Digital Broadcasting White Cane

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DIGITAL BROADCASTING WHITE CANE

ABSTRACT

Systems and methods for digital broadcasting of a white cane and notifying its presence to a user nearby are disclosed. The system includes a white cane fitted with a rechargeable wireless transmitter unit that interacts wirelessly with digital devices enabled to receive alerts. The wireless transmitter may use a low-energy transmission protocol such as Bluetooth that supports proximity sensing. The method includes determining the relative proximity of the person between the cane and the device and displaying an alert to the user that a visually impaired person is approaching. The user of the digital device thus may give way and allows the cane-using visually challenged person to pass by. The system and method may be implemented within the device's operating system. The method gets a user’s attention even when they are not physically alert, thus improving safety for both visually challenged and other users.

BACKGROUND

White canes provide visual indication of a visually impaired person. To be effective, they require nearby people to be able to see the cane. However, people get distracted by various factors (such as by digital devices including mobile phones), or may be in a situation with poor visibility, and may possibly not see the visual broadcast of the cane. Such distractions present danger for the visually impaired as well as non-Visually impaired people. Some GPS-based systems and autonomous cruise control systems for the visually impaired are available. However, autonomous cruise control systems are one-sided as the agent with the cruise control requires no input from others and takes action only based on the information obtained. Social protocol facilitates movement of visually impaired people by movement of non-visually impaired people out of their way. In contrast to autonomous cruise control systems, this interaction is two-sided.
DESCRIPTION

Systems and methods for digital broadcasting of a white cane and notifying its presence to a user nearby are disclosed. The system includes a white cane fitted with a rechargeable wireless transmitter unit that interacts wirelessly with one or more digital devices enabled to receive alerts, such as a mobile phone or a vehicle’s computer, as depicted in FIG. 1. The wireless transmitter unit may use a low-energy transmission protocol such as Bluetooth that supports proximity sensing and permits timely response by device users.

FIG. 1: System for digital broadcast of cane with wireless transmitter

The method by receiving the broadcasts from the white cane and alerting a user based is depicted in FIG. 2. As shown in FIG. 2, a white cane of a visually impaired person issues broadcasts using wireless means. Digital devices, such as a mobile phone, detect these broadcasts. As the cane moves closer to the device, the device starts tracking the relative proximity and displays an alert to the user that a visually impaired person is approaching if contact may be possible. The user of the device thus gives way and allows the associated visually impaired person to pass safely.
challenged person to pass by.

When the distance between the broadcasting white cane and the device decreases, the device determines the direction and distance to compute alert signals. The device also computes multiple trajectories with alerting restricted to just the appropriate ones, each using a unique ID for each encountered white cane. If both the broadcasting cane and the device are stationary, no alert signal is issued. If the device computes an upcoming collision or adjacency with medium to high probability, then it displays an alert and the user gives way to the visually challenged person.

The method of computing relative proximity of the cane to the device may consider location, speed and direction of motion to determine probability of collision. For example, if the cane is travelling perpendicular to the device's trajectory and is not calculated to be nearby at any particular time, an alert is not issued. If the cane and the device are travelling in the same direction and the distance between them is not decreasing, then no alert is issued. If the cane and the device are not moving, e.g., the cane user is seated talking to a person who has a mobile phone, then no alert is issued.
FIG. 2: Method of digitally broadcasting a white cane and notifying its presence to a user

In other cases the system may not show an alert. For example, if the device is carried by the person using the broadcasting white cane, then it displays no alert. This is achieved by configuration or by always fixing the distance between the two devices. It may not be advisable for the visually challenged person to turn off the alert by the device. If a second visually challenged person approaches alerting becomes mandatory.

The digital broadcasting technology maybe extended to protect hearing impaired people. For example, an automobile may determine a hearing-impaired pedestrian cannot hear so honking will not alleviate a collision. Instead, visual indications such as flashing lights may be used. Alternatively, if all devices broadcast, then a hearing impaired person may carry a device to
detect the presence of other devices that are on a collision course.

The discussed system and method may be installed by default on devices so that users need not take any action to participate. A good implementation of the system and method may be within the device's operating system. Users may avoid if necessary, but may be given an option to accept this explicit action. Implementation may optionally be at the app level but is less desired because an app may not run by default.

To protect privacy, the implementation does not require the transmitter to maintain a fixed ID across all time. Instead, the transmitter may broadcast using a fixed ID or deterministic sequence of IDs for long enough for adjacent devices to compute trajectories, e.g., a minute or two. Then it may change IDs to reduce the possibility of tracking individuals.

If people overlook the visual broadcast of a white cane, an accident can result. The digitally broadcasting white cane alerts the user’s digital device to get their attention even when they are not physically alert, thus improving safety for both visually challenged and other users.