RomasLink Communication Hubs – Modular Social, Civic, AR/VR Interaction Network using Voice, EMG and Eye-Tracking Interfaces

DESCRIPTION

Title of the Invention

[001] RomasLink Communication Hubs -- Modular Social, Civic, AR/VR Interaction Network using Voice, EMG and Eye-Tracking Interfaces

Field of the Invention

[002] The present invention relates to communication systems and social networking technologies, and in particular to modular communication hubs designed for outdoor environments. The hubs integrate augmented reality (AR), electromyography (EMG) input, voice commands, and optionally eye-tracking and virtual reality (VR) headsets, providing a multimodal human-computer interaction system.

Background to the Invention

[003] Despite the prevalence of digital connectivity, physical-digital integration in public spaces remains underdeveloped. Existing smart poles or kiosks typically provide Wi-Fi, advertising, or sensor networks, but they lack meaningful multimodal social interaction. There is a need for a system that enables real-world meeting points enriched by digital layers, enhancing social connection, safety, and civic communication. Further, most existing technologies do not combine multiple input modalities, such as voice, EMG, and eye-tracking, with modular hubs adaptable to different deployment environments.

Summary of the Invention

[004] The invention provides a system of modular communication hubs, called RomasLink, installed in urban, rural, and highway environments. Each hub serves as a localized social and civic platform, enabling users to interact through AR smart glasses, EMG wristbands, voice commands, and optionally VR headsets or eye-tracking. Users can post, receive, and interact with social, commercial, governmental, and safety information in a context-aware and prioritized manner. The hubs are modular, adaptable, and capable of combining multiple functional modules within the same unit. Alternative or complementary input methods may include eye-tracking integrated into AR glasses, or other wearable sensors, enabling discreet and natural interaction.

Brief Description of the Drawings

[005] The invention will be more clearly understood from the following description of an embodiment thereof, given by way of example only, with reference to the accompanying drawings, in which:

- Figure 1A illustrates a basic modular hub structure (beacon-only) in isometric view;
- Figure 1B illustrates a Social Hub with display screen in isometric view;
- Figure 1C illustrates a Roadside Safety Hub with warning light in a deployment context;
- Figure 1D illustrates a Rural Solar Hub with solar panel;
- Figure 1E illustrates an Interactive VR Hub with various components;
- Figure 2 illustrates user interaction via AR smart glasses using voice commands;
- Figure 3 illustrates interaction via EMG wristband showing gesture control;
- Figure 4 illustrates eye-tracking interaction with AR glasses;
- Figure 5 illustrates VR headset connection to hub;
- Figure 6 illustrates the system architecture in block diagram form;
- Figure 7 illustrates deployment contexts including urban, highway, and rural installations;

- Figure 8 illustrates children playing in a park with AR glasses interacting with a hub;
- Figure 9 illustrates minimal VR social interaction;
- Figure 10 illustrates matchmaking functionality via hub;
- Figure 11 illustrates AR social feed display;
- Figure 12 illustrates government/safety alert via roadside hub;
- Figure 13 illustrates user posting a message anchored to hub;
- Figure 14 illustrates couple recording a shared memory at hub.

Detailed Description of the Invention

[006] Referring now to the drawings and initially to Figures 1A through 1E, there are illustrated various configurations of the RomasLink communication hub according to the present invention. The basic modular hub structure 10 comprises a vertical support post with modular attachment points for various functional components.

[007] In Figure 1A, the basic hub 10 is shown with a beacon-only configuration, comprising a central vertical post with a base mounting plate and an antenna assembly at the top for wireless communication.

[008] Figure 1B shows a Social Hub configuration wherein the hub 10 includes a display screen module 12 mounted at eye level for displaying social content, notifications, and interactive elements. The screen 12 may be an LED display, e-ink display, or projection surface depending on the deployment environment and power availability.

[009] Figure 1C illustrates a Roadside Safety Hub deployed along a highway, wherein the hub 10 includes a warning light module 16 positioned at the top of the structure. The warning light 16 can be activated automatically in response to detected hazards or emergency broadcasts. The figure also shows the hub's positioning relative to the roadway and a vehicle passing by.

[010] Figure 1D shows a Rural Solar Hub configuration wherein the hub 10 is equipped with a solar panel module 10 for self-sustained power generation. This configuration is particularly suitable for rural deployments where grid power may be

unavailable. The hub base 12 in this configuration includes battery storage for energy collected by the solar panel.

[011] Figure 1E illustrates an Interactive VR Hub configuration comprising the hub base 12, a VR headset docking station 30, and a projector module 20 for creating shared visual experiences. This configuration enables immersive virtual reality experiences while maintaining connection to the physical location.

[012] Referring to Figure 2, user interaction with the hub via AR smart glasses is illustrated. A user wearing AR smart glasses approaches the RomasLink hub. The AR glasses detect the hub through visual markers or wireless beacons and overlay digital content in the user's field of view. Voice commands are processed through the glasses' microphone, allowing the user to interact with the hub without physical contact.

[013] Figure 3 illustrates the EMG wristband interaction method. The user wearing an EMG wristband can control hub functions through muscle gestures. The wristband detects electrical signals from forearm muscles and translates specific patterns into commands: a fist gesture indicates "like," a pinch gesture initiates "reply," and a wrist twist gesture enables scrolling through content.

[014] Figure 4 shows the eye-tracking interaction system integrated into AR glasses. The user's gaze direction is tracked to select interface elements displayed in the AR overlay. Messages and settings icons appear in the user's field of view, and selection is made by maintaining gaze on an element for a predetermined duration. A wireless connection symbol indicates data exchange between the glasses and the hub.

[015] Figure 5 illustrates VR headset interaction with the communication hub. A seated user wearing VR headset 10 connects to the hub 14 for immersive experiences. The hub processes and delivers VR content while maintaining awareness of the user's physical location. Virtual interface elements are shown floating in the VR space.

[016] Figure 6 presents the system architecture as a block diagram. The hardware layer includes the physical hub, beacon systems, solar modules, and screen components. The software layer comprises cloud services, AR overlay systems,

applications, and the priority engine. The interfaces layer shows the various input methods: voice, EMG, eye-tracking, and VR. Bidirectional arrows indicate data flow between layers.

[017] Figure 7 illustrates three deployment contexts. Panel (1) shows an urban hub with multiple users gathering around it, positioned in a public square or park. Panel (2) depicts a roadside hub along a highway for safety communications. Panel (3) shows a rural solar hub in an open field with solar panel clearly visible for self-sustained operation.

[018] Referring to Figure 8, children playing in a park interact with a RomasLink hub through AR glasses. The hub 20 is centrally positioned in the playground. Child figures 12, 14, 16, and 22 wear AR glasses and can see digital content overlaid on their physical environment. Virtual elements shown include emoji reactions 28, 30, and pet avatars 32, creating an enhanced play experience.

[019] Figure 9 illustrates minimal VR social interaction. A user 100 wearing a VR headset sits on a park bench near the RomasLink hub. Virtual conversation bubbles 103 and profile cards 104 appear in the VR space, enabling social interaction while maintaining physical presence in the public space.

[020] Figure 10 depicts the matchmaking functionality. Two users wearing AR glasses stand near a RomasLink hub. Their profile information appears as AR overlays showing names, ages, and interests. The system facilitates connections based on proximity and shared interests, similar to dating applications but anchored to physical locations.

[021] Figure 11 shows the AR social feed interface. A user wearing AR glasses and an EMG wristband interacts with a virtual social media feed projected by the hub. The user can like, comment, and scroll through posts using EMG gestures while the content appears to float in their AR view.

[022] Figure 12 illustrates safety alert functionality. A driver 102 wearing AR glasses 104 receives a safety alert from roadside hub 110. The alert "ACCIDENT AHEAD SLOW DOWN" appears in the driver's field of view without obstructing their vision of the road, providing critical safety information in real-time.

[023] Figures 13 and 14 show social memory creation features. In Figure 13, a user 26 wearing AR glasses 22 and EMG wristband 24 posts a message "Beautiful sunset today" anchored to hub 14 with display 28. In Figure 14, a couple (users 102 and 112) wearing AR glasses create a shared memory at hub 114, with the message "First date here ♡" stored at this physical location for future retrieval.

[024] The multimodal interaction system allows users to choose their preferred method of engagement based on context and personal preference. Voice commands provide hands-free operation ideal for mobile users. EMG wristbands enable discreet gesture control suitable for quiet environments or users with speech impairments. Eye-tracking offers the most subtle interaction method, requiring only gaze direction. VR headsets provide fully immersive experiences while maintaining connection to the physical hub location.

[025] The priority engine manages multiple information streams and functional modules within each hub. Safety alerts receive highest priority and can interrupt other content. Government communications receive second priority, followed by commercial content and social interactions. This hierarchical system ensures critical information reaches users promptly while maintaining engagement during normal operation.

[026] The modular design allows hubs to be customized for specific deployment contexts. Urban hubs emphasize social features and high-resolution displays. Highway hubs prioritize safety communications and visibility. Rural hubs focus on power efficiency and offline content caching. Components can be added, removed, or upgraded without replacing the entire hub infrastructure.

[027] Data synchronization occurs between hubs and the cloud platform when connectivity is available. In offline mode, hubs cache frequently accessed content and queue user posts for later upload. This hybrid approach ensures functionality in areas with intermittent connectivity while maintaining the benefits of cloud-based services.

[028] The invention enables new forms of location-based social interaction that bridge digital and physical experiences. Users can leave digital messages anchored to physical locations, create shared memories with others present at the same hub,

and discover location-specific content created by their community. The system transforms public spaces into interactive social environments while respecting privacy through opt-in participation.

[029] While the invention has been described herein with reference to preferred embodiments, these have been presented by way of example only. The invention is not limited to the specific embodiments described but may be varied in both construction and detail within the scope of the claims.

CLAIMS

[030] 1. A communication hub system, hereinafter referred to as "RomasLink", for enabling localized social interaction, civic communication and safety alerts in outdoor environments, comprising:

(a) a modular hub structure installed in urban, highway or rural areas, the hub including at least one communication interface selected from a beacon, display, projector or connectivity node;

(b) a software platform configured to provide augmented reality (AR) overlays to users wearing AR smart glasses;

(c) a multimodal interaction system, including: (i) voice command recognition processed through the AR glasses, (ii) electromyographic (EMG) wristband input translating muscle gestures into digital actions, (iii) eye-tracking integrated into AR glasses for selecting or controlling digital content;

(d) a priority engine configured to dynamically manage multiple functional modules, including social networking, governmental communication, commercial information, and public safety alerts,

wherein the hub enables users to post, view, and interact with localized content in real time.

[031] 2. A system as claimed in claim 1, wherein selected hubs further comprise support for virtual reality (VR) headsets, enabling immersive applications including games, cultural exhibits, training or tourism experiences.

[032] 3. A system as claimed in claim 1, wherein the modular hub structure is solar-powered to enable deployment in rural areas with limited infrastructure.

[033] 4. A system as claimed in claim 1, wherein multiple modules are combined in a single hub and the priority engine shifts between modules dynamically according to the context, such that public safety alerts override social or commercial information.

[034] 5. A system as claimed in claim 1, wherein the combination of voice command, EMG input and eye-tracking provides multimodal interaction, enabling expressive communication through speech, discreet muscle gestures, and natural gaze direction.

[035] 6. A system as claimed in claim 1, wherein the software platform further allows integration of third-party applications for extending hub functionality.

[036] 7. A system as claimed in claim 1, wherein the hubs are configured to cache content offline and synchronize with the cloud when connectivity is restored.

[037] 8. A system as claimed in claim 1, wherein the hubs are adaptable for deployment in urban, highway, and rural contexts, with structural and functional variations depending on location-specific requirements.

ABSTRACT

[038] RomasLink Communication Hubs -- Modular Social, Civic, AR/VR Interaction Network using Voice, EMG and Eye-Tracking Interfaces

[039] The invention provides a system of modular communication hubs, called RomasLink, designed for deployment in urban, highway, and rural environments. Each hub enables localized social networking, civic communication, and safety alerts. Users interact with the hubs through augmented reality smart glasses using voice commands, electromyographic (EMG) wristbands that convert muscle gestures

into digital actions, and optionally eye-tracking for natural gaze-based control. Selected hubs further support virtual reality headsets for immersive applications such as cultural exhibits, training, or gaming. A priority engine dynamically manages multiple functional modules, including social, governmental, commercial, and safety information, ensuring that critical alerts override general content. The hubs are modular, adaptable, and capable of operating with solar power in rural settings, offering a new model of outdoor digital-physical connectivity.

[Figure 7]