

HEALTH AWARE world

WHAT HAPPENS WHEN ...

pills we put in our bodies connect to homes and clinics to capture and deliver health information?

sensors and cameras embedded in our environments create comprehensive records of our health?

physical spaces wake up and help us manage disease, improve health, and age well?

TRANSFORMING HEALTH

BY BRINGING OBJECTS AND ENVIRONMENTS TO LIFE

An astounding array of everyday objects—from food to furniture, buildings to bodies—is becoming interconnected across environments and scales. Over the next decade, as more than 50 billion objects become connected, they will take us beyond today's landscape of wearable technologies and usher in a world of health-aware environments, where we can enlist homes, cars, clinics, and entire cities to support our health and well-being.

As our world becomes aware and responsive, it will open up new opportunities to transform how we engage people in managing their health. Responsive spaces and objects will create new opportunities to overcome personal and public barriers to engagement. They will suggest new approaches to behavior change and ways to manage health outside traditional clinical settings. Our health-aware world will engage us at just the times and places we need or seek help.

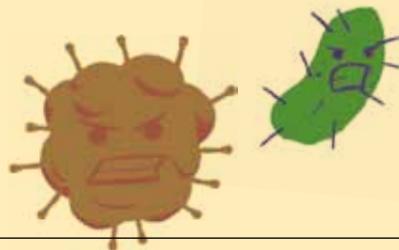
Perhaps more critically, opportunities will open up to move beyond a focus on increasing motivation toward expanding tools, services, and strategies that nudge us and shape our behavior through subtle, ambient reminders.

By building in the most subtle ambient reminders, our health-aware world will lower barriers to engagement. And as open-source technologies and maker communities lower the barrier to entry in creating a health-aware world, the most engaged may not be those with the most resources.

Tensions will inevitably arise as we apply these tools. We might come to rely too much on devices for decision-making, or choose to escape too often into virtual realities. We may risk losing touch with the physical world.

Despite these tensions, the potential of a health-aware world is one in which aware objects and environments can help us manage our health in more persuasive and personalized ways.

Use this map as a source of inspiration to imagine new tools, services, and strategies in a health-aware world.



“... expanding tools, services, and strategies that nudge us and shape our behavior through subtle, ambient reminders.”



HEALTH AWARE world

A NEW PALETTE OF TOOLS TO REINVENT ENGAGEMENT

The technologies that power a health-aware world range from cheap, near-ubiquitous sensors to virtual reality and new interfaces for interacting with computing. Together they give us tools to unlock new possibilities along a spectrum of engagement, from stealthily supporting the uninterested to empowering health-makers in communities.

RELY ON EVERYDAY ITEMS WAKING UP

While today most of our deliberate interactions with the Internet are through screens, we're increasingly embedding computing capability into everyday objects—in effect, breathing life into them and enchanting them with the ability to see and act. Early examples, like pill bottles that glow to remind a person to take medication, point to future objects embedded with a widening array of functions. Advances in voice and gesture recognition will allow us to speak with objects as with people, creating the illusion they're alive and sentient. Local mesh networks will allow objects to communicate with each other wordlessly at incredible speed.



Manage spending with a persuasive purse

The iBag is a smart purse that monitors your shopping and will refuse to open when you're spending too much.

Control your house with brainwaves

Philips and Accenture have jointly developed a prototype headset that lets patients with ALS and other neurodegenerative disease control lights, televisions, and other appliances.

AMPLIFY PLANT AND ANIMAL INTELLIGENCE

Today, for the most part, only humans and electronics are connected to the Internet. However, we'll see a vast expansion of who and what gets connected to the web. Early experiments connecting service dogs to their owners' environments have enabled dogs to start laundry, and the Smart America expo is developing tools to read rescue dogs' stress levels to improve emergency response in disaster settings. Over time, efforts to mine emotional and other signals from animals and plants—and to use these signals to trigger objects in our environments to act—will enable houseplants and pets to improve our health.



Barking to do the laundry

The Woof to Wash laundry machine, developed by JTM Service, activates at the bark of a highly trained service dog.

Detecting bombs with cyborg spinach

Researchers at MIT inserted carbon nanotubes into spinach—with the aim of turning plants into sophisticated pollution or weapons sensors.

DIAGNOSE WITH TELEPATHIC TECHNOLOGIES

The rise of cheap sensors and wearable computing will drive new efforts to measure faces, language, posture, and other indicators of emotional presence to understand underlying biological conditions. New applications of computing in clothing range from detecting early signs of breast cancer to counting calories using embedded 3D cameras. The content and tone of phone calls is being mined to diagnose Parkinson's Disease and early signs of bipolar episodes. As passive diagnostic tools make their way from test labs into the world, they will usher in spaces that can diagnose individual health conditions—whether we want them to or not.



Measuring heat to detect cancer

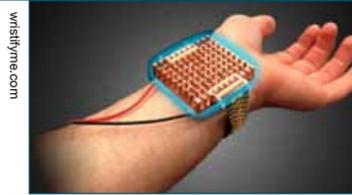
The First Warning Systems bra identifies early stage malignant breast cancer by using sensors to detect unusual body heat patterns.

Finding disease with a home camera

Following his son's cancer diagnosis, chemist Bryan Shaw developed an algorithm to diagnose eye cancer through subtle changes in digital photos.

ESCAPE INSIDE A PERSONAL FILTER BUBBLE

Advances in wearable computing will accelerate from measuring activities to remaking experiences of physical reality. Researchers at MIT have developed a bracelet that works as a personal air conditioner, effectively enabling you to feel comfortable regardless of the ambient temperature. Projects to diminish reality—block visual items from fields of view in computing interfaces—are being developed to complement augmented reality. Taken together, such technologies are creating a future where experiences of environments are no longer fixed or shared in time. Instead, individuals will increasingly be able to manipulate everything from sensory comfort levels to whether they see unhealthy temptations.



Set your bracelet to control the temperature

About the size of a wristwatch, Wristify can heat or cool its wearer, matching a personal thermal set point.

Block out unwanted sights

Using high-speed image recognition, researchers in Germany developed a diminished reality system that enables users to hide specified objects.

ROUTE THROUGH HEALTHY SPACES

As our spaces wake up and begin capturing various kinds of data on impacts to our well-being, the way we interact with and navigate our physical space will change. Already initiatives like Propeller Health, which uses a GPS-enabled inhaler to track where people have asthma attacks, are creating new maps of health risks that are being used to route children away from pollution hotspots. Such initiatives will move beyond tracking and routing us away from risk to guiding us toward healthier and more enjoyable places and commutes—away from environments that make us sick and through places that give us joy.



Finding the most beautiful routes

Researchers at Yahoo! developed GPS algorithms to route pedestrians through pretty parts of cities on their way between two places.

Mapping air quality in real time

PerkinElmer's small sensor called Elm uses a phone to map temperature, pollution, and humidity detailed to the city block level.

MAKE YOUR OWN HEALTH

Sensors, materials, and whole devices are becoming easier to program, even to fabricate in the home and the community. Do-it-yourself projects to create seizure monitors, brainwave-controlled doors, and monitors for early detection of loss of mobility point toward growing efforts to apply the technologies and ethos of the maker movement to creating and shaping health-aware environments. As these technologies become more accessible to everyday people, we'll see our shared spaces transformed in diverse ways to meet what might previously have been seen as niche demands.



Hack brain waves

Engineers are creating an affordable, open-source, brain-computer interface kit to allow people to control applications with nothing more than thoughts.

Put an epilepsy monitor in hands that need it

An innovative lightweight epilepsy movement monitor called SAMi, enabled by smartphones, is seeking funding through the website Indiegogo.

IMMERSE YOURSELF IN A NEW EXPERIENCE OF REALITY

While medical centers have studied applications of virtual reality for years, emerging sophisticated, direct-to-consumer virtual reality will rapidly accelerate the adoption of virtual medical treatments. Experiments with off-the-shelf technology have ranged from creating simulated experiences of walking for bedridden patients to giving cramped living spaces the illusion of spaciousness to make them more welcoming. Such visualizations will converge with efforts to shape smell, sound, and touch to immerse us in virtual multisensory spaces. As virtual spaces continue to free us from the trappings of our physical spaces, people will increasingly immerse themselves in healthier virtual environments, regardless of their physical environments.



Take an end-of-life immersive walk

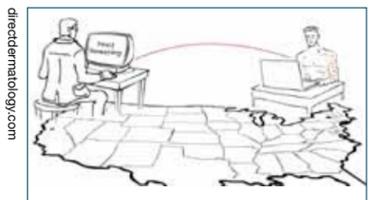
Using an Oculus Rift prototype, a dying cancer patient experienced walking through parks in Italy while confined to her house.

Lend spaciousness to micro-apartments through simulation

Mixed Reality Living Spaces enables people to experience different spaces in one environment, making a small space less stressful.

RESPOND WITH THE RIGHT RESOURCES

Geolocation technologies, drones, and algorithms are giving us the ability to coordinate resources on a just-in-time basis. These developing technologies have the potential to transform a myriad of health responses, from cutting emergency response times to cardiac arrest events by pinging trained first responders to an effort by Kimberley Clark, the manufacturer of Kleenex, to route larger supplies of tissues to cities with emerging flu outbreaks. This same logic of coordination is being applied to telemedicine efforts to enable individuals in remote communities to receive specialist care with minimal wait times.



Supplying cities expected to get sick

Achoo, one of the most sophisticated flu trackers, enables Kimberley Clark to ship early to areas forecast to need tissues.

Cutting wait times with virtual coordination

Dermatology Direct, a telemedicine service, connects people in rural areas, or anywhere, to certified specialists in order to speed treatments.

HEALTH AWARE world

These illustrations depict a range of engagement strategies in which our objects and environments will become aware and help us manage our health in the coming decades. They're designed to provoke your imagination, make you think about future possibilities, and put the emerging health-aware world into the context of people's lives.

IMAGINE THE FUTURE:

IDENTIFY a person you know who is facing a health challenge.

IMMERSE yourself in the possibilities and forecasts on this map.

PROTOTYPE an aware object or environment that can address people's health in new ways.

DIAGNOSE WITH TELEPATHIC TECHNOLOGIES

from intentional to passive sensing systems



MAKE YOUR OWN HEALTH

from consumers to co-creators



RELY ON EVERYDAY ITEMS WAKING UP

from computer screens to magical interactions



ESCAPE INSIDE A PERSONAL FILTER BUBBLE

from shared to personalized reality



IMMERSE YOURSELF IN A NEW EXPERIENCE OF REALITY

from physical spaces to blended digital environments



AMPLIFY PLANT AND ANIMAL INTELLIGENCE

from sensing to triggered actions



ROUTE THROUGH HEALTHY SPACES

from direct routes to healthy paths

RESPOND WITH THE RIGHT RESOURCES

from fixed spaces to on-demand access





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