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# RFID based indoor localization and revision of the RFID protocols\*

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## Abstract

In this article, we examine problems related to RFID systems [3, 2], so that they could not only perceive but also localise [4, 4, 6] transponders, as the present RFID based systems are unable to do so. In order to reach this goal, we have extended the perceptual qualities of the antennas and readers in 2D and 3D. We have constructed an intelligent transponder that is able of self-localization, and we have also written algorithms that can command our new smart devices efficiently.

We also introduce the concept, advantages and application areas of the localization methods. The smart reader [1] and tag localization architecture, protocols [1] and prototypes are also described.

In order to localize an object we can use perception-based localization. Perception-based localization [9, 7, 8] binds the position of the object and the infrastructure node while the object is close to the node. In most cases and applications, this solution is not sufficient.

Using only perception sensors and RFID based systems, it is relatively difficult to determine the position of an object accurately. As RFID can also be used as perception-based technology, we utilized this possibility and have expanded the perception capabilities of said devices (RFID readers, antennas, antenna networks and tags) with the implementation of intelligent algorithms.

Therefore in this article we examine three important issues. The first one is how to extend the perception process of the RFID readers and antennas.

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The second one is how we can create the next generation of the smart RFID transponders and extend them with a new functionality to make an indoor localization. And finally, we cover how we can support the new RFID hardware with a mathematical-based subsystem created in this research.

With these achievements we are able to establish the RFID based indoor localization in a more efficient way.

*Keywords:* RFID, localization, indoor localization, smart tag, smart reader, transponder, RFID antenna, RFID transponder

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