August 2023

Bluetooth-based Home Intrusion Detection Using Smart Home Devices

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ABSTRACT

Security cameras and motion detectors used for home security can be expensive and may not cover the entirety of a home or property. Also, even when an intruder is detected by the camera, there is not much that can be done after the intruder leaves. This disclosure describes the use of in-home smart devices to detect unrecognized devices via Bluetooth and automatically detect an intrusion based on such detection. The described techniques can detect intruders and can also help locate the intruders after they leave the home. The techniques can improve home security without requiring additional hardware.

KEYWORDS

- Home security
- Home surveillance
- Intrusion detection
- Smart home
- Home control app
- Intruder device
- Burglar device

BACKGROUND

Residential properties are susceptible to various security threats, including unauthorized entry by intruders. Traditional home security systems rely on cameras, motion sensors, etc. to detect intrusion within a home. Cameras and motion detectors cannot monitor every inch of the home, and even if an intruder is detected by the camera, there is not much that can be done after the intruder leaves.

DESCRIPTION

This disclosure describes the use of in-home smart devices to detect unrecognized devices via Bluetooth and automatically detect an intrusion based on such detection. The described techniques can detect intruders and can also help find the intruders after they leave the home.

Per the techniques, the existing network of internet-connected smart home devices in a home, such as a smart doorbell, smart speaker, smart thermostat, etc. which are placed at different locations within the home is leveraged to perform intruder detection. When an intruder that is carrying a device (e.g., a smartphone, a watch, or other Bluetooth-capable device) enters a home, the device is automatically detected by one or more of the smart devices. The Bluetooth identifier of the device is recorded. A smart home controller, e.g., an app on the homeowner's smartphone, can be configured to use such detection to detect intrusion.

For example, if the same unrecognized Bluetooth device ID is detected by multiple devices (e.g., smart doorbell at the home entrance and a smart bulb in the living room), the user can be notified. If the user matches the identifier against a guest (e.g., someone who just arrived at their home), they can mark the device as safe. On the other hand, if an unrecognized device is detected while no one is home, or not as belonging to an authorized visitor, the device can be marked as a suspect device likely belonging to an intruder.

To avoid spurious detection, a detection threshold can be set before an unrecognized device is flagged. For example, if two or more smart home devices detect the same unknown device, the device may be determined to be within the home. For example, as an intruder makes their way through the front door of the home and into the hallway, two devices (e.g., a smart doorbell and a smart bulb) detect the unrecognized device. False positives, e.g., triggered by the

device of a person walking on a sidewalk outside the home fail to meet the threshold and are not surfaced. This helps limit notifications that are sent to homeowners to only the unrecognized devices that are within the home and correspond to potential intrusion attempts. Further, notifications can be turned on or off based on user preferences, e.g., the user can set up the home control app such that they are notified when they are not home (smart lock is in a locked state) and not otherwise.

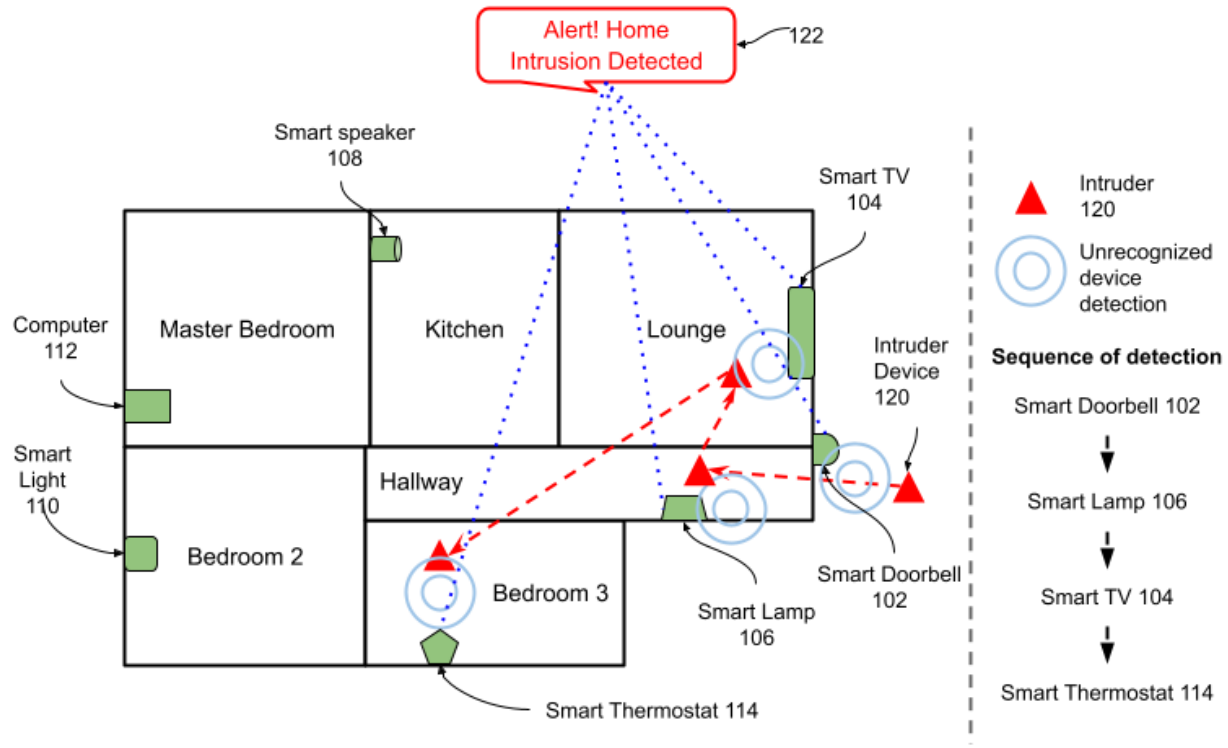

Fig. 1: Detection of intruder device using smart home devices

Fig. 1 illustrates an example home where an intruder device 120 is detected, per techniques of this disclosure. The example home illustrated in Fig. 1 includes a kitchen, lounge, a master bedroom, bedrooms 2 and 3, and a hallway with an entry door. Internet-connected smart home devices (102-112) are placed in every room, including at the entry door of the home. The

smart home devices include a doorbell, a TV, a lamp, a speaker, a computer, a light, and a thermostat.

When the intruder device 120 enters the home, it is detected by one or more of devices 102-112 at different times. In the example of Fig. 1, the intruder device is detected in the following sequence: at the door, by doorbell 102; in the hallway, by lamp 106; in the lounge, by TV 104; and in bedroom 3, by thermostat 114. The devices record the Bluetooth ID of the intruder device and send it along with other information (e.g., detection location, time, etc.) to a home control application. The application raises an alert 122 that is displayed to the homeowner, if the received data indicates that the intruder device is detected by more than a threshold number of devices (or a particular device, e.g., that is deep inside the home).

The home control app can log instances of an unknown device being detected within the home or in vicinity of the home. The log can include the Bluetooth ID, location and time of unknown device detection, and other relevant data. The homeowner can trigger a warning and/or a search via the home control app by specifying the Bluetooth ID of the intruder. Other users of the home control app (or other participating security systems) can receive the search, and if the intruder device is detected, raise an alert to appropriate authorities, e.g., law enforcement.

In this manner, the described techniques utilize Bluetooth and/or other wireless communication-based detection capabilities of smart devices within a home to automatically detect likely intruders and to raise alerts. The techniques can improve home security without requiring additional hardware.

CONCLUSION

This disclosure describes the use of in-home smart devices to detect unrecognized devices via Bluetooth and automatically detect an intrusion based on such detection. The

described techniques can detect intruders and can also help locate the intruders after they leave the home. The techniques can improve home security without requiring additional hardware.