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Title: Empirical analysis of cyber-attacks to an indoor real time localization system for autonomous robots

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PII: S0167-4048(17)30139-6
DOI: http://dx.doi.org/doi: 10.1016/j.cose.2017.06.013
Reference: COSE 1166

To appear in: *Computers & Security*

Received date: 24-1-2017
Revised date: 5-6-2017
Accepted date: 28-6-2017

Please cite this article as: Ángel Manuel Guerrero-Higueras, Noemí DeCastro-García, Francisco Javier Rodríguez-Lera, Vicente Matellán, Empirical analysis of cyber-attacks to an indoor real time localization system for autonomous robots, *Computers & Security* (2017), http://dx.doi.org/doi: 10.1016/j.cose.2017.06.013.

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Empirical analysis of cyber-attacks to an indoor real time localization system for autonomous robots

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Abstract

Real Time Location Systems (RTLSs) are critical components of many mobile robots that rely on them to safely operate in different environments, and their cyber-security is a growing concern. The goal of this paper is to demonstrate that there are statistically meaningful differences in the data provided by beacon-based RTLSs between the case when there is an attacker or none, which can be used to detect attacks. A procedure to choose the more discriminant distribution of beacons is presented, as well as its empirical validation, based on data provided by a commercial RTLS used by a mobile robot for indoor navigation. In the evaluation, three basic alternatives to define the distribution of beacons were considered to see which one was more discriminant, that is, the one with more differences. Statistical differences in the data gathered by the mobile robot, when the localization system is under attack, and when it is not, have been found. It has been also verified that these differences are larger or smaller depending on the location of the beacons.

Keywords: Cybersecurity, Indoor Positioning, Robotics, Cyber-attack, Beacon, Statistical-testing

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