Directional Augmented Reality - An Innovation in Wearable Electronics

Problem

Current augmented reality (AR) eyewear solutions require an extensive amount of hardware and software components to operate. Specifically, "status quo" methodologies typically mandate one or more of the following components: positioning systems (e.g. GPS), connectivity (e.g. Wi-Fi), orientation and direction (e.g accelerometers and gyroscopes), image capture (e.g. high-resolution cameras), image recognition (e.g via GPUs), as well as large and long lasting batteries. As a result, AR systems have historically needed large form factors and significant technical complexity, both factors which have prevented mass consumer adoption of AR glasses.

Prototype demonstration

This booth reports the current level of research addressed by the Computer Science Department of University of Verona and the company Wagoo Italia SRLS. In the presented demonstration, multiple nearby objects (i.e. a person caring a Bluetooth enabled smartphone and a retail item associated with an iBeacon) emit "I am here" signals . A *prototype* of the smart glasses receives the metadata embedded in these signals and ultimately displays identifying information associated with these discovered objects to the user.

Solution

A multi-antenna system, patented by the industrial partner Wagoo LLC, enables a new generation of smart eyewear that requires less hardware, connectivity, and power to provide AR functionality. Each antenna receives a signal from an emitting radio object. *The gaze direction can be estimated by comparing the received signal strength on the various antennas.*
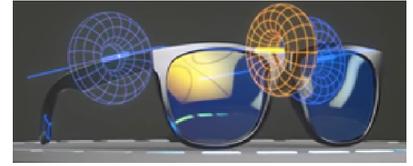
In this embodiment, an iBeacon is integrated with in a retail item commonly found at a shopping mall. Additionally, a second radio emitting object in the form of a Bluetooth equipped smartphone associated with the person represents a second discoverable object in the local vicinity.

Davide Quaglia
University of Verona

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iBeacon

Dr Davide Quaglia app
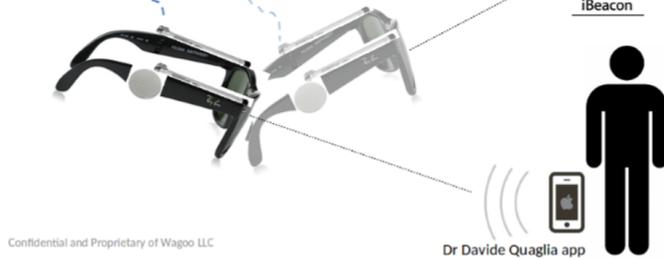
Confidential and Proprietary of Wagoo LLC

Simulation-based design

The design of this device requires to focus on both RF propagation and digital hardware. Traditional approaches for simulation rely either on different domain-specific tools or on analog-mixed-signal modeling languages. In the former case, the simulation of the whole platform in the same session is not possible while in the latter case, simulation performance is limited by the computationally most intensive domain (usually RF). *We created an extension of the SystemC Network Simulation Library that allows to simulate antenna details and node position together with digital hardware and software* (please, search "SCNSL" on SourceForge website).

Outlook: Real World Market Application

In a world full of Bluetooth enabled smartphones and beaconing systems like Apple's iBeacon to Google's Eddystone, this multi-antenna directional AR eyewear system can be readily commercialized today. In addition to the envisioned applications be low spanning social, retail, and supply chain segments, an AR application ecosystem could also service tourism, education, and medical market segments

Dating   *Professional Networking*   *Shopping*   *Supply Chain*

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