ARC4 is a transformative technology, matured from our cutting-edge DARPA research and development program.

Remember when the smartphone changed the way you communicated? ARC4 will change the way you see and interact with the world around you.

Interested?
Your readers will be too.
Who
Applied Research Associates (ARA) is the industry leader in heads-up augmented reality (AR) technology for outdoor on-the-move operations.
For media inquires, please contact Jenn at 919.582.3438 or jcarter@ara.com

What
ARC4 is the most advanced, wearable AR software available. Using a heads-up display, ARC4 users see geo-registered icons overlaid accurately on their real-world view.
ARC4 was originally developed for soldiers to enhance situational awareness and enable non-voice, non-line of sight teammate coordination.

When
ARC4 is the result of six years of cutting-edge R&D and significant investment from DARPA and ARA. This breakthrough in high-performance AR coincides with the emergence of low-cost and wearable displays into the market. This product combination will revolutionize the way people visualize and interact with the world.

Where
The team that created ARC4 lives and works in Raleigh, NC. We’d be happy to show you around our lab or you can visit us online: www.ara.com/ARC4

Why
ARA solves problems of national importance. Heads-up situational awareness for the military means our soldiers can perform their jobs with enhanced safety, speed, and mission effectiveness.
ARC4’s user interface and head tracking capabilities deliver real-time, low-latency geo-registered information. ARC4 is ideal for government and commercial uses where individuals must visualize, create, and share geo-spatial information in a heads-up posture to more effectively accomplish their ongoing tasks and activities.
About

Meet Dave.

Dave Roberts leads ARA’s team of scientists and engineers behind ARC4.

Dave has a PhD. from MIT in Mechanical Engineering and is an AR technology enthusiast.

To chat with Dave and the team about AR and ARC4, contact us!

Head Tracking
Algorithms track user position and orientation in outdoor environments, enabling accurate overlay of virtual icons and messages on the real world.

Heads-Up Visualization
The intuitive heads-up UI communicates object locations, user position, and look direction. Users tag real world objects with virtual icons and annotations.

User Coordination
ARC4 enables users to project icons, images, and messages on others’ real world views, facilitating non-verbal and non-line-of-sight coordination.

Universal Display Compatibility
Our software renders AR information on a wide variety of displays, day/night, see-through or pass-through, head mounted or handheld, for easy integration with existing products.
Status

ARC4 is delivering high-value heads-up AR situational awareness for tactical operations in military and government applications.

ARC4 has been seamlessly integrated with multiple wearable displays: BAE Systems, Lumus, Vuzix, and Exelis. Within a heads-up display a user sees virtual icons and messages blended naturally with their real-world view.

Our team of engineers and scientists can customize ARC4 to fit your needs.
Imagine your world, enhanced.

ARC4 is outdoor mobile augmented reality technology that can deliver enhanced situational awareness and team coordination across a broad spectrum of military, commercial, and recreational uses.

We envision future uses of ARC4 in:

- **Logistics and operations.** Tracking assets, personnel, and tasks for worksites and events
- **Consumer Products.** Real-world object tagging and sharing for socially networked users
- **Team Coordination.** Shared awareness for emergency management and response
- **Immersive Training.** Virtual avatars and effects embedded with live operations
1. Tell me about the DARPA program where the technology baseline for ARC4 originated.

ARA was the prime contractor and integrator on the DARPA ULTRA-Vis program from 2008-2014. We developed a lightweight wearable AR system that delivers tactical information to a soldier while you operate on-the-move.

Rather than looking down at a 2D map or chest-worn computer, the soldier sees virtual icons (such as navigation waypoints, friendly/blue forces, and aircraft) overlaid on their real-world view. You are able to perform your mission with high awareness of their surroundings, with enhanced safety, speed, and in close coordination with team members. We worked closely with warfighters throughout the design, analysis, and field testing phases of the program.

Over the last several years, ARA has funded internal research and development to extend the technology that is now ARC4.

2. There has been significant press about BAE Systems’ Q-Warrior see-through display. This sounds a lot like what you are doing. Are you familiar with Q-Warrior?

ARA is very familiar with BAE Systems’ see through display, now being marketed as ‘Q-Warrior.’ BAE Systems was one of our subcontractors on the DARPA ULTRA-Vis program and developed the display hardware portion of the ULTRA-Vis system.

Some of Q-Warrior’s public footage features ARA’s Augmented Reality software and ARA’s lead field tester wearing the Q-Warrior see through display. As prime contractor, ARA integrated the Q-Warrior display with all other hardware and software components to produce the ULTRA-Vis prototype system. All software, including the head tracking algorithms, AR visualization software, user interface, and information management software was developed and implemented by ARA. ARA worked closely with military end-users throughout the program to develop the intuitive augmented reality user interface that displays tactical information to you.

Q-Warrior is one of a host of potential ARA displays. ARC4 delivers an immersive augmented reality experience, whether paired with the BAE Systems’ Q-Warrior display or any other wearable display on the market (e.g., Lumus, Vuzix, Six15). ARC4 is the engine for augmented reality.
3. Tell me about the R&D behind ARC4 and a little more about how it works.
ARC4 software incorporates best-in-class head tracking algorithms, an intuitive heads-up user interface, and an information management engine that supports communication between networked users.

Information is rendered on the display with very low-latency so that icons track with the real-world, even when you are walking or rotating your head. ARC4 software leverages compact inertial and camera sensors. It runs on mobile processing devices and is display agnostic, meaning that it can be integrated with any heads-up display. The ARC4 head tracking algorithms fuse GPS, digital terrain elevation data (DTED), inertial data, and camera imagery to deliver accurate user position and head orientation in outdoor environments.

4. You mention ARC4 is for outdoor augmented reality. Can you expand on this?
ARC4 delivers state-of-the-art AR for outdoor mobile applications - a game changer in the current market. Legacy AR systems require site preparation via markers or mapping steps to reliably compute your look direction, and as such are limited to confined areas. ARC4 offers new possibilities.

To be effective, a wearable AR system must be able to ingest a latitude, longitude, and elevation and accurately display a virtual icon sitting at that position in the environment. If the icon appears at the correct spot in your view, we say that the icon is accurately geo-registered to the real world. ARC4 achieves accurate geo-registration through novel fusion of inertial data and camera imagery, and does so without needing to prepare the environment with visual reference markers or to perform a-priori vision-based mapping of the surroundings.

5. You have said that ARC4 is display agnostic. What is the significance of this?
Being display agnostic means that ARC4 can seamlessly integrate with any display technology. We have successfully integrated ARC4 with heads-up displays from BAE Systems, Lumus, and Vuzix, as well as night-vision goggles from Exelis. ARC4 can support all standard video interface formats.

ARA can work together with government and commercial clients who have identified a need for augmented reality in their applications and who may already have a preferred heads-up display in mind.

6. What are the limitations of current augmented reality technologies on the market?
ARC4’s ability to work in outdoor unprepared environments differentiates it from conventional augmented reality technologies. Most of today’s AR technologies focus on providing virtual overlay information to you in constrained indoor applications – for example, a technician being guided to repair an engine.

In these applications, the you do not move around. Head tracking is a fairly straightforward case of comparing camera images taken from your perspective with a baseline image or registering to markers in the scene. These technologies are not suited to outdoor applications where your position and head orientation must be computed accurately while you are on-the-move over large distances and without the benefit of markers in the environment or an a priori feature map.
7. As a consumer, how do you think ARC4 could be integrated with products on the market today to change the way the average person interacts with their surroundings?

Today, there is a growing landscape of wearable see-through displays and mobile computing platforms. ARC4 can be integrated with any and all of these devices to enable a new generation of advanced AR capabilities. With your head up, you maintain a continuous understanding of where you are and where objects are around you. You can query information about objects by simply looking toward them. You can tag objects or features in your environment by inserting icons into your real-world. And you can share these icons with others so they view them from their perspective. ARC4 empowers a new level of situational awareness for consumer, commercial, government, and military end-users.

End-users include:

- Consumers interacting and networking with friends without looking down at their smartphone.
- Dismount Soldiers, first responders, or search and rescue personnel assessing status and operating as a coordinated team.
- Construction site or warehouse foremen tracking worker location and material status to enable safety monitoring, and on-the-fly decision-making.
- AR gamers experiencing virtual enemies and avatars in their local environment (e.g., backyard, field site, woods).
- Military trainees viewing virtual avatars as part of customized scenario-driven decision-making exercises in outdoor live environments.
- Outdoor recreational enthusiasts (e.g., runners, bikers, hikers) tracking location and the whereabouts of points of interest.

8. How does ARC4-enabled AR differ from popular market AR technologies like Google Glass?

ARC4 does more than present conventional communications and directional information (e.g., messages, tweets, maps, pictures) in a heads-up fashion. ARC4 is transforming your view of the world with digital tags that persist as if painted on physical objects. Imagine it as virtual graffiti.

The information becomes part of the real world. While other heads-up display products show static information positioned out of your primary field of view, ARC4 overlays digital iconography geo-referenced as part of your primary view. ARC4 is the engine that truly augments your view of reality.
Consider some of these popular topics and angles for your story.

- How will the current state-of-the-art in wearable displays and AR change the way we see and interact with the world around us?

- What are the potential implications to the average consumer of including ARC4 in mobile computing platforms?

- How will the ARC4 technology change the landscape of social media?

- Will I be able to see where my friends are in real time without ever looking down at my phone?

- ARC4 can be applied to emergency response and dismounted operations to save lives. What other professions and operations could use ARC4 as a force multiplier?
Interesting Tidbits

Show what you know. A look at AR milestones...

- In 1901, Author L. Frank Baum first mentions the idea of an electronic display that overlays data onto real life.
- In 1968, Harvard researcher Ivan Sutherland invented the first head mounted display (image to right).
- Boeing researcher Tom Caudell coined the phrase ‘Augmented Reality’ in 1990.
- In 2001, NASA X-38 was flown using software video map overlays at Dryden Flight Research Center.
- In 2013, Google announced an open beta test of its Google Glass AR glasses.

There’s more where that came from.

We have behind the scenes images and footage of ARC4 available upon request for our friends in the media. Contact us to learn more.