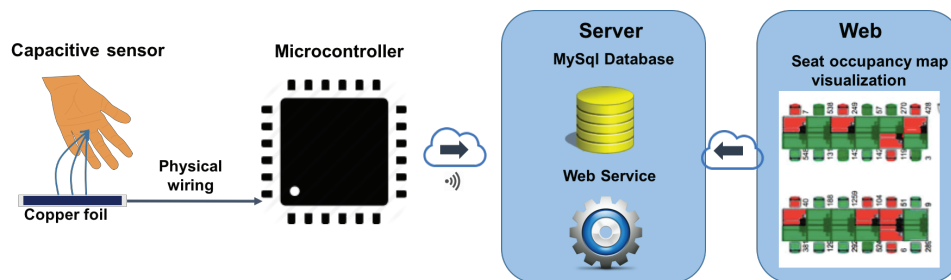


Seat Occupancy Detection using Capacitive Sensor

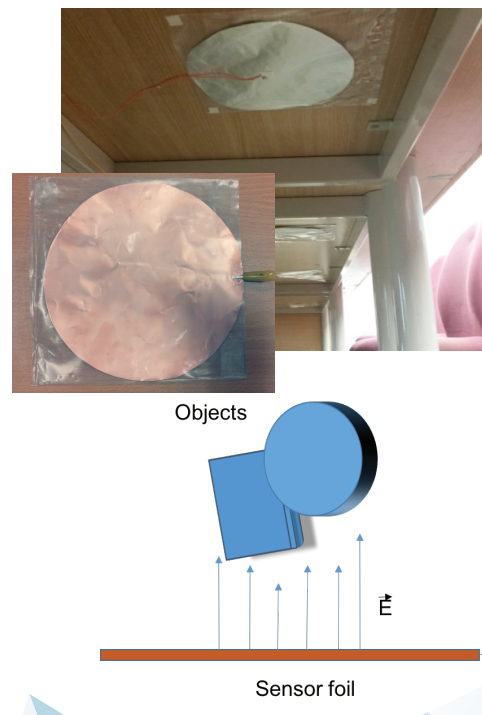
In many public access facilities (e.g., libraries, cafeterias, restaurants), it is useful to get a clear indication, not just of overall occupancy of the facility, but which specific seat is occupied by a human being or not. In Singapore, people often leave personal objects (e.g., umbrellas, tissue packs) to mark a seat as occupied, even though it may be against the facility policy. Our capacitive sensor technology is positioned unobtrusively below the table and is capable of discerning whether a specific seat is human-occupied or “occupied” by an inanimate object. Such Real-time occupancy technology can be used to track real-time occupancy, provide real-time guidance to waiting customers and schedule services when seats become available.



Caption: System flowchart for Seat occupancy detection using capacitive sensor.

Overview

Capacitive sensing solutions are based on interference of objects or people with the electromagnetic field. Most commercial capacitive sensors have high sensitivity with limited range (<5cm) for material detection, water level, counting in production line etc.; such sensors are not suitable for seat occupancy detection. Current seat occupancy detection solutions use pressure sensor mounted on a chair, which provides information on whether someone is seated on the chair, but not about whether a table position itself is occupied (and if so, by a human). Our technology uses table-mounted sensors, placed unobtrusively under the table and hidden from public view. The sensor senses human vs. object occupancy of the table passively and can last for years. The key advantages are that (i) the solution is very cheap and easy to install and use; and (b) it can discriminate between not just occupancy vs. occupied states, but also whether the table location is human-occupied or not.



Features & Specifications

The front end consists of sensors and microcontroller that executes optimised signal processing and filtering algorithms that make occupancy detection robust to environmental factors (e.g., height of a table, material of an object placed on table etc.). Our solution comes with a backend Web-based portal software that includes relevant statistical analytics modules, as well as capabilities to generate alerts based on individual or aggregate occupancy-based events.

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Potential Applications

This product is relevant to public facility management for venues where there are a large number of seats and tables, such as:

Some examples include

- Restaurants and food courts
- Stadiums
- Library
- Coffee shops
- Concert Halls

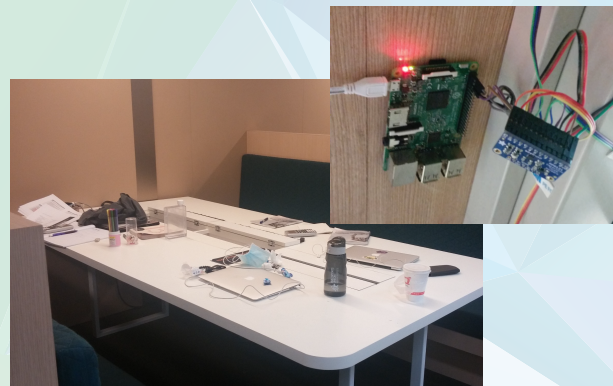


Real-time occupancy detection can be useful for a variety of occupancy-aware services such as those described below:

- Real-time guidance and navigation to empty spaces;*
- occupancy-driven dispatch of service staff (e.g., cleaners at food courts or vendors in sports venues) and*
- Analytics and compliance (e.g., ensuring that individuals do not block seats beyond a permitted duration).*

Market Trends and Opportunities

The seat occupancy tracking using capacitive sensor is one example of potential IoT applications for business place. The sensors themselves are getting cheaper, and multiple sensors can be connected to a single embedded device per table. Additional types of sensors can be mounted under the table (on the same platform) to monitor other types of context.



Customer Benefits

With the use of real-time occupancy detection, it will provide the following benefits which include:

- Spot newly arriving and seated customers;
- Display tables where customers have just left and need cleaning up;
- Real-time seat occupancy monitoring;
- Fine-grained statistics on facility usage;