February 03, 2016

A SYSTEM FOR DETERMINING LOCATION AND CREATING REAL-TIME AUGMENTED REALITY EXPERIENCES

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ABSTRACT

A system for determining location and creating real-time augmented reality experiences on a human scale using a visually coded floor is presented. The user uses an app on their mobile device that shows an augmented reality path overlaid on top of their camera feed. The floor of the indoor space is divided into regions overlaid with uniquely identifiable QR codes. To create the path, the camera detects coded patterns in the floor and references the coded patterns against a Cloud map of the space to draw a path between identified patterns and lead the user to their desired destination. The system is flexible and adaptable to rapidly changing environments and it can give an exact location that is much more accurate than the fuzzy location given by wireless technologies.

BACKGROUND

Current indoor localization technologies are quite inaccurate. Technologies such as WIFI, BLE or high frequency audio provide fuzzy locations that aren't exact. When attempting to navigate through indoor spaces with many possible turns and corners, fuzzy location is not sufficient. Furthermore, using wireless technologies for indoor localization poses issues due to reflection and refraction of waves in dense indoor settings. Moving furniture around a space can change the wireless footprint of a space which can lead to inconsistent readings from wireless

senders. Furthermore, there is no flexible, modular system that can give exact location and turn-by-turn directions.

The current solutions for wirelessly mapping a space for localization involve taking a static signal fingerprint of the space on an offline map and using that as reference when localizing, which needs updating every time there is a change or remodeling. Current wireless technologies also do not allow devices to determine a precise orientation and location relative to their environment.

DESCRIPTION

A system is disclosed to determine exact location in an indoor setting and for creating real-time augmented reality experiences on a human scale using a visually coded floor. The system discloses a coded carpet that allows for exact indoor localization and provides a flexible system for navigation through indoor spaces. The system uses an app on the user's mobile device to show an augmented reality path overlaid on top of their camera feed, as shown in FIG. 1.

FIG 1: Mobile App for Indoor Localization using Coded Carpet

The floor of the indoor space is divided into regions overlaid with uniquely identifiable QR-style codes, or other suitable computer-readable marker. For example, the L-shaped passage in FIG. 2 is divided into regions identifiable based on QR code as shown. To create the path, the camera detects coded patterns in the floor and references the coded patterns against a Cloud map of the space to draw a path between identified patterns and lead the user to their desired destination. If the floor pattern is distributed throughout a modular or changing environment, the Cloud map of the patterns can be updated quickly to adapt to the new environment. The system only needs one code to get exact orientation and location, which means that the codes must be spread out to ensure that the user will always be in sight of at least one code.

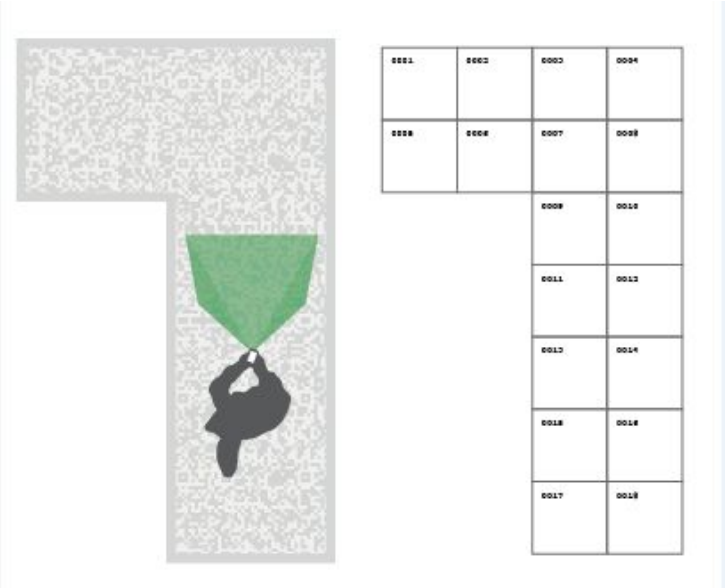

FIG 2: Mapping of QR Codes to an L-Shaped Passage

In order to draw a path relative to the floor with proper perspective, the camera detects the angle of each of the pattern codes and assuming the patterns are flat on the floor, draws a line relative to the floor, pointing to the correct path. The system is able to give an exact location that is much more accurate than the fuzzy location given by wireless technologies and is also flexible and adaptable to rapidly changing environments.

The system can be easily scaled and updated as offices change shape and size, since it uses an omnipresent coded floor that can be repurposed as floor plans change. Since the system uses 2D codes, we are able not only to get an exact location but also the orientation of a user's device in 3D space.