

Improving Service in Restaurants with a Smart Coaster

A Technical Report submitted to the Department of Electrical and Computer Engineering

Presented to the Faculty of the School of Engineering and Applied Science
University of Virginia • Charlottesville, Virginia

In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science, School of Engineering

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Spring, 2020

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On my honor as a University Student, I have neither given nor received
unauthorized aid on this assignment as defined by the Honor Guidelines
for Thesis-Related Assignments

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This capstone project was completed in the Electrical and Computer Engineering department by Daniel Ayoub, Taylor Kramer, James Garcia-Otero, Adam El Sheikh, and Will Define under advisement of Professor Harry Powell. The project sought to create a novel internet enabled device that could be deployed at scale in restaurants to alert waitstaff of an empty drink and thereby improve service. The aim of the project is to determine whether this IoT approach is feasible and beneficial to restaurants as well as determine the best way to implement such a system.

The coaster consists of a custom designed PCB housed within a watertight 3D printed case. The case flexes under weight so that pressure sensors may register the presence of a glass. The case also contains the battery, inductive charging receiver, and PCB with microcontroller. The coaster is recharged inductively rather than via a cord so that the case can be watertight. The second half of the prototype consists of a desktop application (server) running in the restaurant. This application is used to assign drinks to coasters and alert waitstaffs for refills. The coaster communicates with the server over an encrypted WIFI channel. Our prototype only consisted of one coaster, but the system is scalable to dozens of coasters.

The embedded device functions by periodically reading the pressure sensors and then relaying the weight information over an encrypted WIFI channel to a central server. Waitstaff, when placing a drink on the coaster, record what drink is placed on which coaster. Then, when the central server receives the pressure information, it is able to determine if the coaster holds nothing, a full glass, or an empty glass. At this point, the central server can then alert waitstaff to refill the drink on the coaster.

Prior art includes a smart coaster produced by students at Saarland University in Germany in 2005 (Butz 2005). This project identified empty cups with force sensors, but did not include inductive charging.