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Identification of Smart Devices in Proximity to a User

Abstract:

Smart devices continue to increase in popularity, availability, and functionality. However, to make use of a smart device, a user must first discover the smart device and determine how to interact with it. The user could search a local area using an augmented reality or identification system to highlight, determine capabilities of, and present instructions for interacting with nearby devices. Alternatively, the smart device itself could broadcast its presence, functionality, and instructions for interaction in a variety of ways. The device could send potential users an electronic message or respond to an audible command. The device could register with a local communication hub, which could alert potential users, so the user need only interact with a single entity.

Keywords:

Smart device, WiFi, Bluetooth, Internet-of-Things, augmented reality, object recognition, roll call, audible command, voice, voice activation, electronic assistant, smart home, automation.

Background:

As the Internet-of-Things expands, smart devices continue to proliferate. Internet-connected thermostats, appliances, vehicles, lights, and machines are found in all areas of life, including home, work, business, recreation, and school. In some circumstances, a manufacturer would prefer to mask or hide the presence of a smart device, such as home and business security. However, at other times, a manufacturer desires to make the smart device stickier and increase user interaction, delight, and engagement. To do so, a manufacturer may be forced to rely on advertising, word of mouth, or personal knowledge and hope that a user recognizes the smart device and remembers how to use it. To increase user interaction, manufacturers may prefer a

more-consistent method of device identification and a more-complete way to instruct a user in taking advantage of the functionality of the device when the user is near the device.

Description:

Smart devices continue to increase in popularity, availability, and functionality. However, to make use of a smart device, a user must first discover the smart device and determine how to interact with it. The user could search a local area using an augmented reality or identification system to highlight, determine capabilities of, and present instructions for interacting with nearby devices. Alternatively, the smart device itself could broadcast its presence, functionality, and instructions for interaction in a variety of ways. The device could send potential users an electronic message or respond to an audible command. The device could register with a local communication hub, which could alert potential users, so the user need only interact with a single entity.

Smart devices include things like thermostats, home assistants, ovens, refrigerators, cameras, lights, switches, security systems, monitors, appliances, or home theater components. A smart device can be directly connected to the Internet or indirectly connected to the Internet via a communication hub. The smart devices can be accessed and manipulated using a web browser, an application on a mobile device, a local remote, or programming system (e.g., voice commands, home automation systems). The smart devices can also connect and interact with one another. For example, a home theater system that is turning on could send a signal that instructs the lights in the room to dim after a certain amount of time.

A user entering a room may be unaware of, or how to interact with, local smart devices. The user could access an augmented reality system on a smart phone or other mobile device to discover local devices and determine how to interact with them. For example, Figure 1 shows a

user holding up a smart phone. The smart phone includes an augmented reality system showing available smart devices in a kitchen. The augmented reality system may be equipped with an object-recognition system that distinguishes smart devices from other devices or objects. Using the camera of the smart phone, the augmented reality system analyzes the local area (e.g., the kitchen) to determine which devices are smart. The system marks or overlays each smart device with descriptive information. The augmented reality system could also be accessed using smart glasses or other electronic viewing devices.

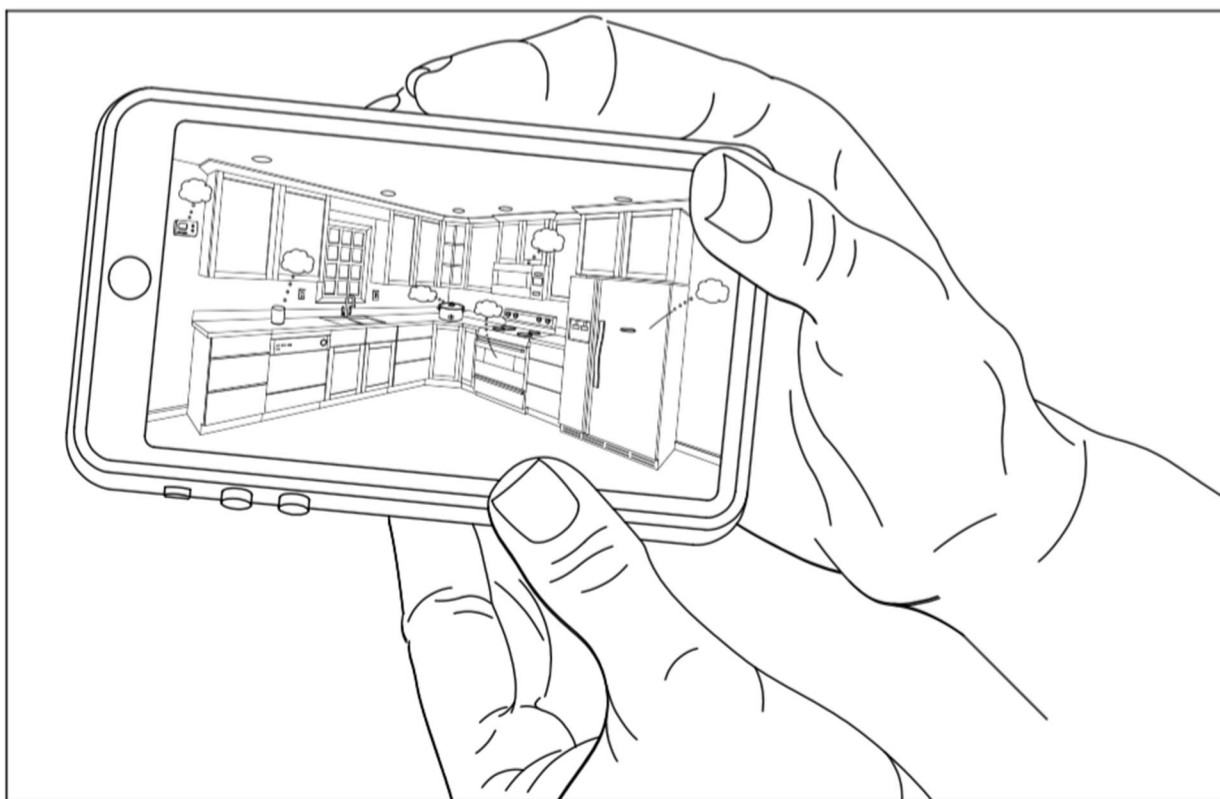


Figure 1

Figure 2 shows a larger version of the augmented reality system applied to a view of the kitchen shown in Figure 1. Above each smart device identified (e.g., refrigerator, thermostat, slow-cooker appliance), a “thought” bubble appears. The thought bubbles could identify the device, announce functionality, provide instructions on how to interact with the device, display

current settings or modes, or other annotations that educate a user on the smart device. Alternatively, each smart device could be highlighted by a halo, a particular color, an overlay, or other identifying marking.

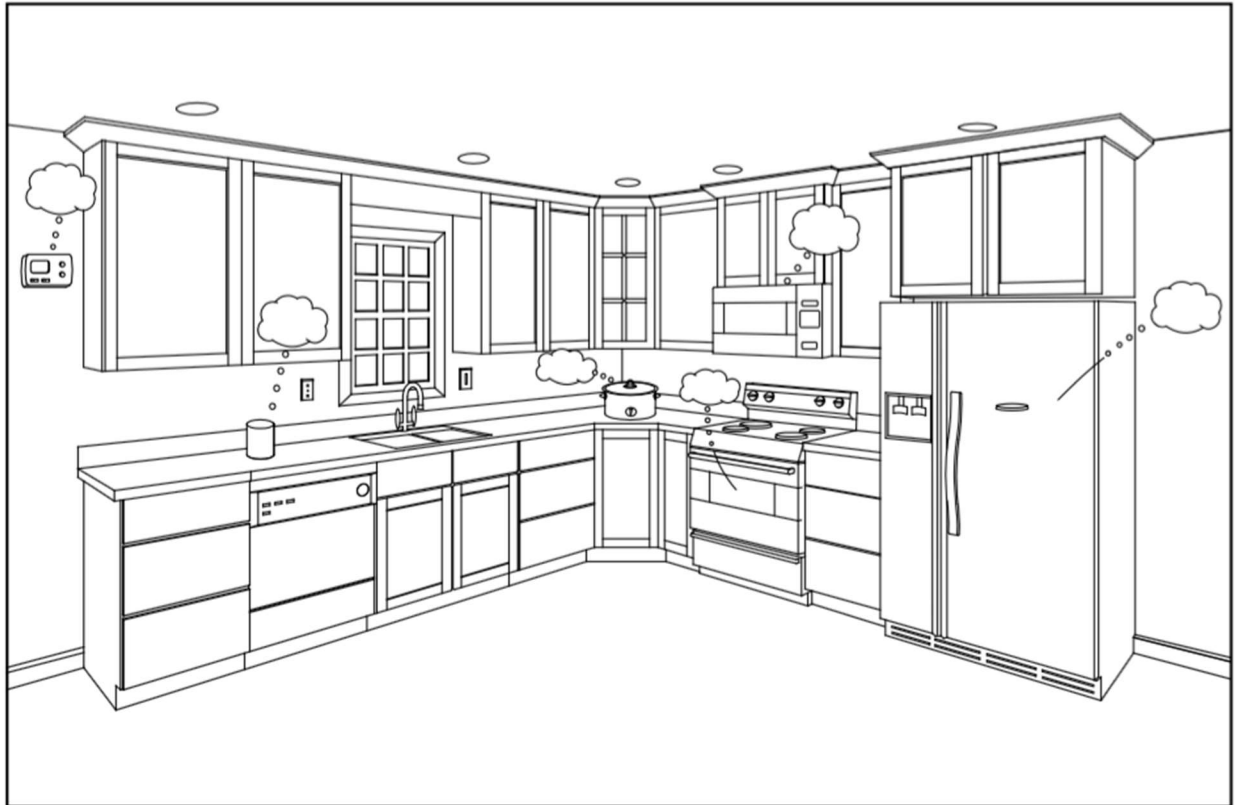


Figure 2

A user could select a particular device by physically touching the screen of the smart phone, zooming in, or hovering over the device, which could access or reveal additional information, direct a user to a controlling application or website, or allow for direct manipulation of the device. The user could also use the augmented reality system to activate a tutorial mode that would provide the user additional information about the device.

Alternatively, the smart devices could distribute or broadcast a message (e.g., text, email) or alert. When a user is within a certain distance of the device, as measured by an indoor positional-tracking system or a type of sensor, the device could announce its presence to the user.

For example, a user entering a store could receive a message describing smart devices in the store that are available to help improve the user's shopping experience. The message could include a recitation of functionality, status, or instructions for interaction.

Additionally, many smart devices respond to voice commands. In some circumstances, a user could call out a universal or common "roll call" voice command, after which each device could audibly announce its presence, functionality, or enter a tutorial mode to provide the user keywords or other instruction for proper use.

In some circumstances, the smart devices can connect to a secondary hub or communication station. The hub could be any combination of hardware or software as a standalone device or a component of any of the individual smart devices (e.g., a master or preeminent smart device). The user could connect directly to the hub instead of each device individually. The hub offers unique advantages whether used alone or in concert with any of the identification methods described above. For example, in a home with multiple smart devices of the same type in the same vicinity, the hub could coordinate the audible response of each so that all do not "speak" simultaneously or repeat identical messages (e.g., two home assistants or multiple identical light bulbs could be announced as group members sharing common features). The hub could also be useful when common or similar commands could affect multiple devices. As shown in Figure 2, a user that issues a voice command to "turn off" could turn off any number of devices, which may be undesirable.

As smart devices become ever more common, identifying nearby devices and learning how to interact with them will become even more necessary and helpful for users and manufacturers of smart devices. For example, consider a potential customer passing through an aisle in an electronics store in search of a new camera, tablet, or wearable computing watch. As

shown in Figure 3, the potential customer could see a display screen showing images of available products in the store.

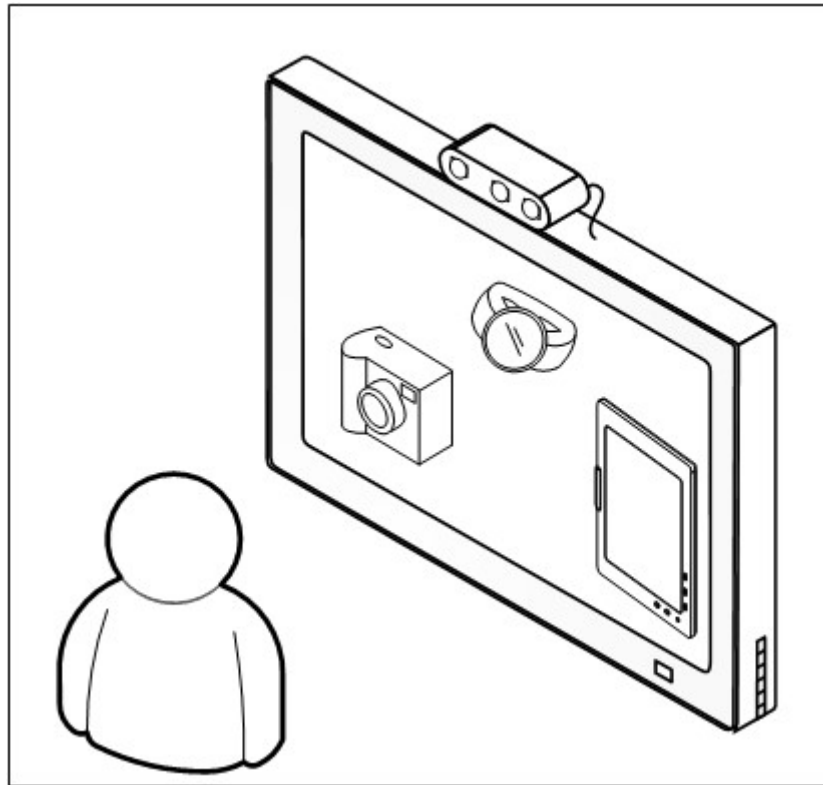


Figure 3

The display screen could be nothing more than a passive device showing advertisements for the various products. However, a smart display screen could offer the potential customer an improved experience, such as through interacting with the user's mobile device. As he or she nears the display, the potential customer could receive a message or other indication that the display screen is a smart display and instructions for interacting with the display such as a key word or command prompt. Once alerted to its smart nature, the potential customer could begin to interact with the display in search of a particular product, even through his or her mobile display.

For example, a smart display could retrieve a purchase history of the customer and, as shown in Figure 3, also includes a camera and microphone at the top, which could enable the

potential customer to interact with a technical support specialist, customer service representative, or other person. The potential customer could place an order or receive assistance with a new product or a previously purchased product then and there.

However, if he or she is unaware, is not alerted of, or is unable to identify and interact with the smart display, the potential customer could pass right by without ever knowing. In this case, the electronics store could lose a potential sale or leave a previous customer less than satisfied. Thus, a more-consistent method of smart device identification and a more-complete way to instruct a user in taking advantage of the functionality of the smart device would increase an improve overall user experience.