

Case Study

Freescale i.MX Applications Processor Powers Device That Compensates for Lost Vision

OrCam transforms the lives of the visually impaired with a compact, eyeglass-mounted device

You've Never Seen Anything Like OrCam

OrCam is a tiny device that's enriching the lives of the visually impaired. Clipped to the earpiece of any ordinary pair of glasses, OrCam sees and understands whatever happens to be in front of the wearer and communicates the information through an earpiece. And "whatever happens to be in front of the wearer" means exactly that—anything from the faces of friends who walk into a room, to the text in newspapers and books, to transit signs and traffic signals, to everyday objects of all sorts. All the wearer has to do is point in the direction of what they want to learn about, and OrCam will describe or read it.

OrCam comes preprogrammed to recognize hundreds of objects, and the wearer can easily teach it to recognize other, more personal objects, such as a credit card or set of keys, by simply scanning the object back and forth in front of the sensor. A wave of the hand toward a face or place alerts OrCam to recognize it in the future. Point at a piece of printed text, and OrCam will read it—even starting at a particular paragraph. Its reading abilities also extend to practical items like the names of packaged foods in grocery stores, route information at bus and subway stops and other sources of information people rely on in their everyday lives.

Small, unobtrusive and easy to use, OrCam makes ordinary activities simple and straightforward for the visually impaired.

Sophisticated Technology for Making Life Simple

OrCam may have been designed first and foremost to simplify people's lives, but the technology required to achieve that goal is extremely complex. OrCam's team of engineers, all recognized as elite in the field of advanced computer vision, developed a unique algorithm far more powerful than what is traditionally used in consumer-type augmented reality products, ultimately squarely placing the product in the future forward category.

The other piece of the puzzle for OrCam was finding an enabling technology that included the following:

- A *quad-core processor* to deliver a compact package with all the processing power needed to execute advanced computer vision algorithms
- An *in-processor camera interface* to eliminate the need for an external component to connect the sensor to the processor and thus reduce the end product size



Challenge:

Create a portable solution for the visually impaired that allows them to access activities that most people take for granted (e.g., riding the bus, shopping for groceries, reading the newspaper, etc.)

Solution:

OrCam employs sophisticated visual computing algorithms run by Freescale's high-performance, energy-efficient i.MX 6Quad applications processor to interpret visual inputs and communicate their meaning in real time to the person wearing the technology.

Benefit:

For people whose visual impairments prevent them from easily interacting with the world around them, OrCam offers a wearable, affordable intuitive solution.

- *Dynamic power management* capabilities to use power efficiently enough to extend battery life for as long as a full day

It may even be fair to say that until recently, a solution like OrCam would have been nearly impossible to develop in terms of achieving practical end product. Without the combination of advanced technologies listed here, any solution along these lines would have been too large and cumbersome to carry and sported an extremely short battery life that rendered it nearly useless.

OrCam Makes It Possible. Freescale Makes It Work.

Only Freescale offers the combination of powerful quad-core applications processing and sophisticated power management that's essential for OrCam to achieve both high portability and low-power operation. i.MX 6Quad applications processors deliver advanced processing performance to handle the massive amounts of data coming into the visual sensor, with up to four ARM® Cortex®-A9 cores running up to 1.2 GHz. This allows execution of all processing algorithms and software speech codecs on a single chip. Meanwhile, Freescale's PF0100 PMIC serves as a dedicated power management tool, automatically adjusting power in response to changing processing needs in order to maximize energy efficiency.

The advanced processing capabilities and sophisticated power management capabilities together enable a user experience that's unmatched in performance and convenience. i.MX 6Quad applications processors support computer vision algorithms that allow OrCam to recognize a broad range of inputs, from shapes and colors to text and faces. The processor's performance-to-power ratio, paired with the added power management provided by the PMIC, results in power efficiencies that

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allow OrCam to run all day without a battery recharge. And a built-in MIPI® interface supports portability by eliminating the need for a separate component to connect the camera sensor with the processor.

“Another processor would not have been as compact, making it inconvenient to carry around,” said Yonatan Wexler, VP of R&D at OrCam. “Freescale’s i.MX 6Quad processors delivered the processing power we needed in a small form factor and with all-day battery life—unmatched by anyone else.

On top of that, our close relationship with Freescale gave us early access to the software, tools, samples and state-of-the-art support, allowing us to achieve our clear mission: to use advanced computer vision to help the visually impaired and blind.”

Freescale: Medical Expertise for the Long Term

Semiconductor technology plays a critical role in the development of new technologies to assist with patient monitoring, diagnostics, therapy and imaging. Medical device designers need to balance processing requirements with power consumption, help to ensure a fast time to market and navigate the regulatory environment. Freescale is a trusted provider of microcontrollers, microprocessors, analog and sensor components, RF amplifiers and wireless technology to meet the unique needs of

medical designs. These vital technologies, along with Freescale's enablement tools, expertise and alliances, help customers develop breakthrough medical systems and life-critical applications. Freescale also offers a formal product longevity program for the medical segment, ensuring that a broad range of program devices will be available for a minimum of 15 years*.

OrCam: A Clear Mission to Help the Visually Impaired

OrCam was founded in 2010 with a clear mission: to use advanced computer vision to help the visually impaired and blind regain the functionality that was lost. The company met with dozens of visually impaired and blind individuals to find out what they missed the most and designed a device to address those issues while keeping it user friendly. They have assembled a team of engineers, most of whom came from elite technological units of the IDF and academia. Over the past three years, the system was developed, tested and refined. It is now available to the public.

*These products are/or may be supported by Freescale's Product Longevity Program. For Terms and Conditions and to obtain a list of available products, visit freescale.com/productlongevity.



Freescale Technology for OrCam

- i.MX 6Quad applications processors
- PF0100 power management IC (PMIC)

Freescale Development Tools for OrCam

- Linux® Board Support Package (BSP) for i.MX applications processors

For more information on Freescale's healthcare and medical solutions, visit freescale.com/healthcare

To learn more about how OrCam is powered by Freescale technology, visit freescale.com/OrCam