Reduction of Location Estimation Error using Neural Networks

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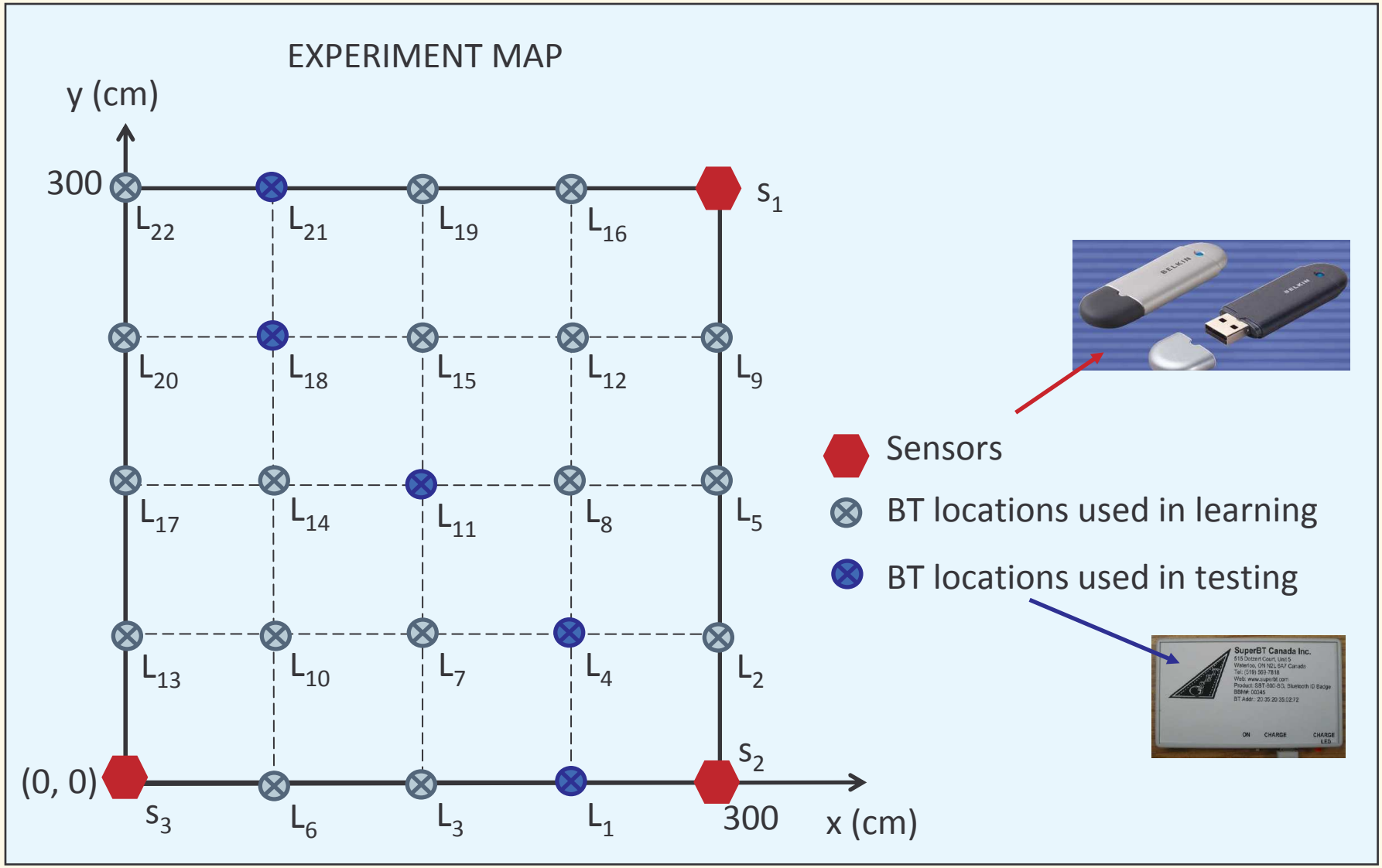
Motivation and Method

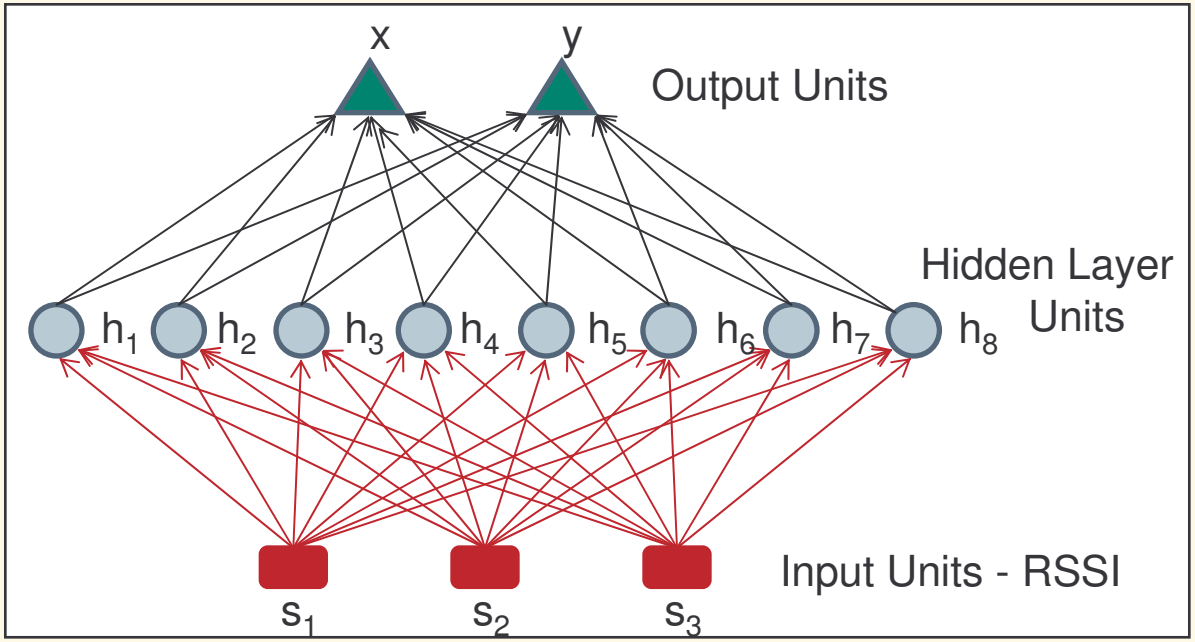
- **Indoor wireless communication**
  - Limited battery
  - Complex signal representation due to multi-path and fading effects
- **In order to estimate the locations of mobile devices in a building;**
  - ✓ Using Bluetooth (BT) Technology
    - Widespread usage and variety of applications
    - Low cost, low power consumption, short range (1, 10, 100 m)
  - ✓ Using neural networks
    - Flexible modeling and learning capabilities
  - Assumptions:
    - Use only Bluetooth RSSI; more sophisticated signal information is unavailable or not cost effective.
    - The environment is not static and that the system must adapt to changes in its environment

Experiment Map



Training the Neural Network

Multi-layer Perceptron Architecture



Our objective is to minimize the error between target and estimated locations in order to find the weights of the links of the neural network

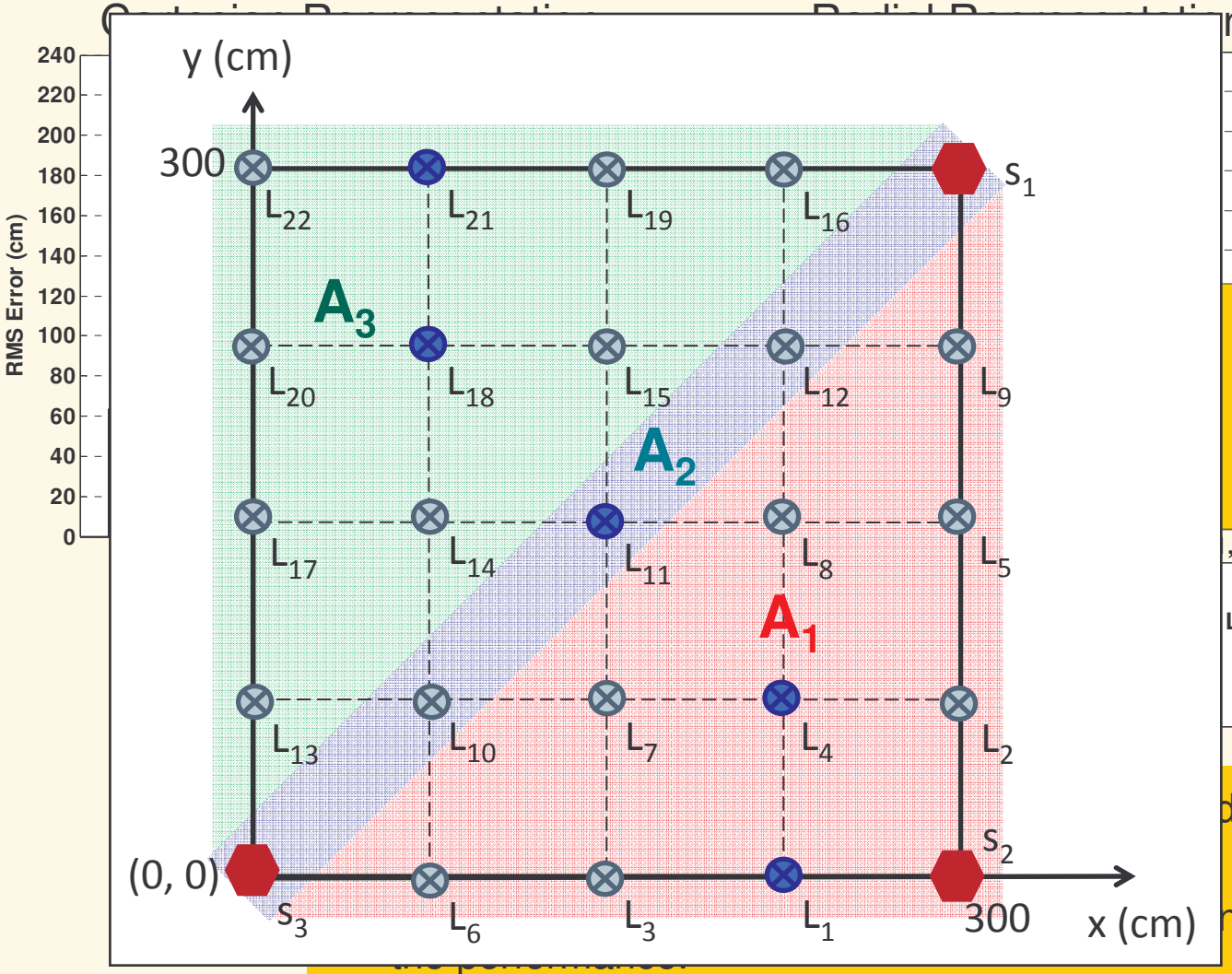
Backpropagation Learning Method with Error Function:

$$E = \sqrt{(x - x')^2 + (y - y')^2}$$

(x, y) : Target Output

(x', y') : Estimated Output

Testing the Neural Network



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network affects

- Increasing the number of hidden layer units may provide a better learning capacity to the neural network