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Exercise for the lecture

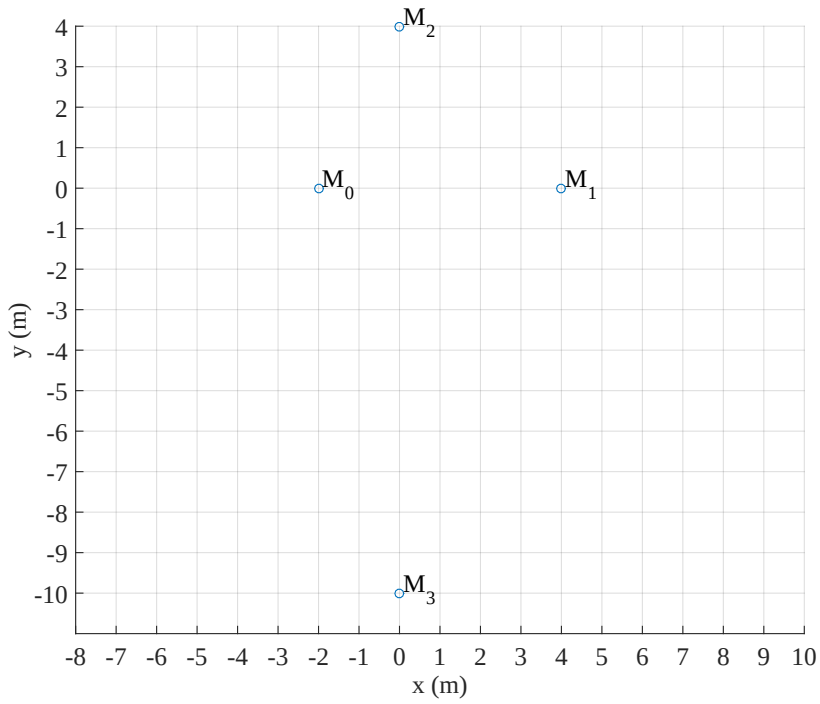
Wireless Sensor Networks

Summer 2016

Sheet 11

EXERCISE 13:

Four ultrasound receivers and a speaker are placed in a room at the same height. Assume they are at the positions M_0, M_1, M_2 and M_3 as shown in the figure. The sender emits a signal at the time 0. Then, the receivers receive this signal at the times t_0=0.0058 s, t_1=0.0117 s, t_2=0.0117 s and t_3=0.0437 s. The velocity of the sound is 343 m/s.



1. Where is most likely to be the sender?
2. What do you think has happened with the measurement of the receiver M_3?
3. Assume we reject the measurement of the receiver M_3. Then, we repeat multiple times the measurements with the remaining receivers and we get exactly the same results. However, the real location of the sender happens to be in x=5 m and y=0 m. What can you say about the accuracy of the measurements? and the precision? Which metrics would you use to measure them? What would be the result using such metrics?

EXERCISE 14:
Enumerate the advantages and disadvantages of the following technologies:

1. Dead Reckoning
2. Multilateration with absolute ranges
3. Multilateration with relative ranges
4. Fingerprinting