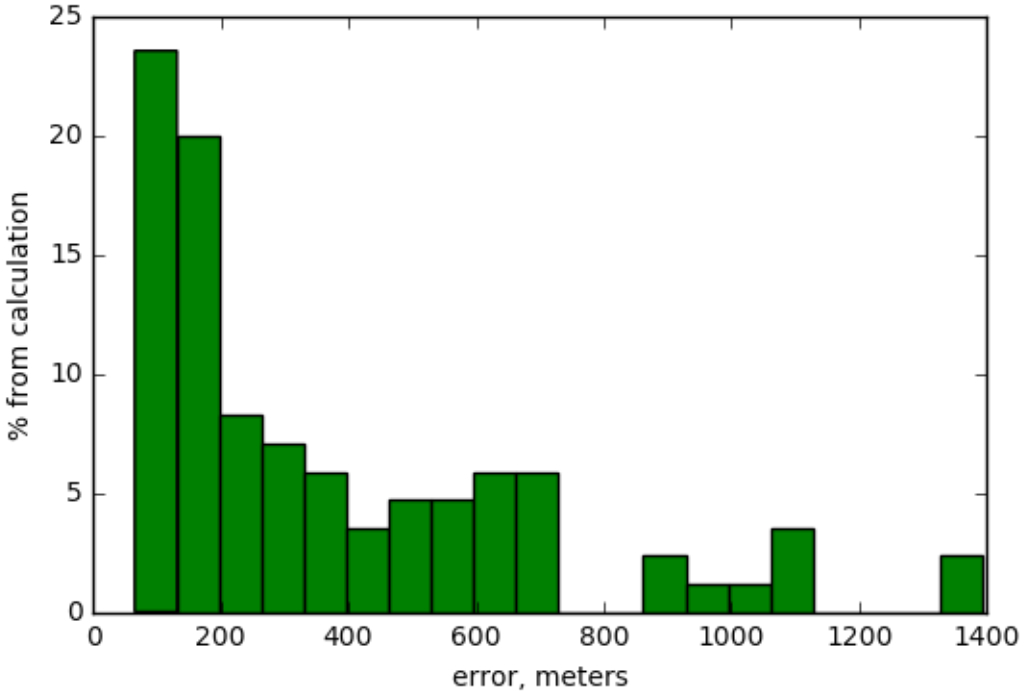
$$F_2 = \left(\frac{U_1}{U_3} - \frac{r_3}{r_1} \right)$$

$$F_3 = \left(\frac{U_3}{U_2} - \frac{r_2}{r_3} \right)$$

Modified Algorithm Structure



Experimental Results



RMSE = 313 meters

Relative RMSE = 10,4 %

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Conclusions

1. The test results of the developed modified energy algorithm have revealed its validity and effective operation under the real-life conditions.
2. The algorithm and its hardware with software implementation can be used for different purposes by the organizations dealing with radio communication monitoring including the analysis of radio-electronic equipment electromagnetic compatibility.
3. Further improvement of the algorithm is worth doing by adding extra functions, providing the possibility of its use in determining the location of the radio signal sources perspective radio communication systems

Radio Network Monitoring Complex

Thank You for Your Attention!