A system for detection of tampering on intermodal containers

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Shipping containers provide a standard and ubiquitous way to move goods between different places and countries. In fact, a large proportion of the international trade rely on them every day. It is thus understandable the importance of improving transport security of the containers hosting those goods.

It is therefore important to detect the possibility that a container has been tampered, both for avoiding losses due to theft, both for minimizing security risks due to counterfeiting or smuggling of illegal assets as soon as possible.

Standard tampering and intrusion counter-measures include locks, hard walls or reinforced curtains, tamper evident seals, etc. Most of these solutions, however, either need that the shipping company buys suitable containers (e.g. a container with hardened walls), or invest money in adding usually active devices to them (like for IR detection systems, locks, etc.).

A different way to detect anomalies can be achieved if the focus for finding intrusion evidence shifts from containers to the intermodal terminals that will receive the goods once they are offloaded from vessels, aircrafts or trains. A few solutions already exist or are being investigated, but they are usually expensive or difficult to deploy, thus reducing their spread and adoption.

In this work, the focus is on cost-effective, transportable solutions. In this context, various sensing technologies for evaluating the integrity of a container, are being explored, both on their own merits, and in combination with others. In particular, inspection based on colour and texture, 3d shape of the container, response to hyperspectral and thermal imaging are considered.

Based on the sensors investigation, a cost-effective prototype of a “transportable” multimodal system is being devised. Such system is complemented by colour and 3d snapshot sensors, able to scan and report anomalies on a panel container or part of it. The system is designed to inspect a container and to fit in it while not in use, for logistics consideration. This work will present a prototype being experimented, along with an investigation of the obtainable results and the necessary trade-off that are necessary to develop such a system.