SMART

THE GLASSES THAT WILL CHANGE OUR WORLD

Google Glass transmits information in real time, recognizes friends, and helps surgeons. It will not only revolutionize our digital life, but also our real life. In an exclusive report iD explains what that means, exactly...

Atlanta, November 12, 2013: Dr. Phani Dantuluri looks into the open shoulder of the patient. The specialist knows that this is a risky procedure. But Dantuluri is assisting only with the insertion of the artificial joint, because the lead surgeon and the actual patient are about 150 miles away at the moment: The scalpel is in the hand of Dr. Brent Ponce at Highlands Hospital within the University of Alabama at Birmingham. He simultaneously receives instructions from Dantuluri face-to-face. Because both doctors see what the other sees via live video—with Google Glass. The camera in their glasses records all their movements and transfers them directly to the display screen of the other surgeon. Thanks to these high-tech glasses, Ponce has his hands free so he can focus on finishing the surgical procedure. This first remote surgery with Google Glass shows how the technology can change our world. It heralds a new era of "augmented reality." It integrates elements from the virtual world into the real one. But critics fear that it is not only advantages that it will bring: "Smart glasses are a sinister invention that will lead to total surveillance," warns technology expert Andrew Keen. There is currently a whole series of high-tech glasses for various purposes. Google Glass is the most developed. In a nutshell, it is a smartphone that's worn on the nose: "About 80% of the hardware components of smart glasses don't differ much from what's in a smartphone," says software developer John Martellaro, who is one of the founders of APX Labs.

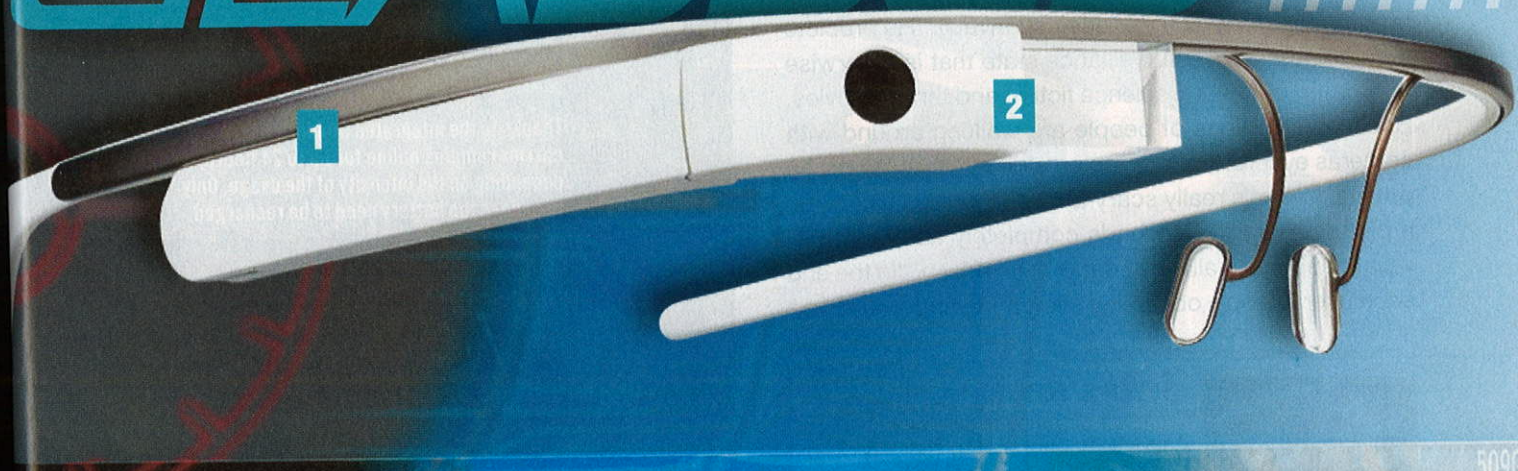
GLASSES

1. FULL POWER

The Google Glass frame contains the battery and the Bone Conduction Transducer built into the right side: This directs acoustic signals (for example, the voice of a caller) in the form of vibrations through the skull. When they arrive at the inner ear, they are perceived as sound.

2. THE CENTERPIECE

Within milliseconds the camera takes photos and records videos that can be displayed on the prism screen via the projector. The prism screen is about 3 centimeters long, is made of robust glass, and it is the most important element of the Google Glass: The user sees the display over the prism and can control all of the applications.



Google's smart glasses are made of flexible aluminium and weigh less than 2 ounces. The device is controlled by a touchpad on the right side near the user's temple, as well as by head movements and voice commands. Users turn on the gear by saying the words "Okay Glass." The display appears in front of the right eye; it's partially transparent, so users can still perceive their environment.

// WHY IS GOOGLE GLASS BANNED IN SOME PLACES?

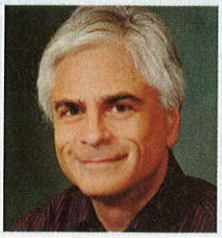
And so the Google Glass user travels through the city; while a route planner is directing him to his destination, a calendar reminds him of his important appointments and a tour guide provides information about the sights. The integrated camera allows users to take photos and videos at any time. The unit's microphone can record conversations. Google Glass recognizes friends and family via InSight—the system identifies people whose clothing and accessories have been photographed and uploaded to the Internet via an app, creating a temporary "visual fingerprint." The system can even identify these individuals within big groups of people and from behind.

Most Google Glass testers have been enthusiastic: "After 10 minutes of playing with the glasses—which the company prefers to call Google Glass, since they don't have lenses—I could see their long-term potential," says Spencer Ante, a senior writer at *The Wall Street Journal.* "The device fit well. It was cool to see the information there in front of my right eye, though a little disorienting." >

Columbia University computer science professor Steven Feiner adds: "We began with the development of such high-tech glasses 45 years ago, and everything that we can do today is unbelievable. This will change the world, it will make many things easier."

// WILL THERE SOON BE SMARTPHONES IN THE FORM OF CONTACT LENSES?

As entranced as Ante and Feiner may be: If they were to use Google Glass out in the field, they would be barred from entering certain establishments. One bar in Seattle has already made it entirely clear that entrance will be denied to anyone wearing the device. "Ass-kickings will be encouraged for violators," proclaims one of the bar's Facebook posts. The reason: privacy. Many patrons fear they may be unwittingly photographed or filmed, or their conversations recorded—and that this information will immediately be made available online. Tech entrepreneur Andrew Keen remarks: "Google Glass opens an entirely new front in the digital war against privacy." He predicts the emergence of a surveillance state that is otherwise to be seen only in the science fiction and thriller movies. Because if millions of people are walking around with cameras ever rolling, nothing outside one's home will be private. "What's really scary is that Google Glass takes a picture every five seconds completely automatically. What happens to all these data?" asks Keen. "In the end each user is a spy, observing everything and everyone."



STEVEN K. FEINER
Professor of computer science, Columbia University, New York City

"Smart glasses can revive past events: If the device detects a place, it can activate information that allows us to relive historical events or concerts."

The "Stop the Cyborgs" initiative is one of the largest countermovements and pushes for strict restrictions on the use of these spectacles. In Russia and Ukraine, bans on the sale and use of Google Glass are being planned. There it is considered to be the ideal spy tool.

But there is also the question of how this "augmented reality," as the technology is referred to in professional circles, will change our perception and behavior. Will we soon no longer be capable of acting independently? Will we become dependent on the information flowing from the device? What would happen if someone hacks into a pair of smart glasses and feeds it false information? >

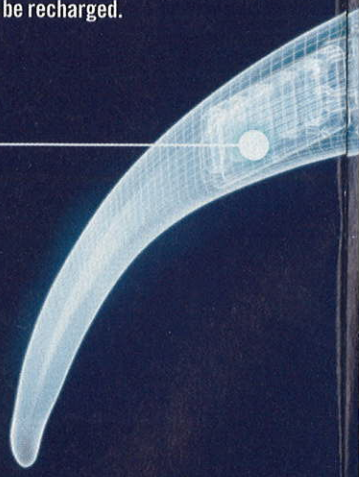
AUGMENTED REALITY...

HOW DOES IT WORK?

Internet, camera, microphone, data memory, microprocessors—Smart glasses (like the model shown here) work like a smartphone. With one decisive difference: All information appears in real time directly on the display of the device. In addition, the user has the option of arranging the various information fields on the display, to superimpose or to hide. If the user needs a map, the navigation window appears at the top right; if the user wants to know if he is friends on Facebook with the person sitting across from him, the relevant window opens at the top left. All the functions can be set manually. Smart glasses will become available from 2014 in two different versions: One will be a system like Google Glass, in which a mini display can be added to any glasses, and the other will be a total glasses system (see below). Both use the same technology.

24-HOUR RUNNING TIME

Thanks to the integrated lithium battery, the carrier remains online for up to 24 hours, depending on the intensity of the usage. Only then does the battery need to be recharged.



INTEGRATED VOICE CONTROL

Every action—whether it's retrieval of status updates, maps, search results, or contact info, or the activation of the camera function—can be controlled by voice command via the integrated microphone or by using the touchpad.

HOW DO THE GLASSES KNOW WHERE I AM?

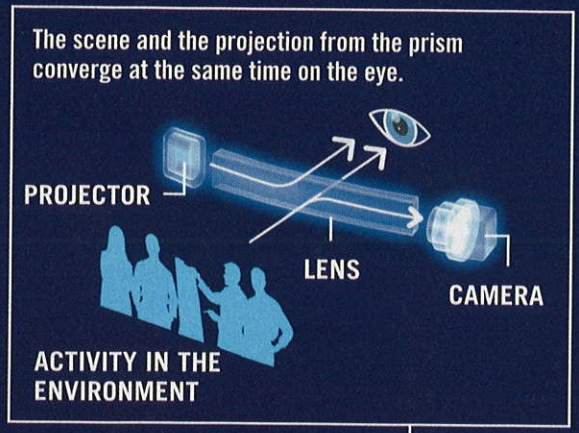
As with any smartphone, smart glasses also have various sensors to determine the user's position. These enable the device to specify in real time where the user is, how fast he is going, and how many feet are left until the next kiosk.

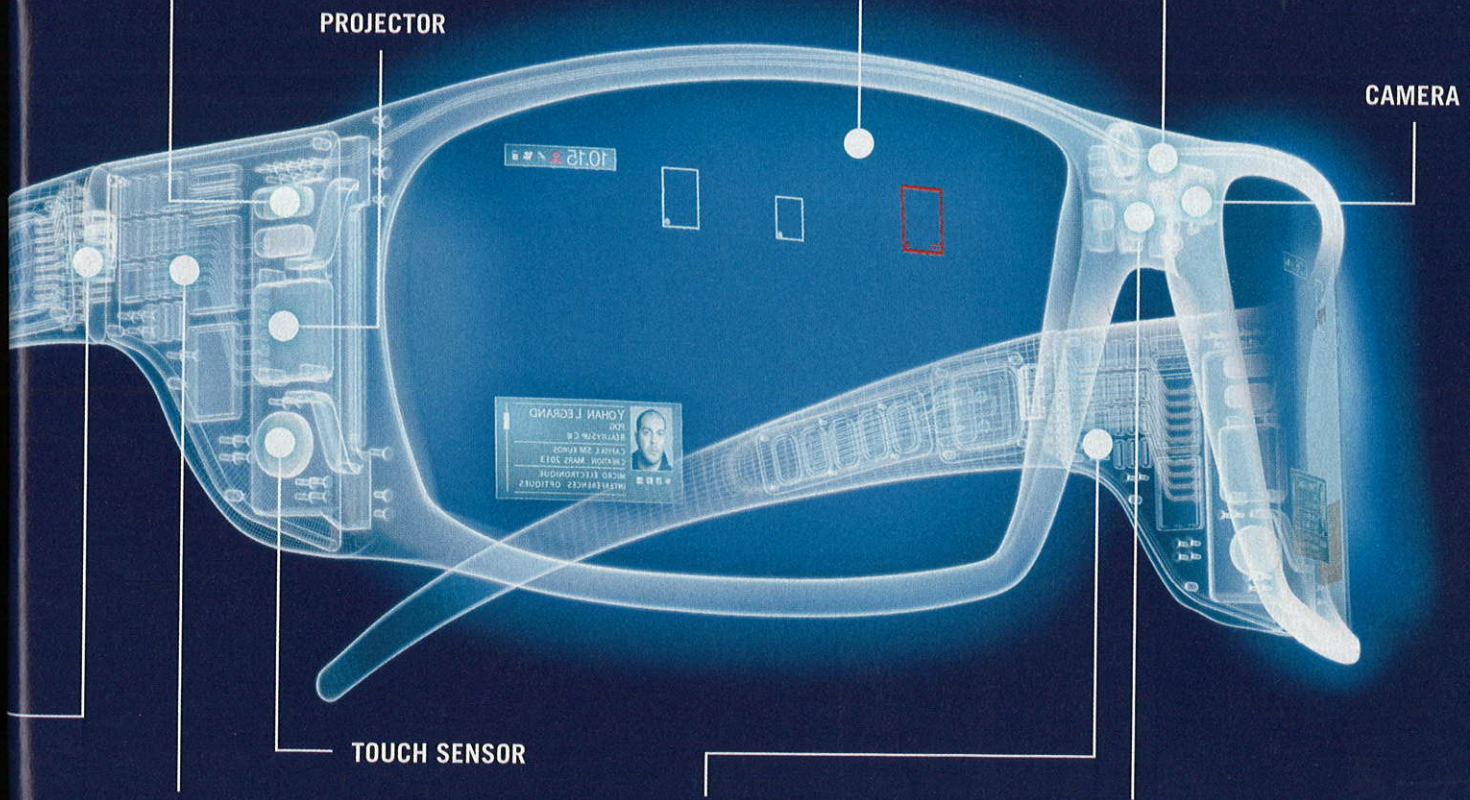
UNOBSTRUCTED VIEW

Information that was previously stored is placed in the user's field of view by means of a projector. Mini projectors spread information over certain areas of the lens with small prisms that reflect the light directly onto the retina.

INTELLIGENT ADAPTATION

Sensors register movements in the visual field and the intensity of light. The device uses this information to adjust the display brightness to that of the ambient light.





DATA ANALYSIS IN REAL TIME

Recognition of voices, faces, buildings, landscapes… With up to 16 gigabytes of internal memory, smart glasses are capable of rendering lots of available information relevant to a person's surroundings in real time.

IN ONLINE MODE THROUGH THE CITY

Smart glasses are equipped with Wi-Fi and a Bluetooth interface. These enable the device to retrieve data from the Web and overlay the desired information, such as the location of the nearest restaurant for example, before the user's eye.

MAKE VIDEOS WITHOUT ANYONE NOTICING

Depending on user-selected settings, smart glasses can take high-resolution photographs (5 megapixels) and record HD videos (1280 x 720 pixels). For some models the command to record is a wink. And no indicator light means people won't know when they are being filmed.