People Power Home Occupancy Status Microservice

Determines home, away, vacation and sleep modes of occupants for innovative security, energy and senior care services.

The Modern Approach

Determining the occupancy status of a residence is essential for smart home services to perform correctly and, more importantly, to be truly useful. Homes should function differently depending on where the occupants are – at home, briefly away, asleep or on holiday. Until now, determining the occupancy of a home depended on GPS technology of smartphones together with mobile apps to create a virtual geographic boundary that triggers smart home services when a properly configured mobile device leaves or enters a particular location. GPS-based solutions – now more than a decade old – all but guarantee a variety of frustrating constraints, chief among them the limitation of smart home services aimed at families, multiple tenant occupancy and those in need of security, energy conservation and senior care.

GPS-based geofencing alone has outlived its usefulness due to a variety of factors that negate predictable performance, to say nothing of the seven individual steps every user must complete before it functions predictably.

Today's antiquated geofencing solutions first depend on having a smartphone, then downloading an app followed by signing into that app, and providing the app permission to access GPS location data from the device. After informing the software of the home location, users should then activate Wi-Fi for additional location accuracy. Then, obviously, a user must carry that device at all times. This totals seven steps that each person living at a home must accomplish for phone-based geofencing activation. If the user has a spouse, roommates, children, or a parent living at home, those seven steps get multiplied by the number of people living at the residence. Not good.

What is needed is a solution that's radically simplified. Something easier to use with significantly improved performance, where people don't need to download and sign into an app, provide location service permissions, identify a home's location or even carry a smart phone. The preferred solution should intelligently detect and understand occupancy conditions based on activity patterns in the home derived from a wireless motion and entry sensor to determine if occupants are home or not, asleep or not, or away on vacation. Fueled by machine learning algorithms that detect natural activity patterns and that constantly learn and predict the occupancy states of a home, the days of GPS-based geofencing are numbered. Finally.

People Power has developed the world's first **Home Occupancy Status Microservice**, a revolutionary method of delivering critical understandings of occupancy conditions that enable a new way of bringing intelligent consumer services to home security, energy conservation, smart buildings and senior care. Able to discern the four essential states of occupancy and the transitions between them

with machine learning algorithms from data collected by at least two wirelessly connected sensors, radical improvements to connected home services are now possible.

This AI-based microservice is available today as part of the consumer services that People Power delivers for our service provider partners. For connected home solutions that incorporate motion and entry sensors – the basis of any smart home solution – this new microservice becomes a vital component to People Power's white label consumer offerings.

How It Works

This solution, designed to replace conventional GPS-based geofencing, is simple on the surface, but complex behind the scenes. The Home Occupancy Status Microservice is an AI-powered solution that depends on at least two wirelessly connected sensors positioned in the home and a combination of machine-learning algorithms to operate intelligently and naturally in the background of peoples' lives to help make critical decisions.

To enable the microservice, **entry** and **motion sensors** are positioned in the home and perform collaboratively to capture essential motion data. These People Power-certified sensors are the basis and definition of any smart home. They are inexpensive, pair reliably with a People Power-developed mobile app, and install in minutes. Powered by a small lithium ion battery, the sensors perform for more than a year before battery replacement is necessary. Installed in or around the kitchen – the soul of every home – the sensors detect motion from which data is derived to fuel intelligent decisions. Addressing essential privacy concerns, this solution does not capture or depend on image-based facial recognition to determine occupancy status of the home.

Complex occupancy status decisions are made quickly and accurately from sensor data through a combination of patent pending **machine learning algorithms** designed to determine the four essential occupancy states of home, away, vacation and sleep, and the transitions between those states. These highly complex algorithms produce more than 10 dimensions of occupancy factors in the home, including the day, time, door activity, motion activity, energy and water use, supporting geofencing data and more. Determinations are then made from data sets to accurately identify modes of occupancy. Historical data helps to automatically classify occupancy status and develop robust machine learning models that deliver increased levels of accuracy over time.

Sleep Mode: A Breakthrough Development for Smart Home Services

Knowing when people are **sleeping** enables previously unknown possibilities for highly intelligent smart home services. We understand from user studies there are predictable patterns to peoples' lives. From these patterns we can elegantly put a home to sleep, or wake it up gently to better prepare users for the day, and more. With even a single strategically placed motion sensor installed in the home, data points of daily activity are rendered into a weekly model for every day of the week, updating constantly once a week. The Home Occupancy Status algorithm makes a prediction of when residents are likely to wake and go to sleep for every day of the week, and then calibrates those predictions against today's daily activity patterns. For example, in the vast majority of cases, people begin their daily routines after several hours of sleep in the morning with a spike of activity followed by their departure to the workplace or errands. In the early evening, when people are home, there

is predictable activity often centered in the kitchen. Then, there is a tapering-off of activity as the evening slows, which transitions into preparations for another night's sleep. The next morning comes, and the cycle begins again. Knowing these patterns through data collection provides a method to better anticipate how a smart home service can enable new levels of resident wellness and device or appliance automation. Improvements to a person's *Circadian rhythm** are possible through sleep predictions to intelligently adjust home temperature and lighting conditions appropriate for the time of day, the day itself, and even the season. New and unheard of levels of home automation and wellness solutions are possible from understanding a person's natural sleep patterns.

*Also known as the sleep/wake cycle, the 24-hour internal clock running in the background of a person's brain drives the Circadian rhythm that cycles between sleepiness and alertness at regular intervals.

Home, Away and Vacation Modes

Determining when a resident is **home** is the easiest to determine of all the conditional states of occupancy. When activity is detected within the home through installed sensors, a smart home service equipped with the Home Occupancy Status Microservice understands how to behave appropriately in response. With home safety and security services, a single notification can inform residents that a specific door has been opened and someone is now in the home. Senior care services depend on understanding and reacting to this important occupancy state. Knowing when people are **away** from the home enables a variety of automated scenarios that make residents more confident in their temporary departure.

The benefits for security and safety are obvious, by automatically arming self-monitored home security systems when residents have vacated the premises, or delivering an intelligent reminder to manually arm their professionally monitored security system. For intelligent energy savings, this microservice helps understand when the home is unoccupied to conveniently adjust thermostats for increased energy efficiency. Additionally, energy providers can better select unoccupied homes as primary participants for demand response energy savings initiatives. Automating interior home lighting is also capable of new levels of safety and convenience. Knowing when occupants are on **vacation** is critical in delivering reassuring outcomes for residents while away. If a home's sensors determine the residence is unoccupied for 24 hours, a smart home service with this microservice automatically switches into vacation mode. The benefits can assist in powering-down appliances including hot water heaters, HVAC equipment and power hungry home entertainment systems for energy savings. Additional benefits include the ability to detect irregularities in a residence and direct alert notifications to delegated friends, family or neighbors. This is beneficial in the case of plumbing problems identified by a water leak sensor attached to a smart home system.

Device Compatibility

Motion Sensors: Bosch, Philips, Centralite, EWIG, LinkHigh, Remote Solution, Leedarson, and more.

Entry Sensors: ZigBee-based devices, Centralite, EWIG, LinkHigh, Remote Solution, and more.

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